

OCULAR DISORDERS

presumed to be inherited in purebred dogs

SEVENTH EDITION

2014

GENETICS COMMITTEE OF THE
AMERICAN COLLEGE OF VETERINARY OPHTHALMOLOGISTS

Foreword

Ocular disorders, proven or presumed to be inherited in purebred dogs, have been a topic of intense dialogue by Diplomates of the American College of Veterinary Ophthalmologists (ACVO) for many years. Discussions commenced in the latter half of the 20th century during the early days of this College's inception, have continued into the 21st century, and will no doubt continue for years to come. Our knowledge of the existence, nature, progression, and inheritance of ocular disorders continues to expand as this field of veterinary science evolves. The Genetics Committee of the ACVO was originally formed in response to requests by registries, breed groups and veterinarians, with the intent to provide a scientific advisory panel and guidelines regarding ocular disorders in purebred dogs. The Genetics Committee of today remains engaged in an ongoing effort to update information on ocular disorders for this purpose.

The most current edition of this document has been prepared in PDF format. The content of this production has originated from several sources. The generation of statistical information is made possible by the efforts of dedicated breeders of purebred dogs who present their dogs to Diplomates of the American College of Veterinary Ophthalmologists for Companion Animal Eye Registry (OFA / CAER) and Canine Eye Registration Foundation (CERF) examinations. The research copies are then conscientiously submitted to the registry by the examining Veterinary Ophthalmologists. These data generate annual statistics. The statistics for each breed are then reviewed by the Genetics Committee for the most recent year and from the previous 5 years. Recommendations regarding the ocular disorders listed for each breed and the breeding advice are compiled following guidelines detailed elsewhere in this publication. A comprehensive review of the scientific literature since the last published edition was undertaken by all committee members. The scientific articles and breed disorders from the statistical and literature review have been added to the information on each breed in the production of this document. The collective educated clinical experience of the committee members is utilized to reach a consensus of opinion in areas where there remains a paucity of hard scientific proof regarding certain identified breed problems.

The current Genetics Committee has instituted an annual scientific literature search, in addition to the previously established yearly statistical data review. This information is compiled and submitted in an effort to maintain a bank of current information for future editions and versions of this document. The content of all editions past, present and future will remain dynamic and ever changing as more precise technologies advance the study of the canine genome, as continued scientific research expands our knowledge and as the data base grows.

This production builds on the basis provided by the diligent efforts of all previous Genetics Committees. Out of collegial respect and for an historical perspective I would like to acknowledge the previous Chairpersons of the ACVO Genetics Committee recognizing that with every chair, a multitude of dedicated committee members were responsible for the accomplishments and contributions of each committee. Dr. David Covitz 1986-1988, Dr. Randall Scagliotti 1988-1992, Dr. Cynthia Cook 1992-1995, Dr. Keith Collins 1995-1997, the late Dr. Cindy Wheeler 1997-1999, Dr. Nancy Bromberg 1999-2003.

It has been an honor and a privilege to serve the ACVO, my fellow Diplomates, reputable dog breeders, and our most trusted canine companions in this endeavour.

Melanie Morgan Williams
DVM, Diplomate ACVO,
Chair, ACVO Genetics Committee 2003-2006

7th Edition 2014 Version Acknowledgements:

The following groups and individuals deserve credit for the production of this edition of Ocular Disorders Presumed to be inherited in Purebred Dogs.

The ACVO Board of Regents.

Genetics Committee Chairs Dr. Andras Komaromy 2006-2008, Dr. Katie Diehl (2009-2011), Dr. Jacqueline Pearce (2011-2012), Dr. Carrie Breaux (2011-2013), Dr. Kenneth Pierce (2014), Dr. Wendy Townsend (2015) and all Genetics Committee members.

The Genetics Committee members (2014-2015): Dr. Ellen Belknap, Dr. Caroline Betbeze, Dr. Shannon Boveland, Dr. Janet Isherwood, Dr. Ruth Marrion, Dr. Jessica Meekins, Dr. Kenneth Pierce, Dr. Lynn Sandmeyer, Dr. Wendy Townsend, Dr. Kristina Vygantas, and OFA liaison Dr. Katie Diehl.

Eddie Dziuk, OFA Chief Operating Officer.

Fifth Edition 2010 Version Content:

Scientific literature and statistics to December 31st, 2008.
Acceptance of literature and statistics @ Genetics Committee meeting November 2009.
Compilation and proofing of content of 2010 Version, November 2009 – November 2010.
Publication, November 2010.

Sixth Edition 2013 Version Content:

Scientific literature and statistics to January 1 2014
Acceptance of literature and statistics at Genetics Committee meeting November 2013.
Publication October 2013

Seventh Edition 2014 Version Content:

Scientific literature and statistics to January 1 2015
Acceptance of literature and statistics at Genetics Committee meeting October 2014.
Publication Summer 2015

Introduction

What is the purpose of this book?

The Orthopedic Foundation for Animals (OFA), Canine Eye Registration Foundation (CERF), other breed registry groups, breed clubs, and practicing veterinarians have requested that the American College of Veterinary Ophthalmologists (ACVO) provide a scientific advisory panel to furnish guidelines regarding ocular disorders of major concern to purebred dogs. The Genetics Committee of the ACVO was formed in response to these requests and is engaged in an ongoing effort to update information on ocular disorders proven or suspected to be hereditary in purebred dogs. The compendium of ocular disorders and breeding recommendations which follow are interim guidelines. They are reviewed regularly and revised whenever additional information becomes available.

How can this information be used?

National and international breed clubs are encouraged to submit their input regarding breeding decisions for ocular disorders found in their breeds. **Local breed clubs** can participate by encouraging and organizing ocular examination clinics and forwarding their requests and concerns to their national organization. **Practicing veterinarians** are encouraged to contribute by informing all owners of potential breeding animals of the value and availability of ocular examinations, prior to breeding. Information regarding ocular disorders found in litters or individuals can be forwarded to the Genetics Committee via any ACVO diplomate. **Individual breeders** wishing to uphold high ethical standards for the improvement of their breed are urged to contribute by annual examination of their breeding animals and by encouraging the same from other breeders. Further information can be obtained from the Orthopedic Foundation for Animals (OFA): 2300 E Nifong Boulevard, Columbia, MO, 65201-3806, 573-442-0418. Only through increased awareness of the problems and a sustained cooperative effort to disseminate accurate information, will we be able to control and/or eliminate hereditary eye diseases in purebred dogs.

How do we identify an inherited eye disease?

Although there are noteworthy exceptions, most of the ocular diseases of dogs which are presumed to be hereditary have not been adequately documented. Genetic studies require examination of large numbers of related animals in order to characterize the disorder (age of onset, characteristic appearance, rate of progression) and to define the mode of inheritance (recessive, dominant). In a clinical situation, related animals are frequently not available for examination once a disorder suspected to be inherited is identified in an individual dog. Maintaining a number of dogs for controlled breeding trials through several generations is a long and costly process. Both of these obstacles are compounded by the fact that many ocular conditions do not develop until later in life.

Until the genetic basis of an ocular disorder is defined in a published report, we rely on what statistical information is available from registry organizations, informed opinions and consensus from ACVO diplomates, and must satisfy ourselves with terms like "presumed inherited" and "suspected to be inherited". Several companies provide information on genetic testing greatly assist in providing more information and data to aid in defining the canine genetics of ocular diseases.

When do we suspect that a disorder is inherited in a given breed?

- when the frequency is greater than in other breeds
- when the frequency increases in a given breed as a whole
- when the frequency is greater in related dogs within a breed
- when it has a characteristic appearance and location
- when it has a characteristic age of onset and course of progression (predictable stages of development and time for each stage to develop)
- when it looks identical to an entity which has been proven to be inherited in another breed

Guidelines Used by the ACVO Genetics Committee in Making Breeding Recommendations

In this book, we chose the term "**BREEDING ADVICE**" and intentionally avoided the words "certifiable" and "registerable". The ACVO does not serve as a registry organization. Registry organizations operate independently of the ACVO and set their own standards for registration. However, the OFA does follow the guidelines set forth by the ACVO Genetics Committee in this publication. Any registry organization may use the information in this compendium and results of examinations performed by ACVO Diplomates in the registering of animals with regard to breeding suitability as they see fit.

It is important to recognize that the sensitivity of genetic disorder detection is greater when large numbers of dogs are examined. The extensive number of disorders listed in this book for some breeds may reflect the popularity of the breed and the numbers of animals evaluated. Conversely, the lack of disorders listed for other breeds often reflects only the paucity of examinations reported for each breed. For these reasons, the ACVO Genetics Committee strongly recommends annual evaluations of dogs of all breeds as the imperative first step in the control of hereditary ocular disorders. We would like to acknowledge the contribution of the Orthopedic Foundation for Animals (OFA) and Canine Eye Registration Foundation (CERF) in providing statistical summaries of ophthalmic examinations from their files.

For each breed, specific ocular disorders have been listed which are known or suspected to be inherited based on one or more of the following criteria:

- 1) There are published reports in the scientific literature regarding a condition in a particular breed with evidence of inheritance.
- 2) The incidence of affected animals (from OFA and CERF reports) is greater than or equal to 1% of the examined population with a minimum of five affected animals per five year period. Regardless of the population of dogs examined, if 50 or more affected individuals are identified in a five year period, the entity will be listed for that breed.
- 3) A specific request from a breed club that a condition be included for their breed may be considered at the ACVO annual meeting of the Genetics Committee if information is received by August 1. Such requests are reviewed critically and must include specific documentation as to the disorder in question and the numbers seen. Further information from the breed club may be requested. The request must receive agreement by a majority of the committee.
- 4) There is overwhelming opinion by a majority of the Genetics Committee members that clinical experience by ACVO Diplomates would indicate a particular condition should be listed for a breed, in spite of the absence of direct evidence of affected animals on OFA or CERF reports.
- 5) Results of genetic laboratory research and genetic testing.

The "Breeding Advice" given is determined by the significance of the condition to vision and/or very strong evidence of heritability:

Two categories of advice regarding breeding have been established:

- **NO:** Substantial evidence exists to support the heritability of this entity AND/OR the entity represents a potential compromise of vision or other ocular function.
- **BREEDER OPTION:** Entity is suspected to be inherited but does not represent potential compromise of vision or other ocular function.

When the breeding advice is "**NO**", even a minor clinical form of the entity would make this animal unsuitable for breeding. When the advice is "**BREEDER OPTION**", caution is advised. In time, it may be appropriate to modify this stand to "**NO**" based on accumulated evidence. If, in time, it becomes apparent that there is insufficient evidence that an entity is inherited, it may be deleted from the list.

There are currently ten disorders for which there is an unequivocal recommendation against breeding in all breeds:

These are conditions which frequently result in blindness and for which there is definite evidence of heritability in one or more breeds. However, these disorders will not be listed on the individual breed page for a given breed, unless they also meet the criteria described above.

*Note: The prudent approach of these disorders is to assume they are hereditary except in cases specifically known to be associated with trauma, other causes of ocular inflammation, specific metabolic diseases or nutritional deficiencies.

1. **Glaucoma** – See above *note.
2. **Keratocconjunctivitis sicca (KCS)** – Breeding is not recommended for any animal demonstrating keratitis consistent with KCS. The prudent approach is to assume KCS to be hereditary except in cases suspected to be non-genetic in origin. See above *note.
3. **Cataract** – Breeding is not recommended for any animal demonstrating partial or complete opacity of the lens or its capsule *unless the examiner has also checked the box for “suspect not inherited” or unless specified otherwise for the particular breed.* See above *note.
4. **Lens luxation or subluxation** – See above *note.
5. **Persistent hyperplastic primary vitreous/persistent hyperplastic tunica vasculosa lentis** – See above *note.
6. **Retinal detachment** – See above *note.
7. **Retinal atrophy – generalized (PRA)** - Breeding is not advised for any animal demonstrating bilaterally symmetric retinal degeneration (considered to be PRA unless proven otherwise).
8. **Retinal dysplasia, geographic or detached forms** – See above *note
9. **Optic nerve coloboma**
10. **Optic nerve hypoplasia**

In breeds recognized with Persistent Pupillary Membrane (PPM) as an inherited problem there is an unequivocal recommendation against breeding when there is PPM iris to lens, or PPM iris to cornea, or iris sheets. Breeding advice is 'NO'.

The following breeds are recommended to have a preliminary examination prior to initial pharmacological dilation to best facilitate identification of these disorders:

Dalmatian – iris hypoplasia/sphincter dysplasia

Australian Shepherd – iris coloboma

Miniature American Shepherd/Miniature Australian Shepherd – iris coloboma

Toy Australian Shepherd – iris coloboma

Mastiff – persistent pupillary membrane

Basenji – persistent pupillary membrane

Pembroke Welsh Corgi – persistent pupillary membrane

What can be detected during an Eye Certification Examination?

A routine eye screening examination includes indirect ophthalmoscopy and slit lamp biomicroscopy following pharmacological dilation of the pupils. Gonioscopy, tonometry, Schirmer tear test, electroretinography, and ultrasonography are not routinely performed; thus, dogs with goniodysgenesis, glaucoma, keratoconjunctivitis sicca, or some early cases of progressive retinal atrophy might not be detected without further testing.

The diagnoses obtained during an ophthalmic eye certification examination refer only to the **phenotype** (clinical appearance) of an animal. Thus it is possible for a clinically normal animal to be a carrier (abnormal **genotype**) of genetic abnormalities.

An individual ACVO Diplomate may disagree with the breeding advice contained in this compendium. It is appropriate for this examiner to contact the ACVO Genetics Committee to voice disagreement, initiate change or suggest additions. The members of the Genetics Committee represent the ACVO but acknowledge that the information generated for a breed may not agree with the knowledge and clinical experience of every individual ACVO Diplomate.

What is the role of the responsible dog breeder?

The final beneficiary of the information in this book is the dog breeder. It is up to the conscientious breeder to use this information along with other criteria in selecting which animals to breed. To assist this determination, current certification is recommended. Animals currently free of heritable eye disease will be issued a certificate on receipt of the examination/application by OFA. To avoid confusion between a normal animal (no evidence of heritable eye disorders) and one that may have a minor fault coming under the advice of Breeder Option, the Breeder Option category will be printed on the certificate. This is intended to stimulate conversation as to the specific nature of the Breeder Option condition found in that particular animal, allowing breeders using a dog in a breeding program to make an informed decision.

There are many ocular conditions which are a direct result of selection for a facial conformation considered desirable by breeders.

These include

- 1) Entropion
- 2) Ectropion
- 3) Macroblepharon

4) Exposure keratopathy syndrome

Facial conformation with excessively prominent eyes, heavy facial folds, or eyelids which are either inverted or everted predispose animals to corneal irritation, discomfort and if untreated, can lead to loss of vision. A responsible breeding program should recognize and select away from these exaggerated facial features.

The information contained in this book is protected by copyright. Duplication of any part is not allowed without express written permission from the American College of Veterinary Ophthalmologists and/or the OFA.

Glossary of Terms

(For more detailed definition the reader is referred to medical and genetic scientific texts)

Achromatopsia: see **Day blindness**

Canine multifocal retinopathy: characterized by numerous distinct (i.e. multi-focal), roughly circular patches of elevated retina (multifocal bullous retinal detachments). The condition includes numerous distinct (i.e. multi-focal), roughly circular patches of elevated retina with accumulation of material that produces gray-tan-pink colored lesions (multifocal bullous retinal detachments). These lesions, looking somewhat like blisters, vary in location and size, although typically they are present in both eyes of the affected dog.

The disease generally develops in young dogs and might not progress or progress slowly, or may appear to heal with discrete areas of tapetal hyper-reflectivity or hyperpigmentation. Most dogs exhibit no noticeable problem with vision despite their abnormal appearing retinas.

Cataract: any opacity of the lens and/or its capsule, regardless of size or location within the lens. Cataracts are assumed to be hereditary unless associated with known trauma, ocular inflammation, specific metabolic diseases or nutritional deficiencies.

Ceroid lipofuscinosis: an inherited disease of man and animals characterized by the accumulation of lipopigment in various tissues of the body including the eye. It results in progressive neurologic disease including blindness. (Also called Batten's disease)

Choroidal hypoplasia: a congenital, inherited, non-progressive defect primarily affecting the choroid resulting in some or all of the following: decreased or lack of pigment in the retinal pigment epithelium or choroid, tapetal thinning and reduced or abnormal choroidal blood vessels.

Chronic superficial keratitis (CSK): see **Pannus**

Collie eye anomaly: a congenital syndrome of ocular anomalies characterized by bilateral and often symmetrical defects including any combination of **choroidal hypoplasia**, **coloboma** and **retinal detachment(s)**.

Coloboma: a congenital abnormality in ocular development usually characterized by focal absence of tissue, commonly (though not exclusively) located at the 6 o'clock position associated with failure of closure of the optic fissure.

Cone degeneration: the loss of photopic vision caused by selective degeneration of the cone photoreceptors. Also known as day blindness, hemeralopia or achromatopsia.

Corneal degeneration: opacification of one or more of the corneal layers frequently resulting from deposition of lipid or mineral and occurring secondary to chronic inflammation

Corneal dystrophy: non-inflammatory corneal opacity (white to gray) present in one or more of the corneal layers (**epithelium**, **stroma**, **endothelium**). The term dystrophy implies an inherited condition. It is usually bilateral although not necessarily symmetrical and the onset in one eye may precede the other.

Corneal dystrophy - endothelial: breed-related loss or dysfunction of corneal endothelial cells resulting in bilateral, progressive corneal edema

Corneal dystrophy - epithelial, stromal: breed-related, non-inflammatory, white to silver-colored opacification of the corneal epithelium and/or stroma frequently resulting from deposition of lipid

Day blindness: see **cone degeneration**

Dermoid: a congenital, non-cancerous growth occurring on the cornea, conjunctiva, or eyelid typified by the presence of skin-like structures

Distichiasis: the presence of abnormally oriented eyelashes, frequently protruding from meibomian gland ductal openings

Dry eye: see **Keratoconjunctivitis sicca**

Dysplasia: abnormality of development

Dystrophy: noninflammatory, developmental, nutritional or metabolic abnormality; dystrophy implies a possible hereditary basis and is usually bilateral.

Ectopic cilia: aberrant hairs emerging through the palpebral conjunctiva which often causes ocular discomfort and corneal disease.

Ectropion: a conformational defect resulting in eversion of the eyelid margin, which may cause ocular irritation due to exposure. It is likely that ectropion is influenced by several factors defining the skin and other structures, which make up the eyelids, orbital contents and conformation of the skull.

Entropion: a conformational defect resulting in inversion of the eyelid margin which may cause ocular irritation. It is likely that entropion is influenced by several factors defining the skin and other structures, which make up the eyelids, orbital contents and conformation of the skull.

Euryblepharon: an exceptionally long eyelid marginal length, which may lead to ectropion or Entropion. Euryblepharon is synonymous with the term macropalpebral fissure.

Exposure/pigmentary keratitis: a condition characterized by variable degrees of superficial vascularization, fibrosis and/or pigmentation of the cornea. May be associated with excessive exposure/irritation of the globe due to shallow orbits, lower eyelid medial entropion, lagophthalmos and macropalpebral fissure.

Glaucoma: characterized by an elevation of intraocular pressure (IOP) which causes optic nerve and retinal degeneration and results in blindness. Diagnosis and classification of glaucoma requires tonometry and gonioscopy, which are not part of a routine eye certification examination.

Glaucoma, pigmentary: see **ocular melanosis**

Goniodysgenesis: congenital anomaly characterized by the persistence of a variably fenestrated sheet of uveal tissue spanning the iridocorneal angle, extending from the iris base to the peripheral cornea. Diagnosis is by gonioscopy which is not part of a routine eye certification examination.

Hemeralopia: see **cone degeneration**.

Imperforate lacrimal punctum: developmental anomaly resulting in an imperforate opening of the lacrimal puncta. An imperforate lower punctum may result in epiphora, an overflow of tears onto the face.

Iridocorneal angle: the junction between the iris and the cornea; the drainage angle. Aqueous humor leaves the anterior chamber via the trabecular meshwork within the iridocorneal angle into the venous circulation.

Iris coloboma: a congenital abnormality in iris development usually characterized by a full-thickness defect in iris tissue, commonly (though not exclusively) located at the 6 o'clock position associated with failure of closure of the optic fissure. A partial-thickness defect in iris tissue should be recorded as iris hypoplasia on the eye certification form.

Iris cyst: see **Uveal cyst**

Iris hypoplasia: a congenital abnormality in iris development usually characterized by a reduced quantity of tissue identified as a partial-thickness defect in iris tissue. Full-thickness iris hypoplasia is rare and should be recorded as an iris coloboma on the eye certification form.

Iris melanoma: see **Uveal melanoma**

Iris sphincter dysplasia: a congenital abnormality in iris development usually characterized by a full-thickness defect in iris tissue at the level of the iris sphincter, causing pupillary dilation. This abnormality has been noted in the Dalmatian breed.

Keratitis: inflammation of the cornea.

Keratitis, punctate: inflammation of the cornea accompanied by multifocal, coalescing areas of stromal corneal ulceration of variable depth.

Keratoconjunctivitis sicca (KCS): an abnormality of the tear film attributed to deficiency of the aqueous portion of the tears. Progressive KCS may result in ocular surface irritation and/or vision impairment via corneal opacification. Also called dry eye. The test for this condition is the Schirmer Tear Test, which is not part of a routine eye certification examination.

Lens subluxation/luxation: partial (subluxation) or complete displacement of the lens from the normal anatomic site. Lens luxation may result in elevated intraocular pressure (secondary glaucoma) causing vision impairment and pain and/or retinal detachment.

Lenticonus: an anomaly of the lens in which the anterior or posterior surface protrudes in a conical form; usually congenital.

Macroblepharon: an exceptionally large palpebral fissure, macroblepharon in conjunction with laxity of the lateral canthal structures may lead to lower lid ectropion and upper lid entropion. Either of these conditions may lead to severe ocular irritation.

Merle: an incompletely dominant phenotype in which heterozygous (M/m) dogs exhibit a coat color phenotype of various dilute color patches, while homozygous (M/M) dogs exhibit marked hypopigmentation and ocular defects, including microphthalmia, blindness and colobomas, and deafness. Deafness and ocular defects are sometimes seen in heterozygous individuals.

Micropapilla: a congenital anomaly, which results in a small optic disk diameter without vision loss. Contrast with optic nerve hypoplasia, which may have a similar ophthalmoscopic appearance with vision loss.

Microphakia: a congenital anomaly in which there is an abnormally small lens.

Microphthalmos: a congenital anomaly in which the globe is abnormally small. Commonly associated with multiple ocular malformations and when severe, may affect vision.

Nictitans cartilage anomaly/eversion: a congenital anomaly in the nictitating membrane in which the T-shaped cartilage is malformed and/or folded.

Nictitans gland prolapse: Protrusion of the tear-producing gland of the nictitating membrane from its normal position posterior to the nictitating membrane, to a position superior to the free margin of this structure

Nodular granulomatous episclerokeratitis (NGE): an inflammatory disorder of the sclera and episclera, with occasional corneal involvement, characterized by granulomatous infiltrates. Previously known as **Proliferative keratoconjunctivitis**. This condition is most commonly seen in the Collie.

Nyctalopia: loss of scotopic (night) vision. Causes include genetic defects in photoreceptors and in retinal pigment epithelium, either dystrophy or degeneration of affected cells.

Ocular melanosis: progressive bilateral and sometimes asymmetrical increase in pigmentation with melanocytic accumulation the uveal tract and adjacent tissues. Ultimately progresses to glaucoma and loss of vision in most cases (melanocytic glaucoma). Not associated with systemic disease or metastases. Most often recognized in Cairn Terriers.

Optic nerve coloboma: a congenital abnormality of the optic nerve commonly associated with failure of closure of the optic fissure, resulting in a defect in the optic nerve in the anterior-posterior plane. May result in partial or total vision loss.

Optic nerve hypoplasia: a congenital anomaly, which results in a small optic disk diameter and vision loss. Contrast with micropapilla, which may have a similar ophthalmoscopic appearance but without loss of vision.

Pannus: a bilateral inflammatory disease of the cornea which usually starts as a grayish haze to the inferior or inferiotemporal cornea, followed by the formation of a vascularized subepithelial

opacity that begins to spread toward the central cornea; pigmentation may follow the vascularization. If severe, vision impairment occurs. Plasma cell infiltration of the nictitans may occur in conjunction with CSK, or on its own. (Also called “CSK”)

Persistent hyaloid artery (PHA): congenital defect resulting from abnormalities in the development and regression of the hyaloid artery. The blood vessel remnant can be present in the vitreous as a small patent vascular strand (PHA) or as a non-vascular strand that appears gray-white (persistent hyaloid remnant).

Persistent hyperplastic primary vitreous (PHPV): congenital defect resulting from abnormalities in the regression of the hyaloid artery (the primary vitreous) and the interaction of the blood vessel with the posterior lens capsule/cortex during embryogenesis. This condition is often associated with congenital cataracts and frequently seen with PHTVL.

Persistent hyperplastic tunica vasculosa lentis (PHTVL): congenital defect resulting from failure of regression of the embryonic vascular network which surrounds the developing lens. Often associated with PHPV and a patent hyaloid artery.

Persistent pupillary membranes (PPM): persistent blood vessel remnants in the anterior chamber which fail to regress normally by 3 months of age. These strands arise from the iris collaret and may bridge from iris to iris, iris to lens, iris to cornea or form sheets of tissue in the anterior chamber.

Persistent tunica vasculosa lentis (PTVL): clinically insignificant posterior epicapsular lenticular opacities resulting from incomplete regression of the embryonic vascular network which surrounds the developing lens.

Pigmentary glaucoma: see **Ocular melanosis**

Pigmentary uveitis: see **Uveitis, pigmentary**

Pigmentary keratopathy: Pigmentary keratopathy is a condition reported in Pugs in which the cornea becomes pigmented, often resulting in vision impairment. Development of pigmentary keratopathy is associated with congenital uveal pathology – iris hypoplasia and the presence of persistent pupillary membranes – but not with other factors such as Schirmer tear test values or medial canthal entropion.

Plasmoma: see **Pannus**. Also called Atypical Pannus. Bilateral thickening and depigmentation of the nictitans due to invasion of lymphocytes and plasma cells. It may or may not be associated with corneal involvement (Pannus).

Progressive rod-cone degeneration (PRCD): See **PRA**. Typically refers to recessively inherited generalized loss of rod photoreceptors followed by cone degeneration. Many different genetic mutations result in a similar phenotypic presentation.

Progressive retinal atrophy (PRA): an umbrella term used to describe a group of inherited dysplastic, dystrophic, or degenerative disease of the retinal visual cells (photoreceptors, retinal pigment epithelium, or both).

Proliferative keratoconjunctivitis: see **Nodular granulomatous episclerokeratitis**

Retinal atrophy: a non-specific term used to describe a decrease in the number and deterioration of the cells of the retina, regardless of cause.

Retinal degeneration: see **Retinal atrophy**

Retinal detachment: a separation of the neurosensory retina from the retinal pigment epithelium.

Retinal dysplasia: abnormal development of the retina present at birth. This condition is non-progressive and recognized in 3 forms: **folds, geographic, detached**.

Retinal dysplasia – folds: seen ophthalmoscopically as linear, triangular, curved or curvilinear foci of retinal folding. May be single or multiple. In puppies, retinal folds can be seen as a transient phenomenon, resolving as the eye reaches maturity.

Retinal dysplasia – geographic: geographic: an irregularly shaped area of retinal development containing both areas of thinning and areas of elevation. This form may be associated with visual impairment.

Retinal dysplasia – detached: severe retinal disorganization associated with separation of the neurosensory retina from the retinal pigmented epithelium. This form results in visual impairment

Retinopathy: any non-inflammatory condition of the retina. These conditions can usually be detected by ophthalmoscopic examination, but an electroretinogram (ERG) may be required some instances (e.g. canine multifocal retinopathy).

Rod-cone dysplasia: an inherited retinal disease characterized by abortive or abnormal development of rods and cones. Affected animals become blind early in life, usually within the first 6 months, with the exception of *rcd4* in the Gordon and Irish Setter dogs. See specific breed pages for rod-cone dysplasia type descriptions.

Rod dysplasia: abnormal development of the visual cells resulting in vision impairment in dim light by 6 months and total blindness at 3-5 years.

Uveal cyst: a pigmented, fluid-filled epithelial-lined structure arising from the posterior iris or ciliary body epithelium. Cysts may remain attached to the pupil margin, iris, or ciliary body, or may detach and be free-floating within the anterior chamber. They may rupture and adhere to the cornea or anterior lens capsule. Uveal cysts may occur in any breed. Uveal cysts are commonly benign, although they may be associated with other pathologic conditions in various breeds.

Uveal cyst, anterior chamber: a pigmented, fluid-filled, epithelial-lined structure arising from the posterior iris or ciliary body epithelium which has detached from its site of origin and is free-floating in the anterior chamber.

Uveal cyst, ciliary body: a pigmented, fluid-filled, epithelial-lined structure arising from

the ciliary body epithelium and attached to the ciliary body.

Uveal cyst, iris: a pigmented, fluid-filled, epithelial-lined structure arising from the posterior iris epithelium and attached to the iris.

Uveal melanoma: a locally invasive melanocytic neoplasm arising within the uveal tract, may be benign (melanocytoma) or malignant (malignant melanoma). Uveal melanomas are reported in higher frequency in German Shepherd Dogs and Labrador Retrievers. Inherited iris melanoma has been reported in Labrador Retrievers

Uveitis, pigmentary: a specific form of uveitis most commonly seen in middle-aged to older Golden Retrievers. Clinically manifests early as pigment deposition in a radial fashion on the anterior lens capsule with iridociliary cysts. Later stages are associated with posterior synechia, fibrinous anterior uveitis, cataract and ultimately glaucoma. Not associated with systemic disease; may be asymmetric in presentation.

Uveodermatologic syndrome: an immune-mediated syndrome of anterior uveitis, chorioretinitis, dermal depigmentation (vitiligo) and hair depigmentation (poliosis). A similar syndrome in humans, called Vogt-Koyanagi-Harada syndrome (VKH), is an autoimmune disease directed against melanocytes. Secondary glaucoma and/or retinal detachment are frequent complications of this disease. Seen most commonly in the Akita, Samoyed, and Siberian Husky breeds.

Vitreous degeneration: Liquefaction of the vitreous gel which may predispose to retinal detachment resulting in blindness.

Breeds Not Listed for Insufficient Data

Attempts have been made to confirm information on the following list of breeds/rare breeds. This list is not an endorsement of the breed status and may change from time to time as additional information is available.

To date there are no published reports of inherited ocular conditions in these breeds and/or the numbers of individuals for which examinations are recorded are too low to identify the presence of significant ocular disorders. Examinations are encouraged to accumulate information and reduce the likelihood of undetected conditions becoming problematic.

Aatu Tamaskan	Grand Basset Griffon Vendeen
Alaskan Noble Companion Dog	Hovawart
American Blue Lacy	Kai Ken
American English Coonhound	Kooikerhondje
American Foxhound	Kyi Leo
Anatolian Shepherd	Lamalese
Azawakh	Large Munsterlander
Barbet	Manchester Terrier
Basset Fauve de Bretagne	Mudi
Beauceron	Otterhound
Bergamasco	Perro de Presa Canario
Biewer	Peruvian Inca Orchid
Bluetick Coonhound	Plott
Bolonka Zwetna	Portuguese Pointer
Braque du Bourbonnais	Pudelpointer
Braque Francais	Pumi
Canadian Eskimo Dog	Redbone Coonhound
Cane Corso	Scottish Deerhound
Caucasian Ovcharka	Silken Windhound
Chart Polski	Shikoku
Cirneco Dell'Etna	Skye Terrier
Drever	Small Munsterlander
Deutscher Wachtelhund	Swedish Lapphund
Dutch Shepherd	Treeing Walker Coonhound
English Foxhound	Tibetan Mastiff
Fila Brasileiro	White Shepherd
French Spaniel	Xoloitzcuintli
German Longhaired Pointer	

Genetic Testing For Canine Ocular Disorders

A. Contact Information For Genetic Testing Laboratories (as of October 8, 2014)

OptiGen, LLC

Cornell Business & Technology Park
767 Warren Road, Suite 300
Ithaca, NY 14850
Tel: 607-257-0301
Fax: 607-257-0353
E-mail: genetest@optigen.com
www.optigen.com

Animal Health Trust

Lanwades Park
Kentford
Newmarket
Suffolk
United Kingdom
CB8 7UU
Tel: 01638 55 56 21 (UK)
Fax: 01638 55 56 66 (UK)
Email: dnatesting@aht.org.uk
www.aht.org.uk

Animal Genetics Inc.

1336 Timberlane Road
Tallahassee, FL 32312-1766
Tel: 1-866-922-6436
Email: contact@animalgenetics.us
www.animalgenetics.us/

Animal Genetic Testing and Research Lab

Department of Veterinary Science 108
Gluck Equine Research Center
University of Kentucky
Lexington, KY 40546-0099
Tel: 859-257-4757 Ext: 81212
Fax: 859-2575169

Dogenes

161 Sherin Ave
Peterborough, ON K9J 7V5
Canada
Tel: 705-748-0089

GenSol Diagnostics

PO Box 701492

Saint Cloud, FL 34770
Tel: (321) 482-8347
Email: info@gensoldx.com
www.gensoldx.com

Goldstein Molecular and Genetics Laboratory

Cornell University
Richard E. Goldstein
Tel: 607-253-4490
Fax: 607-253-3534
Email: phpt@cornell.edu

HealthGene

2175 Keele Street
Toronto, ON M6M 3Z4
Canada
Tel: 1-877-371-1551 (toll free)
Email: info@healthgene.com

MSU - Laboratory of Comparative Medical Genetics

Michigan State University
2209 Biomedical Physical Sciences
East Lansing, MI, 48824
Tel: 517-355-6463 Ext: 1552
Email: fyfe@cvm.msu.edu

MU - Animal Molecular Genetics Lab

University of Missouri College of Veterinary Medicine
320 Connaway Hall
Columbia, MO 65211
Email: hansenl@missouri.edu
www.caninegeneticdiseases.net/

Orthopedic Foundation for Animals

2300 E Nifong Boulevard
Columbia, MO 65201-3806
Tel: 573-442-0418
Fax: 573-875-5073
Email: ofa@offa.org

Paw Prints Genetics

850 E Spokane Falls Blvd, Suite 200
Spokane, WA 99202
Tel: (855) 202-4889
Email: askus@pawprintgenetics.com
www.pawprintgenetics.com

PennGen

3850 Spruce Street
Philadelphia, PA 19104-6010
Tel: 215-898-3375

UC-Davis, Veterinary Genetics Lab

PO Box 1102
Davis, CA 95617
Tel: (530) 752-2211
www.vgl.ucdavis.edu

VetGen

3728 Plaza Drive, Suite 1
Ann Arbor, MI 48108
Tel: 1-800-483-8436 (toll free)
www.vetgen.com

OCULAR DISORDERS REPORT

AFFENPINSCHER - 1

AFFENPINSCHER

	DISORDER	INHERITANCE	REFERENCE	BREEDING ADVICE
A.	Distichiasis	Not defined	1	Breeder option
B.	Persistent pupillary membranes - iris to iris	Not defined	2	Breeder option
C.	Cataract	Not defined	3	NO

Description and Comments

A. Distichiasis

Eyelashes abnormally located on the eyelid margin which may cause ocular irritation. Distichiasis may occur at any time in the life of a dog. It is difficult to make a strong recommendation with regard to breeding dogs with this entity. The hereditary basis has not been established although it seems probable due to the high incidence in some breeds. Reducing the incidence is a logical goal. When diagnosed, distichiasis should be recorded; breeding discretion is advised.

B. Persistent pupillary membranes (PPM)

Persistent blood vessel remnants in the anterior chamber of the eye which fail to regress normally by 3 months of age. These strands may bridge from iris to iris, iris to cornea, iris to lens, or form sheets of tissue in the anterior chamber. The last three forms pose the greatest threat to vision and when severe, vision impairment or blindness may occur.

C. Cataract

A partial or complete opacity of the lens and/or its capsule. In cases where cataracts are complete and affect both eyes, blindness results. The prudent approach is to assume cataracts to be hereditary except in cases known to be associated with trauma, other causes of ocular inflammation, specific metabolic diseases, persistent pupillary membrane, persistent hyaloid or nutritional deficiencies. Cataracts may involve the lens completely (diffuse) or in a localized region.

OCULAR DISORDERS REPORT

AFFENPINSCHER-2

References

There are no references providing detailed descriptions of hereditary ocular conditions of the Affenpinscher breed. The conditions listed above are generally recognized to exist in this breed, as evidenced by identification on breed eye screening examinations and/or clinical experience of veterinary ophthalmologists.

1. ACVO Genetics Committee, 2008 and/or Data from CERF All-Breeds Report, 2003-2007.
2. ACVO Genetics Committee, 2011 and/or Data from CERF All-Breeds Report, 2009.
3. ACVO Genetics Committee, 1999 and/or Data from CERF All-Breeds Report, 1991-1998.

OCULAR DISORDERS REPORT AFFENPINSCHER

Diagnostic Name	TOTAL DOGS EXAMINED		1991-1999		2000-2009		2010-2013		2014	
	#	%	#	%	#	%	#	%	#	%
GLOBE										
0.110 microphthalmia	1	1.9%	0		0		0		0	
EYELIDS										
20.140 ectopic cilia	0		0		2	1.6%	0		0	
25.110 distichiasis	4	7.7%	9	5.8%	7	5.6%	2	7.4%		
NASOLACRIMAL										
40.910 keratoconjunctivitis sicca	0		0		2	1.6%	0			
NICTITANS										
52.110 prolapsed gland of the third eyelid	0		0		1	0.8%	0			
CORNEA										
70.700 corneal dystrophy	1	1.9%	1	0.6%	4	3.2%	0			
UVEA										
93.710 persistent pupillary membranes, iris to iris	2	3.8%	7	4.5%	8	6.4%	6	22.2%		
93.730 persistent pupillary membranes, iris to cornea	0		0		1	0.8%	0			
93.740 persistent pupillary membranes, iris sheets	0		1	0.6%	0		0			
93.750 persistent pupillary membranes, lens pigment foci/no strands	0		0		2	1.6%	1	3.7%		
LENS										
100.200 cataract, unspecified	3	5.8%	0		0		0		0	
100.210 cataract, significance unknown	1	1.9%	4	2.6%	3	2.4%	1	3.7%		
100.302 punctate cataract, posterior cortex	1	1.9%	0		0		0		0	
100.307 punctate cataract, capsular	0		0		1	0.8%	0		0	
100.311 incipient cataract, anterior cortex	0		1	0.6%	0		0		0	
100.312 incipient cataract, posterior cortex	2	3.8%	1	0.6%	0		0		0	
100.330 generalized/complete cataract	2	3.8%	1	0.6%	0		0		0	
VITREOUS										
110.320 vitreous degeneration syneresis	0		1	0.6%	1	0.8%	0		0	
110.330 vitreous degeneration anterior chamber	0		0		2	1.6%	0		0	
RETINA										
120.170 retinal dysplasia, folds	0		2	1.3%	0		0		0	
OTHER										
900.000 other, unspecified	0		2	1.3%	1	0.8%	0		0	
900.100 other, not inherited	1	1.9%	7	4.5%	0		0		0	
900.110 other, suspected as inherited	1	1.9%	0		0		0		0	
NORMAL										
0.000 normal globe	41	78.8%	137	88.4%	114	91.2%	21	77.8%		

OCULAR DISORDERS REPORT

AFGHAN HOUND - 1

AFGHAN HOUND

	DISORDER	INHERITANCE	REFERENCE	BREEDING ADVICE
A.	Distichiasis	Not defined	1	Breeder option
B.	Corneal dystrophy - epithelial/stromal	Not defined	2, 3	Breeder option
C.	Persistent pupillary membranes - iris to iris	Not defined	2	Breeder option
D.	Cataract	Not defined	2, 4-7	NO

Description and Comments

A. Distichiasis

Eyelashes abnormally located on the eyelid margin which may cause ocular irritation. Distichiasis may occur at any time in the life of a dog. It is difficult to make a strong recommendation with regard to breeding dogs with this entity. The hereditary basis has not been established although it seems probable due to the high incidence in some breeds. Reducing the incidence is a logical goal. When diagnosed, distichiasis should be recorded; breeding discretion is advised.

B. Corneal Dystrophy - epithelial/stromal

A non-inflammatory corneal opacity (white to gray) present in one or more of the corneal layers. Corneal dystrophy implies a probable inherited basis and is usually bilateral.

C. Persistent pupillary membranes (PPM)

Persistent blood vessel remnants in the anterior chamber of the eye which fail to regress normally by 3 months of age. These strands may bridge from iris to iris, iris to cornea, iris to lens, or form sheets of tissue in the anterior chamber. The last three forms pose the greatest threat to vision and when severe, vision impairment or blindness may occur.

D. Cataract

A partial or complete opacity of the lens and/or its capsule. In cases where cataracts are complete and affect both eyes, blindness results. The prudent approach is to assume cataracts to be hereditary except in cases known to be associated with trauma, other causes

OCULAR DISORDERS REPORT

AFGHAN HOUND - 2

of ocular inflammation, specific metabolic diseases, persistent pupillary membrane, persistent hyaloid or nutritional deficiencies. Cataracts may involve the lens completely (diffuse) or in a localized region.

The characteristic cataract in the Afghan Hound begins as equatorial lens vacuoles in dogs from 4 months to 2 years of age. The opacities then extend into the anterior and posterior cortices. Rapid progression can occur with visual impairment in young adults. Test breedings have been done which support a hereditary basis; however, the exact mode of inheritance is unknown.

References

1. ACVO Genetics Committee, 2008 and/or Data from CERF All-Breeds Report, 2003-2007.
2. ACVO Genetics Committee, 1999 and/or Data from CERF All-Breeds Report, 1991-1998.
3. Vainisi SJ, Goldberg MF. *Animal models of inherited disease. In: Genetic and Metabolic Eye Disease* Little Brown and Company, Boston, 1974.
4. Roberts SR, Helper LC. Cataracts in Afghan hounds. *J Am Vet Med Assoc.* 1972; 160: 427.
5. Roberts SR. Hereditary cataracts. *Vet Clin North Am.* 1973; 3: 433.
6. Barnett KC. The diagnosis and differential diagnosis of cataract in the dog. *J Small Anim Pract.* 1985; 26: 305.
7. Barnett KC. Hereditary cataract in the dog. *J Small Anim Pract.* 1978; 19: 109-120.

OCULAR DISORDERS REPORT AFGHAN HOUND

Diagnostic Name	TOTAL DOGS EXAMINED		1991-1999		2000-2009		2010-2013		2014	
	#	%	#	%	#	%	#	%	#	%
GLOBE										
10.000 glaucoma	1	0.1%	1	0.1%	0		0		0	
EYELIDS										
21.000 entropion, unspecified	2	0.2%	0		0		0		0	
25.110 distichiasis	12	1.5%	6	0.8%	7	1.4%	2	2.4%		
NASOLACRIMAL										
32.110 imperforate lower nasolacrimal punctum	0		0		1	0.2%	0			
40.910 keratoconjunctivitis sicca	0		0		1	0.2%	0			
CORNEA										
70.210 corneal pannus	2	0.2%	0		1	0.2%	0			
70.700 corneal dystrophy	75	9.4%	85	10.9%	54	11.1%	10	11.9%		
70.730 corneal endothelial degeneration	0		1	0.1%	2	0.4%	0			
UVEA										
93.120 iris cyst	0		4	0.5%	0		0		0	
93.710 persistent pupillary membranes, iris to iris	10	1.2%	29	3.7%	20	4.1%	0		0	
93.720 persistent pupillary membranes, iris to lens	0		1	0.1%	0		0		0	
93.730 persistent pupillary membranes, iris to cornea	1	0.1%	0		0		0		0	
93.740 persistent pupillary membranes, iris sheets	1	0.1%	1	0.1%	0		0		0	
93.760 persistent pupillary membranes, endothelial opacity/no strands	0		0		1	0.2%	0		0	
LENS										
100.200 cataract, unspecified	9	1.1%	0		0		0		0	
100.210 cataract, significance unknown	35	4.4%	44	5.7%	38	7.8%	6	7.1%		
100.301 punctate cataract, anterior cortex	0		0		1	0.2%	0		0	
100.302 punctate cataract, posterior cortex	1	0.1%	0		0		0		0	
100.303 punctate cataract, equatorial cortex	0		1	0.1%	0		0		0	
100.305 punctate cataract, posterior sutures	3	0.4%	2	0.3%	11	2.3%	0		0	
100.306 punctate cataract, nucleus	0		0		2	0.4%	0		0	
100.307 punctate cataract, capsular	0		3	0.4%	1	0.2%	0		0	
100.311 incipient cataract, anterior cortex	1	0.1%	3	0.4%	0		0		0	
100.312 incipient cataract, posterior cortex	0		1	0.1%	0		0		0	
100.313 incipient cataract, equatorial cortex	0		1	0.1%	1	0.2%	0		0	
100.314 incipient cataract, anterior sutures	1	0.1%	1	0.1%	0		0		0	
100.315 incipient cataract, posterior sutures	5	0.6%	4	0.5%	0		1	1.2%		
100.316 incipient cataract, nucleus	2	0.2%	1	0.1%	0		0		0	
100.317 incipient cataract, capsular	0		1	0.1%	1	0.2%	0		0	
100.321 incomplete cataract, anterior cortex	0		0		2	0.4%	0		0	
100.322 incomplete cataract, posterior cortex	0		0		2	0.4%	0		0	
100.324 incomplete cataract, anterior sutures	0		0		2	0.4%	0		0	
100.325 incomplete cataract, posterior sutures	0		0		2	0.4%	0		0	
100.326 incomplete cataract, nucleus	0		0		2	0.4%	0		0	
100.330 generalized/complete cataract	1	0.1%	1	0.1%	0		0		0	
100.375 subluxation/luxation, unspecified	0		1	0.1%	0		0		0	

OCULAR DISORDERS REPORT AFGHAN HOUND

	1991-1999	2000-2009	2010-2013	2014
VITREOUS				
110.120 persistant hyaloid artery/remnant	0	0	2 0.4%	0
110.135 PHPV/PTVL	0	1 0.1%	0	0
110.200 vitritis	0	0	0	1 1.2%
110.320 vitreous degeneration syneresis	1 0.1%	2 0.3%	1 0.2%	1 1.2%
110.330 vitreous degeneration anterior chamber	0	2 0.3%	1 0.2%	0
FUNDUS				
97.120 coloboma	1 0.1%	1 0.1%	0	0
RETINA				
120.170 retinal dysplasia, folds	0	4 0.5%	1 0.2%	0
120.180 retinal dysplasia, geographic	0	0	2 0.4%	0
120.310 generalized progressive retinal atrophy (PRA)	4 0.5%	2 0.3%	3 0.6%	0
120.960 retinopathy	0	0	1 0.2%	0
OPTIC NERVE				
130.150 optic disc coloboma	0	3 0.4%	0	0
OTHER				
900.000 other, unspecified	0	5 0.6%	15 3.1%	0
900.100 other, not inherited	4 0.5%	30 3.9%	6 1.2%	4 4.8%
900.110 other, suspected as inherited	9 1.1%	2 0.3%	2 0.4%	0
NORMAL				
0.000 normal globe	647 80.9%	623 80.1%	403 82.9%	72 85.7%

OCULAR DISORDERS REPORT

AIREDALE TERRIER - 1

AIREDALE TERRIER

	DISORDER	INHERITANCE	REFERENCE	BREEDING ADVICE
A.	Distichiasis	Not defined	1	Breeder option
B.	Corneal dystrophy - epithelial/stromal	Presumed sex-linked recessive	2, 3	Breeder option
C.	Persistent pupillary membranes - iris to iris - all other forms	Not defined Not defined	1, 2 1	Breeder option NO
D.	Cataract	Not defined	2	NO
E.	Vitreous degeneration	Not defined	4	Breeder option

Description and Comments

A. Distichiasis

Eyelashes abnormally located on the eyelid margin which may cause ocular irritation. Distichiasis may occur at any time in the life of a dog. It is difficult to make a strong recommendation with regard to breeding dogs with this entity. The hereditary basis has not been established although it seems probable due to the high incidence in some breeds. Reducing the incidence is a logical goal. When diagnosed, distichiasis should be recorded; breeding discretion is advised.

B. Corneal dystrophy - epithelial/stromal

A non-inflammatory corneal opacity (white to gray) present in one or more of the corneal layers; usually inherited and bilateral.

In the Airedale Terrier, the age of onset is 9-11 months with dense axial accumulation of lipids resulting in corneal opacity. The condition may progress with vision impairment noted by 3-4 years of age. Pedigrees suggest a sex-linked recessive mode of inheritance but this is not conclusive.

C. Persistent pupillary membranes (PPM)

©2014, American College of Veterinary Ophthalmologists

OCULAR DISORDERS REPORT

AIREDALE TERRIER - 2

Persistent blood vessel remnants in the anterior chamber of the eye which fail to regress normally by 3 months of age. These strands may bridge from iris to iris, iris to cornea, iris to lens, or form sheets of tissue in the anterior chamber. The last three forms pose the greatest threat to vision and when severe, vision impairment or blindness may occur.

D. Cataract

A partial or complete opacity of the lens and/or its capsule. In cases where cataracts are complete and affect both eyes, blindness results. The prudent approach is to assume cataracts to be hereditary except in cases known to be associated with trauma, other causes of ocular inflammation, specific metabolic diseases, persistent pupillary membrane, persistent hyaloid or nutritional deficiencies. Cataracts may involve the lens completely (diffuse) or in a localized region.

E. Vitreous degeneration

Liquefaction of the vitreous gel which may predispose to retinal detachment.

References

1. ACVO Genetics Committee, 2005 and/or Data from CERF All-Breeds Report 2003-2004.
2. ACVO Genetics Committee, 1999 and/or Data from CERF All-Breeds Report, 1991-1998.
3. Dice PF. Corneal dystrophy in the Airedale. *Proc Am Coll Vet Ophthalmol, Fifth Annual Scientific Program* 1974: 80-86.
4. ACVO Genetics Committee, 2014 and/or Data from OFA/CERF All-Breeds Report, 2013

OCULAR DISORDERS REPORT

AIREDALE TERRIER

Diagnostic Name	TOTAL DOGS EXAMINED	1991-1999		2000-2009		2010-2013		2014	
		#	%	#	%	#	%	#	%
GLOBE									
0.110 microphthalmia		3	0.9%	0		0		0	
EYELIDS									
20.140 ectopic cilia		2	0.6%	0		0		0	
21.000 entropion, unspecified		1	0.3%	3	1.0%	0		0	
25.110 distichiasis		19	6.0%	22	7.2%	7	6.9%	3	12.0%
CORNEA									
70.210 corneal pannus		1	0.3%	0		0		0	
70.700 corneal dystrophy		7	2.2%	1	0.3%	1	1.0%	0	
70.730 corneal endothelial degeneration		3	0.9%	0		0		0	
UVEA									
93.120 iris cyst		0		1	0.3%	0		0	
93.710 persistent pupillary membranes, iris to iris		9	2.8%	9	3.0%	5	5.0%	1	4.0%
93.720 persistent pupillary membranes, iris to lens		3	0.9%	4	1.3%	0		0	
93.730 persistent pupillary membranes, iris to cornea		14	4.4%	3	1.0%	2	2.0%	1	4.0%
93.740 persistent pupillary membranes, iris sheets		2	0.6%	0		0		0	
93.750 persistent pupillary membranes, lens pigment foci/no strands		0		0		1	1.0%	2	8.0%
93.760 persistent pupillary membranes, endothelial opacity/no strands		0		0		2	2.0%	0	
LENS									
100.200 cataract, unspecified		7	2.2%	0		0		0	
100.210 cataract, significance unknown		10	3.2%	30	9.8%	7	6.9%	2	8.0%
100.301 punctate cataract, anterior cortex		4	1.3%	1	0.3%	3	3.0%	0	
100.302 punctate cataract, posterior cortex		2	0.6%	3	1.0%	1	1.0%	0	
100.303 punctate cataract, equatorial cortex		2	0.6%	0		0		0	
100.304 punctate cataract, anterior sutures		0		0		1	1.0%	0	
100.305 punctate cataract, posterior sutures		2	0.6%	1	0.3%	1	1.0%	0	
100.306 punctate cataract, nucleus		0		0		2	2.0%	0	
100.307 punctate cataract, capsular		1	0.3%	0		0		0	
100.311 incipient cataract, anterior cortex		3	0.9%	5	1.6%	0		0	
100.312 incipient cataract, posterior cortex		5	1.6%	4	1.3%	0		0	
100.313 incipient cataract, equatorial cortex		2	0.6%	3	1.0%	0		0	
100.315 incipient cataract, posterior sutures		2	0.6%	1	0.3%	0		0	
100.316 incipient cataract, nucleus		0		2	0.7%	0		0	
100.317 incipient cataract, capsular		0		1	0.3%	1	1.0%	0	
100.330 generalized/complete cataract		4	1.3%	0		0		0	
VITREOUS									
110.120 persistent hyaloid artery/remnant		3	0.9%	0		0		0	
110.135 PHPV/PTVL		1	0.3%	0		0		0	
110.320 vitreous degeneration syneresis		0		2	0.7%	5	5.0%	0	
FUNDUS									
97.120 coloboma		1	0.3%	0		0		0	

OCULAR DISORDERS REPORT AIREDALE TERRIER

	1991-1999	2000-2009	2010-2013	2014
RETINA				
120.170 retinal dysplasia, folds	8 2.5%	8 2.6%	3 3.0%	1 4.0%
120.180 retinal dysplasia, geographic	4 1.3%	1 0.3%	4 4.0%	0
120.310 generalized progressive retinal atrophy (PRA)	9 2.8%	2 0.7%	1 1.0%	0
120.910 retinal detachment without dialysis	1 0.3%	0	0	0
OTHER				
900.000 other, unspecified	0	2 0.7%	6 5.9%	0
900.100 other, not inherited	5 1.6%	30 9.8%	3 3.0%	0
900.110 other, suspected as inherited	2 0.6%	3 1.0%	1 1.0%	0
NORMAL				
0.000 normal globe	226 71.3%	231 75.7%	80 79.2%	21 84.0%

OCULAR DISORDERS REPORT

AKBASH - 1

AKBASH

	DISORDER	INHERITANCE	REFERENCE	BREEDING ADVICE
A.	Cataract	Not defined	1	NO

Description and Comments

A. Cataract

A partial or complete opacity of the lens and/or its capsule. In cases where cataracts are complete and affect both eyes, blindness results. The prudent approach is to assume cataracts to be hereditary except in cases known to be associated with trauma, other causes of ocular inflammation, specific metabolic diseases, persistent pupillary membrane, persistent hyaloid or nutritional deficiencies. Cataracts may involve the lens completely (diffuse) or in a localized region.

References

There are no references providing detailed descriptions of hereditary ocular conditions of the Akbash breed. The conditions listed above are generally recognized to exist in this breed, as evidenced by identification on breed eye screening examinations and/or clinical experience of veterinary ophthalmologists.

1. ACVO Genetics Committee, 1999 and/or Data from CERF All-Breeds Report, 1991-1998.

OCULAR DISORDERS REPORT AKBASH

Diagnostic Name	TOTAL DOGS EXAMINED	1991-1999		2000-2009		2010-2013		2014	
		#	%	#	%	#	%	#	%
GLOBE									
0.110 microphthalmia		1	4.0%	0		0		0	
EYELIDS									
21.000 entropion, unspecified		3	12.0%	0		0		0	
22.000 ectropion, unspecified		0		1	9.1%	0		0	
UVEA									
93.120 iris cyst		1	4.0%	1	9.1%	0		0	
LENS									
100.210 cataract, significance unknown		2	8.0%	0		0		0	
100.303 punctate cataract, equatorial cortex		1	4.0%	0		0		0	
100.316 incipient cataract, nucleus		1	4.0%	0		0		0	
100.330 generalized/complete cataract		1	4.0%	0		0		0	
VITREOUS									
110.120 persistant hyaloid artery/remnant		1	4.0%	0		0		0	
NORMAL									
0.000 normal globe		19	76.0%	10	90.9%	2	100.0%	0	

OCULAR DISORDERS REPORT

AKITA - 1

AKITA

	DISORDER	INHERITANCE	REFERENCE	BREEDING ADVICE
A.	Strabismus	Not defined	1	NO
B.	Microphthalmia with multiple ocular defects	Not defined	2, 3	NO
C.	Entropion	Not defined	2, 4	Breeder option
D.	Distichiasis	Not defined	5	Breeder option
E.	Persistent pupillary membranes			
	- iris to iris	Not defined	2	Breeder option
	- all other forms	Not defined	2, 6	NO
F.	Uveodermatologic syndrome	Not defined	2, 7-15	NO
G.	Cataract	Not defined	2	NO
H.	Retinal dysplasia - folds	Not defined	2	Breeder option
I.	Retinal atrophy - generalized	Not defined	2, 16, 17	NO

Description and Comments

A. Strabismus

Strabismus is characterized as the deviation of one or both eyes from the normal position; the eyes may turn in, out, up or down. In the Akita, a severe uni- or bilateral ventral (down) or ventromedial (down and in) strabismus has been described with resulting vision loss. The strabismus was caused by restrictive fibrosis (scarring) of the extraocular muscles (the muscles that rotate the eye in different directions), possibly due to chronic inflammation (extraocular myositis).

B. Microphthalmia with multiple ocular defects

OCULAR DISORDERS REPORT

AKITA - 2

Multiple ocular defects consisting of small eye (microphthalmia), opacity of the lens (cataract), conical shape of the posterior lens (posterior lenticonus), and folding of the retina into rosettes (retinal dysplasia) have been reported in related Akita pups. Cataracts affected primarily the nuclear and cortical lens. Retinal dysplasia affected the superior retina overlying the tapetal fundus. Affected dogs may have severe visual dysfunction. An autosomal recessive mode of inheritance is suspected but not proven.

C. Entropion

A conformational defect resulting in an "in-rolling" of one or both of the eyelids which may cause ocular irritation. It is likely that entropion is influenced by several genes (polygenic), defining the skin and other structures which make up the eyelids, the amount and weight of the skin covering the head and face, the orbital contents, and the conformation of the skull. OFA/CERF data indicates that entropion in the Akita usually occurs by 2 years of age.

D. Distichiasis

Eyelashes abnormally located on the eyelid margin which may cause ocular irritation. Distichiasis may occur at any time in the life of a dog. It is difficult to make strong recommendations with regard to breeding dogs with this entity. The hereditary basis has not been established, although it seems probable due to the high incidence in some breeds. Reducing the incidence is a logical goal. When diagnosed, distichiasis should be recorded; breeding discretion is advised.

E. Persistent pupillary membranes (PPM)

Persistent blood vessel remnants in the anterior chamber of the eye which fail to regress normally by 3 months of age. These strands may bridge from iris to iris, iris to cornea, iris to lens, or form sheets of tissue in the anterior chamber. The last three forms pose the greatest threat to vision and when severe, vision impairment or blindness may occur.

In the Akita, many of these strands bridge between the iris and lens thus resulting in focal cataract and possible vision impairment.

F. Uveodermatologic syndrome

Uveodermatologic syndrome in the Akita bears many similarities to a condition in people called Vogt-Koyanagi-Harada (or VKH) syndrome. Thus, the condition in dogs is often referred to as VKH or VKH-like syndrome. It is an immune-mediated disease in which pigmented cells (melanocytes) in the eye and in the skin are destroyed by white blood cells (lymphocytes). The first clinical signs are usually inflammation of the intraocular structures (or uveitis) in both eyes. The uveitis is very difficult to control medically and ultimately results in blindness in most affected dogs. Whitening of the hair (poliosis) and skin (vitiligo) may also be noted in advanced cases. The genetics of this condition are unclear, but some genetic predisposition is indicated by the higher prevalence of this disorder in Akitas compared with other dog breeds. Affected dogs are generally young, ranging in age between 1 ½ to 4 years.

OCULAR DISORDERS REPORT

AKITA - 3

G. Cataract

Lens opacity which may affect one or both eyes and may involve the lens partially or completely. In cases where cataracts are complete and affect both eyes, blindness results. The prudent approach is to assume cataracts to be hereditary except in cases known to be associated with trauma, other causes of ocular inflammation, specific metabolic diseases, persistent pupillary membranes, persistent hyaloid or nutritional deficiencies.

H. Retinal Dysplasia - folds

Linear, triangular, curved or curvilinear foci of retinal folding that may be single or multiple. When seen in puppies, this condition may partially or completely resolve with maturity. Its significance to vision is unknown. There are two other forms of retinal dysplasia (geographic, detached) which are known to be inherited in other breeds and, in their most severe form, cause blindness. The genetic relationship between folds and the more severe forms of retinal dysplasia is undetermined.

I. Retinal atrophy - generalized

A degenerative disease of the retinal visual cells which progresses to blindness. This abnormality, also known as Progressive Retinal Atrophy or PRA, may be detected by electroretinogram (not part of a routine eye screening examination) before it is apparent clinically. Except for X-linked PRA in the Siberian Husky, in all breeds studied to date, PRA is inherited as an autosomal recessive trait.

The age of onset has been reported to be between 2 and 3 years of age with initial loss of night vision progressing to complete blindness.

References

1. Allgoewer I, Blair M, Basher T, et al. Extraocular muscle myositis and restrictive strabismus in 10 dogs. *Vet Ophthalmol.* 2000; 3: 21-26.
2. ACVO Genetics Committee, 1999 and/or Data from CERF All-Breeds Report, 1991-1998.
3. Laratta LJ, Riis RC, Kern TJ, et al. Multiple congenital ocular defects in the Akita dog. *Cornell Vet.* 1985; 75: 381-392.
4. Startup FG. Hereditary eye problems in the Japanese Akita. *Vet Rec.* 1986; 118.
5. ACVO Genetics Committee, 2006 and/or Data from CERF All Breeds Report, 2001-2005.
6. ACVO Genetics Committee, 2005 and/or Data from CERF All-Breeds Report 2003-2004.
7. Bussanich MN, al e. Granulomatous panuveitis and dermal depigmentation in dogs. *J Am Anim Hosp Assoc.* 1982; 13: 131.

OCULAR DISORDERS REPORT

AKITA - 4

8. Kern TJ, Walton DK, Riis RC, et al. Uveitis associated with poliosis and vitiligo in six dogs. *J Am Vet Med Assoc.* 1985; 187: 408-414.
9. Asakura S, Takahasi K, Onishi T. Vogt-Koyanagi-Harada syndrome (uveitis diffusa acuta) in the dog. *Japanese J Vet Med.* 1977; 673: 445-455.
10. Romatowski J. A uveodermatological syndrome in an Akita dog. *J Am Anim Hosp Assoc.* 1985; 21.
11. Campbell KL, McLaughlin SA, Reynolds HA. Generalized leukoderma and poliosis following uveitis in a dog. *J Am Anim Hosp Assoc.* 1986; 22.
12. Cottrell BD, Barnett KC. Harada disease in the Japanese Akita. *J Small Anim Pract* 28:517,1987. *J Small Anim Pract.* 1987; 28.
13. Bellhorn RW, Murphy CL, Thirkill CE. Antiretinal immunoglobulins in canine ocular diseases. *Semin Vet Med Surg.* 1988; 3.
14. Murphy CJ, Bellhorn RW. Anti-retinal antibodies associated with Vogt-Koyanagi-Harada-like syndrome in a dog. *J Am Anim Hosp Assoc.* 1989; 27.
15. Morgan RV. Vogt-Koyanagi-Harada syndrome in humans and dogs. *Comp Cont Educ Pract Vet.* 1989; 11: 1211-1217.
16. O'Tolle DO, Roberts S. Generalized progressive retinal atrophy in two Akita dogs. *Vet Pathol.* 1984; 21: 457-462.
17. Paulsen ME, Severen GA, Young S, et al. Progressive retinal atrophy in a colony of Akita dogs. In: *Trans Am Col Vet Ophthalmol* 1988; 1-4.

OCULAR DISORDERS REPORT AKITA

Diagnostic Name	TOTAL DOGS EXAMINED	1991-1999		2000-2009		2010-2013		2014	
		#	%	#	%	#	%	#	%
GLOBE									
0.110	microphthalmia	20	0.4%	10	0.2%	3	0.3%	0	
10.000	glaucoma	2	0.0%	0		0		0	
EYELIDS									
21.000	entropion, unspecified	58	1.1%	40	1.0%	6	0.5%	0	
22.000	ectropion, unspecified	9	0.2%	4	0.1%	3	0.3%	0	
25.110	distichiasis	23	0.4%	24	0.6%	17	1.4%	0	
NASOLACRIMAL									
32.110	imperforate lower nasolacrimal punctum	6	0.1%	0		0		0	
NICTITANS									
51.100	third eyelid cartilage anomaly	3	0.1%	3	0.1%	2	0.2%	0	
CORNEA									
70.700	corneal dystrophy	25	0.5%	22	0.5%	5	0.4%	2	0.9%
UVEA									
93.120	iris cyst	0		1	0.0%	0		0	
93.150	iris coloboma	1	0.0%	0		0		0	
93.710	persistent pupillary membranes, iris to iris	110	2.1%	106	2.6%	36	3.0%	12	5.2%
93.720	persistent pupillary membranes, iris to lens	22	0.4%	12	0.3%	5	0.4%	0	
93.730	persistent pupillary membranes, iris to cornea	10	0.2%	10	0.2%	1	0.1%	1	0.4%
93.740	persistent pupillary membranes, iris sheets	2	0.0%	1	0.0%	0		0	
93.750	persistent pupillary membranes, lens pigment foci/no strands	0		0		2	0.2%	3	1.3%
93.760	persistent pupillary membranes, endothelial opacity/no strands	0		0		1	0.1%	0	
LENS									
100.200	cataract, unspecified	28	0.5%	0		0		0	
100.210	cataract, significance unknown	72	1.4%	123	3.0%	35	2.9%	10	4.3%
100.301	punctate cataract, anterior cortex	5	0.1%	1	0.0%	2	0.2%	0	
100.302	punctate cataract, posterior cortex	4	0.1%	2	0.0%	2	0.2%	0	
100.303	punctate cataract, equatorial cortex	2	0.0%	2	0.0%	0		0	
100.304	punctate cataract, anterior sutures	0		1	0.0%	2	0.2%	0	
100.305	punctate cataract, posterior sutures	16	0.3%	9	0.2%	4	0.3%	0	
100.306	punctate cataract, nucleus	2	0.0%	0		0		0	
100.307	punctate cataract, capsular	0		4	0.1%	1	0.1%	0	
100.311	incipient cataract, anterior cortex	8	0.2%	1	0.0%	2	0.2%	0	
100.312	incipient cataract, posterior cortex	22	0.4%	12	0.3%	5	0.4%	1	0.4%
100.313	incipient cataract, equatorial cortex	5	0.1%	2	0.0%	2	0.2%	0	
100.314	incipient cataract, anterior sutures	2	0.0%	0		0		0	
100.315	incipient cataract, posterior sutures	7	0.1%	7	0.2%	2	0.2%	0	
100.316	incipient cataract, nucleus	5	0.1%	1	0.0%	0		0	
100.317	incipient cataract, capsular	2	0.0%	3	0.1%	5	0.4%	0	
100.322	incomplete cataract, posterior cortex	0		0		1	0.1%	0	
100.330	generalized/complete cataract	20	0.4%	3	0.1%	0		1	0.4%
100.375	subluxation/luxation, unspecified	1	0.0%	0		0		0	

OCULAR DISORDERS REPORT AKITA

	1991-1999	2000-2009	2010-2013	2014
VITREOUS				
110.120 persistant hyaloid artery/remnant	9 0.2%	3 0.1%	0	3 1.3%
110.135 PHPV/PTVL	4 0.1%	1 0.0%	0	0
110.320 vitreous degeneration syneresis	2 0.0%	4 0.1%	1 0.1%	0
110.330 vitreous degeneration anterior chamber	0	1 0.0%	0	0
RETINA				
120.170 retinal dysplasia, folds	103 2.0%	77 1.9%	12 1.0%	0
120.180 retinal dysplasia, geographic	11 0.2%	10 0.2%	0	0
120.190 retinal dysplasia, detached	2 0.0%	2 0.0%	0	0
120.310 generalized progressive retinal atrophy (PRA)	64 1.2%	21 0.5%	2 0.2%	1 0.4%
120.910 retinal detachment without dialysis	5 0.1%	1 0.0%	0	0
120.920 retinal detachment with dialysis	0	0	1 0.1%	0
OPTIC NERVE				
130.120 optic nerve hypoplasia	3 0.1%	3 0.1%	2 0.2%	0
130.150 optic disc coloboma	2 0.0%	0	0	0
OTHER				
900.000 other, unspecified	0	11 0.3%	41 3.4%	0
900.100 other, not inherited	13 0.3%	161 3.9%	9 0.8%	9 3.9%
900.110 other, suspected as inherited	54 1.1%	12 0.3%	6 0.5%	0
NORMAL				
0.000 normal globe	4550 88.8%	3740 90.4%	1116 93.6%	218 93.6%

OCULAR DISORDERS REPORT

ALASKAN KLEE KAI - 1

ALASKAN KLEE KAI

	DISORDER	INHERITANCE	REFERENCE	BREEDING ADVICE
A.	Distichiasis	Not defined	4	Breeder option
B.	Persistent pupillary membranes			
	- iris to iris	Not defined	1	Breeder option
	- iris sheets	Not defined	2, 3	No

Description and Comments

A. Distichiasis

Eyelashes abnormally located on the eyelid margin which may cause ocular irritation. Distichiasis may occur at any time in the life of a dog. It is difficult to make a strong recommendation with regard to breeding dogs with this entity. The hereditary basis has not been established although it seems probable due to the high incidence in some breeds. Reducing the incidence is a logical goal. When diagnosed, distichiasis should be recorded; breeding discretion is advised.

B. Persistent pupillary membranes (PPM)

Persistent blood vessel remnants in the anterior chamber of the eye which fail to regress normally by 3 months of age. These strands may bridge from iris to iris, iris to cornea, iris to lens, or form sheets of tissue in the anterior chamber. The last three forms pose the greatest threat to vision and when severe, vision impairment or blindness may occur

References

There are no references providing detailed descriptions of hereditary ocular conditions of the Alaskan Klee Kai breed. The conditions listed above are generally recognized to exist in the breed, as evidenced by identification on breed eye screening examinations and/or clinical experience of veterinary ophthalmologists.

1. ACVO Genetics Committee, 2006 and/or Data from CERF All-Breeds Report, 2001-2005.
2. ACVO Genetics Committee, 2007 and/or Data from CERF All-Breeds Report, 2002-2006.

OCULAR DISORDERS REPORT

ALASKAN KLEE KAI - 2

3. ACVO Genetics Committee, 2008 and/or Data from CERF All-Breeds Report, 2003-2007.
4. ACVO Genetics Committee, 2011 and/or Data from CERF All-Breeds Report, 2009.

OCULAR DISORDERS REPORT ALASKAN KLEE KAI

Diagnostic Name	TOTAL DOGS EXAMINED		1991-1999		2000-2009		2010-2013		2014	
	#	%	#	%	#	%	#	%	#	%
EYELIDS										
25.110 distichiasis	1	3.8%	9	4.9%	36	13.3%	1	1.4%		
NASOLACRIMAL										
32.110 imperforate lower nasolacrimal punctum	0		0		0		1	1.4%		
CORNEA										
70.220 pigmentary keratitis	0		0		4	1.5%	0			
70.700 corneal dystrophy	0		4	2.2%	6	2.2%	0			
70.730 corneal endothelial degeneration	0		0		1	0.4%	0			
UVEA										
93.710 persistent pupillary membranes, iris to iris	0		1	0.5%	5	1.8%	0			
93.730 persistent pupillary membranes, iris to cornea	0		1	0.5%	0		0			
93.740 persistent pupillary membranes, iris sheets	0		5	2.7%	0		0			
LENS										
100.210 cataract, significance unknown	1	3.8%	5	2.7%	2	0.7%	0			
100.307 punctate cataract, capsular	0		0		1	0.4%	0			
100.311 incipient cataract, anterior cortex	0		4	2.2%	2	0.7%	1	1.4%		
100.312 incipient cataract, posterior cortex	0		1	0.5%	0		0			
VITREOUS										
110.320 vitreous degeneration syneresis	0		1	0.5%	5	1.8%	0			
110.330 vitreous degeneration anterior chamber	0		0		1	0.4%	0			
RETINA										
120.170 retinal dysplasia, folds	1	3.8%	3	1.6%	1	0.4%	0			
OTHER										
900.000 other, unspecified	0		2	1.1%	4	1.5%	0			
900.100 other, not inherited	1	3.8%	3	1.6%	0		4	5.6%		
NORMAL										
0.000 normal globe	24	92.3%	168	91.3%	232	85.6%	68	94.4%		

OCULAR DISORDERS REPORT

ALASKAN MALAMUTE - 1

ALASKAN MALAMUTE

	DISORDER	INHERITANCE	REFERENCE	BREEDING ADVICE
A.	Glaucoma	Not defined	1,2	NO
B.	Distichiasis	Not defined	1	Breeder option
C.	Corneal dystrophy - epithelial/stromal	Not defined	3	Breeder option
D.	Persistent pupillary membranes			
	- iris to iris	Not defined	1	Breeder option
	- iris to lens	Not defined	3	NO
	- all other forms	Not defined	3	NO
E.	Cataract	Not defined	1	NO
F.	Cone degeneration - day blindness * a DNA test is available	Autosomal recessive	1,4-12	NO
G.	Retinal dysplasia - folds	Not defined	1	Breeder option

Descriptions and Comments

A. Glaucoma

An elevation of intraocular pressure (IOP) which, when sustained, causes intraocular damage resulting in blindness. The elevated IOP occurs because the fluid cannot leave through the iridocorneal angle. Diagnosis and classification of glaucoma require measurement of IOP (tonometry) and examination of the iridocorneal angle (gonioscopy). Neither of these tests is part of a routine breed eye screening exam.

B. Distichiasis

Eyelashes abnormally located on the eyelid margin which may cause ocular irritation. Distichiasis may occur at any time in the life of a dog. It is difficult to make a strong recommendation with regard to breeding dogs with this entity. The hereditary basis has not been established although it seems probable due to the high incidence in some breeds. Reducing the incidence is a logical goal. When diagnosed, distichiasis should be recorded; breeding discretion is advised.

OCULAR DISORDERS REPORT

ALASKAN MALAMUTE - 2

C. Corneal dystrophy - epithelial/stromal

A non-inflammatory corneal opacity (white to gray) present in one or more of the corneal layers; usually inherited and bilateral.

D. Persistent pupillary membranes (PPM)

Persistent blood vessel remnants in the anterior chamber of the eye which fail to regress normally by 3 months of age. These strands may bridge from iris to iris, iris to cornea, iris to lens, or form sheets of tissue in the anterior chamber. The last three forms pose the greatest threat to vision and when severe, vision impairment or blindness may occur.

E. Cataract

A partial or complete opacity of the lens and/or its capsule. In cases where cataracts are complete and affect both eyes, blindness results. The prudent approach is to assume cataracts to be hereditary except in cases known to be associated with trauma, other causes of ocular inflammation, specific metabolic diseases, persistent pupillary membrane, persistent hyaloid or nutritional deficiencies. Cataracts may involve the lens completely (diffuse) or in a localized region.

F. Cone degeneration - day blindness or hemeralopia

Autosomal recessively inherited early degeneration of the cone photoreceptors. Affected puppies develop day-blindness, colorblindness, and photophobia between 8 and 12 weeks of age. Affected dogs remain ophthalmoscopically normal their entire life. Electroretinography is required to definitively diagnose the disorder. A DNA test is available.

G. Retinal dysplasia - folds

Linear, triangular, curved or curvilinear foci of retinal folding that may be single or multiple. When seen in puppies, this condition may partially or completely resolve with maturity. Its significance to vision is unknown. There are two other forms of retinal dysplasia (geographic, detached) which are known to be inherited in other breeds and, in their most severe form, cause blindness. The genetic relationship between folds and more severe forms of retinal dysplasia is undetermined.

References

1. ACVO Genetics Committee, 1999 and/or Data from CERF All-Breeds Report, 1991-1998.
2. ACVO Genetics Committee, 2005 and/or Data from CERF All-Breeds Report 2003-2004.
3. ACVO Genetics Committee, 2000-2002 and/or Data from CERF All-Breeds Report, 2000-2002.

©2014, American College of Veterinary Ophthalmologists

OCULAR DISORDERS REPORT

ALASKAN MALAMUTE - 3

4. Rubin LF, Bourne TKR, Lord LH. Hemeralopia in dogs: Heredity of hemeralopia in Alaska malamutes. *Am J Vet Res.* 1967; 28: 355.
5. Rubin LF. Clinical features of hemeralopia in the adult Alaskan malamute. *J Am Vet Med Assoc.* 1971; 158: 1696.
6. Rubin LF. Hemeralopia in Alaskan malamute pups. *J Am Vet Med Assoc.* 1971; 158: 1699.
7. Aguirre GD, Rubin LF. Pathology of hemeralopia in the Alaskan malamute dog. *Invest Ophthalmol.* 1974; 13: 231-235.
8. Aguirre GD, Rubin LF. The electroretinogram in dogs with inherited cone degeneration. *Invest Ophthalmol.* 1975; 14: 840-847.
9. Rubin LF. Hemeralopia in dogs. In: *Trans Am Acad Ophthalmol Otolaryngol* 1976; 667.
10. Aguirre GD, Rubin LF. Postnatal development of the retina in Alaskan malamute dogs with inherited cone degeneration. In: *Proc Am Coll Vet Ophthalmol.* 1977; 51.
11. Seddon JM, Hampson ECGM, Smith RIE, et al. Genetic heterogeneity of day blindness in Alaskan Malamute. *Anim Genet.* 2006; 37: 407-410.
12. Sidjanin DJ, Lowe JK, McElwee JL, et al. Canine CNGB3 mutations establish cone degeneration as orthologous to the human achromatopsia locus ACHM3. *Human Molecular Genetics.* 2002; 11: 1823-1833.

OCULAR DISORDERS REPORT ALASKAN MALAMUTE

Diagnostic Name	TOTAL DOGS EXAMINED		1991-1999 3490		2000-2009 3591		2010-2013 1210		2014 283	
	#	%	#	%	#	%	#	%	#	%
GLOBE										
0.110	microphthalmia	0		1	0.0%	1	0.1%	0		
10.000	glaucoma	1	0.0%	1	0.0%	0		0		
EYELIDS										
20.140	ectopic cilia	1	0.0%	0		0		0		
21.000	entropion, unspecified	1	0.0%	4	0.1%	0		0		
22.000	ectropion, unspecified	1	0.0%	0		0		0		
25.110	distichiasis	66	1.9%	80	2.2%	38	3.1%	10	3.5%	
NASOLACRIMAL										
40.910	keratoconjunctivitis sicca	2	0.1%	0		0		0		
NICTITANS										
51.100	third eyelid cartilage anomaly	0		1	0.0%	0		0		
52.110	prolapsed gland of the third eyelid	0		0		1	0.1%	0		
CORNEA										
70.700	corneal dystrophy	29	0.8%	32	0.9%	8	0.7%	5	1.8%	
UVEA										
93.120	iris cyst	3	0.1%	3	0.1%	0		0		
93.140	corneal endothelial pigment without PPM	0		0		1	0.1%	0		
93.150	iris coloboma	0		3	0.1%	0		0		
93.710	persistent pupillary membranes, iris to iris	133	3.8%	306	8.5%	84	6.9%	24	8.5%	
93.720	persistent pupillary membranes, iris to lens	7	0.2%	26	0.7%	3	0.2%	0		
93.730	persistent pupillary membranes, iris to cornea	3	0.1%	6	0.2%	3	0.2%	0		
93.740	persistent pupillary membranes, iris sheets	2	0.1%	2	0.1%	0		0		
93.750	persistent pupillary membranes, lens pigment foci/no strands	0		0		6	0.5%	1	0.4%	
93.760	persistent pupillary membranes, endothelial opacity/no strands	0		0		4	0.3%	0		
93.810	uveal melanoma	0		1	0.0%	1	0.1%	0		
LENS										
100.200	cataract, unspecified	125	3.6%	0		0		0		
100.210	cataract, significance unknown	95	2.7%	163	4.5%	58	4.8%	18	6.4%	
100.301	punctate cataract, anterior cortex	10	0.3%	8	0.2%	1	0.1%	1	0.4%	
100.302	punctate cataract, posterior cortex	87	2.5%	37	1.0%	13	1.1%	1	0.4%	
100.303	punctate cataract, equatorial cortex	6	0.2%	7	0.2%	1	0.1%	1	0.4%	
100.304	punctate cataract, anterior sutures	5	0.1%	10	0.3%	1	0.1%	0		
100.305	punctate cataract, posterior sutures	29	0.8%	29	0.8%	6	0.5%	0		
100.306	punctate cataract, nucleus	3	0.1%	2	0.1%	5	0.4%	0		
100.307	punctate cataract, capsular	1	0.0%	22	0.6%	3	0.2%	0		
100.311	incipient cataract, anterior cortex	8	0.2%	15	0.4%	4	0.3%	0		
100.312	incipient cataract, posterior cortex	148	4.2%	146	4.1%	50	4.1%	4	1.4%	
100.313	incipient cataract, equatorial cortex	14	0.4%	17	0.5%	7	0.6%	1	0.4%	
100.314	incipient cataract, anterior sutures	4	0.1%	3	0.1%	0		0		
100.315	incipient cataract, posterior sutures	30	0.9%	33	0.9%	10	0.8%	3	1.1%	
100.316	incipient cataract, nucleus	8	0.2%	9	0.3%	1	0.1%	0		
100.317	incipient cataract, capsular	3	0.1%	26	0.7%	8	0.7%	2	0.7%	
100.322	incomplete cataract, posterior cortex	0		0		5	0.4%	6	2.1%	

OCULAR DISORDERS REPORT ALASKAN MALAMUTE

LENS CONTINUED	1991-1999	2000-2009	2010-2013	2014
100.324 incomplete cataract, anterior sutures	0	0	0	1 0.4%
100.325 incomplete cataract, posterior sutures	0	0	2 0.2%	1 0.4%
100.326 incomplete cataract, nucleus	0	0	3 0.2%	0
100.330 generalized/complete cataract	43 1.2%	36 1.0%	1 0.1%	0
100.375 subluxation/luxation, unspecified	3 0.1%	3 0.1%	0	0
VITREOUS				
110.120 persistant hyaloid artery/remnant	4 0.1%	5 0.1%	0	0
110.135 PHPV/PTVL	5 0.1%	1 0.0%	0	0
110.320 vitreous degeneration syneresis	3 0.1%	8 0.2%	1 0.1%	0
110.330 vitreous degeneration anterior chamber	0	1 0.0%	0	0
FUNDUS				
97.110 choroidal hypoplasia	0	2 0.1%	1 0.1%	0
97.120 coloboma	1 0.0%	0	0	0
RETINA				
120.170 retinal dysplasia, folds	22 0.6%	32 0.9%	7 0.6%	0
120.180 retinal dysplasia, geographic	10 0.3%	7 0.2%	2 0.2%	0
120.190 retinal dysplasia, detached	1 0.0%	1 0.0%	0	0
120.310 generalized progressive retinal atrophy (PRA)	6 0.2%	9 0.3%	2 0.2%	0
120.400 retinal hemorrhage	2 0.1%	0	0	0
120.910 retinal detachment without dialysis	2 0.1%	6 0.2%	2 0.2%	0
120.960 retinopathy	0	0	1 0.1%	0
OPTIC NERVE				
130.110 micropapilla	0	2 0.1%	0	0
130.120 optic nerve hypoplasia	5 0.1%	3 0.1%	0	1 0.4%
130.150 optic disc coloboma	1 0.0%	1 0.0%	0	0
OTHER				
900.000 other, unspecified	0	16 0.4%	59 4.9%	0
900.100 other, not inherited	9 0.3%	246 6.9%	19 1.6%	18 6.4%
900.110 other, suspected as inherited	33 0.9%	17 0.5%	4 0.3%	1 0.4%
NORMAL				
0.000 normal globe	2760 79.1%	2850 79.4%	1006 83.1%	238 84.1%

OCULAR DISORDERS REPORT

AMERICAN BULLDOG - 1

AMERICAN BULLDOG

	DISORDER	INHERITANCE	REFERENCE	BREEDING ADVICE
A.	Glaucoma	Not defined	1	NO
B.	Distichiasis	Not defined	2	Breeder option
C.	Multifocal retinopathy - cmr1 * a DNA test is available	Autosomal recessive	3	NO

Description and Comments

A. Glaucoma

Glaucoma is characterized by an elevation of intraocular pressure which, when sustained even for a brief period of time, causes intraocular damage resulting in blindness. The elevated intraocular pressure occurs because the fluid cannot leave through the iridocorneal angle. Diagnosis and classification of glaucoma requires measurement of IOP (tonometry) and examination of the iridocorneal angle (gonioscopy). Neither of these tests is part of a routine breed eye screening exam.

American Bulldogs with glaucoma were reported to have uveal cysts (evident on ophthalmic exam, ultrasound biomicroscopy and/or histopathology), goniodysgenesis and anterior segment inflammation. Consistent clinical findings among reported individuals included an absent menace response, diminished to absent light perception, mydriasis, and elevated intraocular pressures.

B. Distichiasis

Eyelashes abnormally located on the eyelid margin which may cause ocular irritation. Distichiasis may occur at any time in the life of a dog. It is difficult to make a strong recommendation with regard to breeding dogs with this entity. The hereditary basis has not been established although it seems probable due to the high incidence in some breeds. Reducing the incidence is a logical goal. When diagnosed, distichiasis should be recorded; breeding discretion is advised.

C. Multifocal retinopathy

Canine Multi-focal Retinopathy type 1 (cmr1) is characterized by numerous distinct (i.e. multi-focal), roughly circular patches of elevated retina (multifocal bullous retinal detachments). There may be a serous subretinal fluid, or accumulation of subretinal material that produces gray-tan-pink colored lesions. These lesions, looking somewhat like

OCULAR DISORDERS REPORT

AMERICAN BULLDOG - 2

blisters, vary in location and size, although typically they are present in both eyes of the affected dog.

The disease generally develops in young dogs between 11-20 weeks of age and there is minimal progression after 1 year of age. The lesions may flatten, leaving areas of retinal thinning and RPE hypertrophy, hyperplasia, and pigmentation. Discrete areas of tapetal hyper-reflectivity may be seen in areas of previous retinal and RPE detachments. Most dogs exhibit no noticeable problem with vision or electroretinographic abnormalities despite their abnormal appearing retinas. A DNA test is available.

Canine Multi-focal Retinopathy type 1 is caused by a mutation in the Bestrophin 1 gene (BEST1) and is described to be recessively inherited in the Great Pyrenees, Dogue de Bordeaux, Bullmastiff, and Mastiff.

References

1. Pumphrey SA, Pizzirani S, Pirie CG, et al. Glaucoma associated with uveal cysts and goniodysgenesis in American Bulldogs: a case series. *Vet Ophthalmol*. 2012:1-9.
2. ACVO Genetics Committee, 2013-2014 and Data from OFA All-Breeds Report, 2013-2014.
3. Guziewicz KE, Zangerl B, Lindauer SJ, et al. Bestrophin gene mutations cause canine multifocal retinopathy: a novel animal model for best disease. *Invest Ophthalmol Vis Sci*. 2007 May;48:1959-1967.

OCULAR DISORDERS REPORT AMERICAN BULLDOG

Diagnostic Name	TOTAL DOGS EXAMINED	1991-1999		2000-2009		2010-2013		2014	
		#	%	#	%	#	%	#	%
EYELIDS									
20.160	macropalpebral fissure	0		0		3	3.5%	0	
21.000	entropion, unspecified	0		3	8.6%	6	7.1%	0	
22.000	ectropion, unspecified	0		0		2	2.4%	0	
25.110	distichiasis	0		10	28.6%	21	24.7%	0	
NASOLACRIMAL									
40.910	keratoconjunctivitis sicca	0		0		4	4.7%	0	
CORNEA									
70.220	pigmentary keratitis	0		1	2.9%	0		0	
UVEA									
93.120	iris cyst	0		0		1	1.2%	0	
93.710	persistent pupillary membranes, iris to iris	0		0		1	1.2%	0	
93.730	persistent pupillary membranes, iris to cornea	0		0		1	1.2%	0	
LENS									
100.210	cataract, significance unknown	0		0		1	1.2%	0	
RETINA									
120.170	retinal dysplasia, folds	0		0		4	4.7%	0	
OTHER									
900.000	other, unspecified	0		8	22.9%	8	9.4%	0	
900.100	other, not inherited	0		0		1	1.2%	0	
900.110	other, suspected as inherited	0		0		1	1.2%	0	
NORMAL									
0.000	normal globe	0		24	68.6%	59	69.4%	1	100.0%

OCULAR DISORDERS REPORT

AMERICAN ESKIMO DOG - 1

AMERICAN ESKIMO DOG

(all varieties)

	DISORDER	INHERITANCE	REFERENCE	BREEDING ADVICE
A.	Persistent pupillary membranes - iris to iris	Not defined	1	Breeder option
B.	Cataract	Not defined	2	NO
C.	Lens luxation * a DNA test is available	Not defined	4	NO
D.	Retinal atrophy - generalized * a DNA test is available	Autosomal recessive	2,3	NO

Description and Comments

A. Persistent pupillary membranes (PPM)

Persistent blood vessel remnants in the anterior chamber of the eye which fail to regress normally by 3 months of age. These strands may bridge from iris to iris, iris to cornea, iris to lens, or form sheets of tissue in the anterior chamber. The last three forms pose the greatest threat to vision and when severe, vision impairment or blindness may occur.

B. Cataract

A partial or complete opacity of the lens and/or its capsule. In cases where cataracts are complete and affect both eyes, blindness results. The prudent approach is to assume cataracts to be hereditary except in cases known to be associated with trauma, other causes of ocular inflammation, specific metabolic diseases, persistent pupillary membrane, persistent hyaloid or nutritional deficiencies. Cataracts may involve the lens completely (diffuse) or in a localized region.

C. Lens luxation

Partial (subluxation) or complete displacement of the lens from its normal anatomic site behind the pupil. Lens luxation not associated with trauma or inflammation is presumed to be inherited. Lens luxation may result in elevated intraocular pressure (glaucoma) causing vision impairment or blindness. A DNA test is available.

OCULAR DISORDERS REPORT

AMERICAN ESKIMO DOG –2

D. Retinal atrophy - generalized

A degenerative disease of the retinal visual cells which progresses to blindness. This abnormality, also known as progressive retinal atrophy or PRA, may be detected by electroretinogram (not part of a routine eye screening examination) before it is apparent clinically. Except for X-linked PRA in the Siberian Husky, in all breeds studied to date, PRA is inherited as an autosomal recessive trait.

This photoreceptor degeneration is characterized by slow death of visual cells following their normal development. The disease begins clinically with signs of night blindness followed by day blindness.

There are cases reported in the United States and Canada. Animals at the 3-5 year age range have had ophthalmoscopically typical signs of diffuse retinal degeneration, which can be confirmed by electroretinography. Clinically there were only subtle signs of night blindness in the younger animals. Owners have reported obvious night and day blindness in animals at 5-6 years of age. Recent evaluation of pedigrees from all varieties for the mode of inheritance suggests a simple autosomal recessive. Because of the significance of blindness, suspicious and affected animals are not to be recommended for breeding foundation. Parents of affected animals should be presumed to be carriers and siblings of affected animals should not be used as breed foundation.

References

There are few references providing detailed descriptions of hereditary ocular conditions of the American Eskimo Dog breed. The conditions listed above are generally recognized to exist in this breed, as evidenced by identification on breed eye screening examinations and/or clinical experience of veterinary ophthalmologists.

1. ACVO Genetics Committee, 2006 and/or Data from CERF All-Breeds Report, 2001-2005.
2. ACVO Genetics Committee, 1999 and/or Data from CERF All-Breeds Report, 1991-1998.
3. Zangerl B, Goldstein O, Philp AR, et al. Identical mutation in a novel retinal gene causes progressive rod-cone degeneration in dogs and retinitis pigmentosa in humans. *Genomics*. 2006; 88: 551-563.
4. Gould D, Pettitt I, McLaughlin B, et al. ADAMTS17 mutation associated with primary lens luxation is widespread among breeds. *Vet Ophthalmol*. 2011;14:378-384.

OCULAR DISORDERS REPORT AMERICAN ESKIMO DOG

Diagnostic Name	TOTAL DOGS EXAMINED	1991-1999		2000-2009		2010-2013		2014	
		#	%	#	%	#	%	#	%
EYELIDS									
21.000	entropion, unspecified	4	0.4%	0		0		0	
25.110	distichiasis	9	0.9%	5	0.4%	1	0.7%	0	
NASOLACRIMAL									
32.110	imperforate lower nasolacrimal punctum	1	0.1%	0		0		0	
CORNEA									
70.700	corneal dystrophy	4	0.4%	4	0.3%	0		0	
70.730	corneal endothelial degeneration	1	0.1%	3	0.3%	0		0	
UVEA									
93.120	iris cyst	1	0.1%	1	0.1%	2	1.4%	0	
93.710	persistent pupillary membranes, iris to iris	8	0.8%	10	0.8%	0		0	
93.720	persistent pupillary membranes, iris to lens	1	0.1%	0		0		0	
93.730	persistent pupillary membranes, iris to cornea	3	0.3%	1	0.1%	0		0	
93.740	persistent pupillary membranes, iris sheets	4	0.4%	0		0		0	
LENS									
100.200	cataract, unspecified	3	0.3%	0		0		0	
100.210	cataract, significance unknown	35	3.5%	74	6.2%	21	15.1%	3	12.0%
100.301	punctate cataract, anterior cortex	8	0.8%	12	1.0%	4	2.9%	0	
100.302	punctate cataract, posterior cortex	2	0.2%	4	0.3%	3	2.2%	0	
100.303	punctate cataract, equatorial cortex	1	0.1%	3	0.3%	3	2.2%	0	
100.304	punctate cataract, anterior sutures	1	0.1%	1	0.1%	1	0.7%	0	
100.305	punctate cataract, posterior sutures	3	0.3%	1	0.1%	0		0	
100.306	punctate cataract, nucleus	2	0.2%	1	0.1%	1	0.7%	0	
100.307	punctate cataract, capsular	0		3	0.3%	0		0	
100.311	incipient cataract, anterior cortex	3	0.3%	14	1.2%	4	2.9%	0	
100.312	incipient cataract, posterior cortex	5	0.5%	17	1.4%	1	0.7%	0	
100.313	incipient cataract, equatorial cortex	2	0.2%	7	0.6%	3	2.2%	1	4.0%
100.314	incipient cataract, anterior sutures	0		5	0.4%	0		0	
100.315	incipient cataract, posterior sutures	1	0.1%	1	0.1%	0		0	
100.316	incipient cataract, nucleus	0		4	0.3%	1	0.7%	1	4.0%
100.317	incipient cataract, capsular	0		5	0.4%	0		0	
100.330	generalized/complete cataract	5	0.5%	5	0.4%	0		0	
100.375	subluxation/luxation, unspecified	0		1	0.1%	0		0	
VITREOUS									
110.120	persistant hyaloid artery/remnant	3	0.3%	2	0.2%	0		0	
110.135	PHPV/PTVL	0		2	0.2%	0		0	
110.320	vitreous degeneration syneresis	6	0.6%	9	0.8%	1	0.7%	0	
RETINA									
120.170	retinal dysplasia, folds	4	0.4%	4	0.3%	0		0	
120.180	retinal dysplasia, geographic	2	0.2%	0		0		0	
120.310	generalized progressive retinal atrophy (PRA)	84	8.5%	88	7.3%	4	2.9%	0	
120.910	retinal detachment without dialysis	1	0.1%	0		0		0	

OCULAR DISORDERS REPORT AMERICAN ESKIMO DOG

	1991-1999	2000-2009	2010-2013	2014
OPTIC NERVE				
130.110 micropapilla	0	1 0.1%	1 0.7%	0
130.120 optic nerve hypoplasia	0	1 0.1%	0	0
130.150 optic disc coloboma	2 0.2%	1 0.1%	0	0
OTHER				
900.000 other, unspecified	0	2 0.2%	6 4.3%	0
900.100 other, not inherited	12 1.2%	74 6.2%	5 3.6%	3 12.0%
900.110 other, suspected as inherited	5 0.5%	7 0.6%	3 2.2%	0
NORMAL				
0.000 normal globe	810 81.8%	946 78.9%	123 88.5%	19 76.0%

OCULAR DISORDERS REPORT

AMERICAN HAIRLESS TERRIER - 1

AMERICAN HAIRLESS TERRIER

	DISORDER	INHERITANCE	REFERENCE	BREEDING ADVICE
A.	Distichiasis	Not defined	1	Breeder option
B.	Persistent pupillary membranes			
	- iris to iris	Not defined	1	Breeder option
	- iris to cornea	Not defined	1	NO
C.	Cataract	Not defined	1	NO
D.	Lens luxation	Not defined	2, 3	NO
	* a DNA test is available			

Description and Comments

A. Distichiasis

Eyelashes abnormally located on the eyelid margin which may cause ocular irritation. Distichiasis may occur at any time in the life of a dog. It is difficult to make a strong recommendation with regard to breeding dogs with this entity. The hereditary basis has not been established although it seems probable due to the high incidence in some breeds. Reducing the incidence is a logical goal. When diagnosed, distichiasis should be recorded; breeding discretion is advised.

B. Persistent pupillary membranes (PPM)

Persistent blood vessel remnants in the anterior chamber of the eye which fail to regress normally by 3 months of age. These strands may bridge from iris to iris, iris to cornea, iris to lens, or form sheets of tissue in the anterior chamber. The last three forms pose the greatest threat to vision and when severe, vision impairment or blindness may occur.

C. Cataract

A partial or complete opacity of the lens and/or its capsule. In cases where cataracts are complete and affect both eyes, blindness results. The prudent approach is to assume cataracts to be hereditary except in cases known to be associated with trauma, other causes of ocular inflammation, specific metabolic diseases, persistent pupillary membrane, persistent hyaloid or nutritional deficiencies. Cataracts may involve the lens completely (diffuse) or in a localized region.

OCULAR DISORDERS REPORT

AMERICAN HAIRLESS TERRIER - 2

D. Lens luxation

Partial (subluxation) or complete displacement of the lens from the normal anatomic site behind the pupil. Lens luxation not associated with trauma or inflammation is presumed to be inherited. Lens luxation may result in elevated intraocular pressure (glaucoma), causing vision impairment or blindness. A DNA test is available.

References

There are no references providing detailed descriptions of hereditary ocular conditions of the American Hairless Terrier. The conditions listed above are generally recognized to exist in this breed, as evidenced by identification on breed eye screening examinations and/or clinical experience of veterinary ophthalmologists.

1. ACVO Genetics Committee, 2000-2002 and/or Data from CERF All-Breeds Report, 2000-2002.
2. Farias FH, Johnson GS, Taylor JF, et al. An ADAMTS17 splice donor site mutation in dogs with primary lens luxation. *Invest Ophthalmol Vis Sci*. 2010 Sep;51:4716-4721.
3. Gould D, Pettitt L, McLaughlin B, et al. ADAMTS17 mutation associated with primary lens luxation is widespread among breeds. *Vet Ophthalmol*. 2011 Nov;14:378-384.

OCULAR DISORDERS REPORT AMERICAN HAIRLESS

TOTAL DOGS EXAMINED	1991-1999		2000-2009		2010-2013		2014	
Diagnostic Name	0		5		18		4	
	#	%	#	%	#	%	#	%
UVEA								
93.710 persistent pupillary membranes, iris to iris	0		0		1	5.6%	0	
LENS								
100.210 cataract, significance unknown	0		0		2	11.1%	0	
100.301 punctate cataract, anterior cortex	0		0		1	5.6%	0	
RETINA								
120.910 retinal detachment without dialysis	0		0		1	5.6%	0	
OTHER								
900.000 other, unspecified	0		0		1	5.6%	0	
NORMAL								
0.000 normal globe	0		5	100.0%	13	72.2%	4	100.0%

OCULAR DISORDERS REPORT

AMERICAN LAMALESE - 1

AMERICAN LAMALESE

	DISORDER	INHERITANCE	REFERENCE	BREEDING ADVICE
A.	Corneal dystrophy - epithelial/stromal	Not defined	1	Breeder option

Description and Comments

- A. Corneal dystrophy - epithelial/stromal

A non-inflammatory corneal opacity (white to gray) present in one or more of the corneal layers; usually inherited and bilateral.

References

There are no references providing detailed descriptions of hereditary ocular conditions of the American Lamalese breed. The conditions listed above are generally recognized to exist in this breed, as evidenced by identification on breed eye screening examinations and/or clinical experience of veterinary ophthalmologists.

1. ACVO Genetics Committee, 2002-2003 and/or Data from CERF All-Breeds Report, 2002-2003.

OCULAR DISORDERS REPORT AMERICAN LAMALESE

Diagnostic Name	TOTAL DOGS EXAMINED	1991-1999		2000-2009		2010-2013		2014	
		#	%	#	%	#	%	#	%
EYELIDS									
25.110	distichiasis	0		1	4.8%	0		0	
NICTITANS									
52.110	prolapsed gland of the third eyelid	0		1	4.8%	0		0	
CORNEA									
70.700	corneal dystrophy	4	7.7%	3	14.3%	0		0	
UVEA									
93.710	persistent pupillary membranes, iris to iris	3	5.8%	1	4.8%	0		0	
93.720	persistent pupillary membranes, iris to lens	2	3.8%	0		0		0	
LENS									
100.210	cataract, significance unknown	6	11.5%	3	14.3%	0		0	
100.302	punctate cataract, posterior cortex	2	3.8%	0		0		0	
100.311	incipient cataract, anterior cortex	1	1.9%	0		0		0	
100.312	incipient cataract, posterior cortex	1	1.9%	0		0		0	
100.313	incipient cataract, equatorial cortex	1	1.9%	0		0		0	
100.314	incipient cataract, anterior sutures	1	1.9%	0		0		0	
VITREOUS									
110.320	vitreous degeneration syneresis	1	1.9%	1	4.8%	0		0	
RETINA									
120.170	retinal dysplasia, folds	2	3.8%	0		0		0	
OTHER									
900.100	other, not inherited	0		1	4.8%	0		0	
NORMAL									
0.000	normal globe	36	69.2%	16	76.2%	2	100.0%	0	

OCULAR DISORDERS REPORT

AMERICAN PIT BULL TERRIER - 1

AMERICAN PIT BULL TERRIER

	DISORDER	INHERITANCE	REFERENCE	BREEDING ADVICE
A.	Persistent pupillary membranes - iris to iris - all other forms	Not defined Not defined	1 1	Breeder option NO
B.	Retinal atrophy cone-rod dystrophy 1 (<i>crd1</i>) and cone-rod dystrophy 2 (<i>crd2</i>) * a DNA test is available	Not defined	2	NO
C.	Retinal dysplasia - folds	Not defined	1	Breeder option

Description and Comments

A. Persistent pupillary membranes (PPM)

Persistent blood vessel remnants in the anterior chamber of the eye which fail to regress normally by 3 months of age. These strands may bridge from iris to iris, iris to cornea, iris to lens, or from sheets of tissue in the anterior chamber. The last three forms pose the greatest threat to vision and when severe, vision impairment or blindness may occur.

B. Retinal Atrophy

Cone-rod dystrophy 1 (*crd-1*) and Cone-rod dystrophy 2 (*crd-2*)

Early-onset autosomal recessive retinal degeneration. Affects very young dogs less than 1-year of age, with severe photopic and scotopic visual impairment. Ophthalmic signs of disease become apparent in affected animals between 3 and 6 months of age. By 12 months, affected dogs show fixed dilated pupils and generalized retinal degeneration on funduscopic examination, and ERGs are non-recordable. The severity of blindness progresses into early adulthood. A DNA test is available.

C. Retinal dysplasia - folds

Linear, triangular, curved or curvilinear foci of retinal folding that may be single or multiple. When seen in puppies, this condition may partially or completely resolve with maturity. Its significance to vision is unknown. There are two other forms of retinal dysplasia (geographic, detached) which are known to be inherited in other breeds and, in their most

OCULAR DISORDERS REPORT

AMERICAN PIT BULL TERRIER - 2

severe form, cause blindness. The genetic relationship between folds and more severe forms of retinal dysplasia is undetermined.

References

1. ACVO Genetics Committee, 2014 and/or Data from OFA/CERF All-Breeds Report, 2013
2. Goldstein O, Mezey JG, Schweitzer P, et al. IQCB1 and PDE6B mutations cause similar early onset retinal degenerations in two closely related terrier dog breeds. *Invest Ophthalmol.* 2013;54:7005-7019.

OCULAR DISORDERS REPORT AMERICAN PIT BULL TERRIER

Diagnostic Name	TOTAL DOGS EXAMINED	1991-1999		2000-2009		2010-2013		2014	
		#	%	#	%	#	%	#	%
EYELIDS									
25.110	distichiasis	0		5	3.8%	0		0	
CORNEA									
70.700	corneal dystrophy	1	7.1%	0		0		0	
70.730	corneal endothelial degeneration	1	7.1%	0		0		0	
UVEA									
93.710	persistent pupillary membranes, iris to iris	0		1	0.8%	4	12.9%	1	20.0%
93.720	persistent pupillary membranes, iris to lens	1	7.1%	1	0.8%	0		0	
93.730	persistent pupillary membranes, iris to cornea	1	7.1%	1	0.8%	0		0	
93.740	persistent pupillary membranes, iris sheets	1	7.1%	0		0		0	
LENS									
100.210	cataract, significance unknown	0		5	3.8%	1	3.2%	0	
100.301	punctate cataract, anterior cortex	0		0		1	3.2%	0	
100.302	punctate cataract, posterior cortex	0		1	0.8%	1	3.2%	0	
100.305	punctate cataract, posterior sutures	0		1	0.8%	0		0	
100.326	incomplete cataract, nucleus	0		0		0		1	20.0%
100.375	subluxation/luxation, unspecified	0		1	0.8%	0		0	
RETINA									
120.170	retinal dysplasia, folds	0		2	1.5%	0		0	
120.180	retinal dysplasia, geographic	0		1	0.8%	0		0	
120.310	generalized progressive retinal atrophy (PRA)	1	7.1%	0		1	3.2%	0	
OTHER									
900.000	other, unspecified	0		0		1	3.2%	0	
900.100	other, not inherited	0		10	7.5%	0		0	
NORMAL									
0.000	normal globe	11	78.6%	118	88.7%	27	87.1%	5	100.0%

OCULAR DISORDERS REPORT

AMERICAN STAFFORDSHIRE TERRIER - 1

AMERICAN STAFFORDSHIRE TERRIER^{***}

* Please note that since 1972 the AKC considers the Staffordshire Bull Terrier a different breed from the American Staffordshire Terrier. Since the latter breed evolved from the former, it is possible that the same genetic diseases exist in both.

	DISORDER	INHERITANCE	REFERENCE	BREEDING ADVICE
A.	Entropion	Not defined	1	Breeder option
B.	Distichiasis	Not defined	2	Breeder option
C.	Persistent pupillary membranes - iris to iris	Not defined	2, 3	Breeder option
D.	Cataract	Not defined	1, 4, 5	NO
E.	Persistent hyperplastic primary vitreous/ persistent hyperplastic tunica vasculosa lentis	Not defined	1, 6, 7	NO
F.	Retinal atrophy cone-rod dystrophy 1 (<i>crd1</i>) and cone-rod dystrophy 2 (<i>crd2</i>) * a DNA test is available	Autosomal Recessive	8	NO
G.	Retinal dysplasia - folds	Not defined	2	Breeder option

Description and Comments

A. Entropion

A conformational defect resulting in "in-rolling" of one or both of the eyelids which may cause ocular irritation. It is likely that entropion is influenced by several genes (polygenic), defining the skin and other structures which make up the eyelids, the amount and weight of the skin covering the head and face, the orbital contents and the conformation of the skull. Selection should be directed against entropion and toward a head conformation that minimizes or eliminates the likelihood of the defect.

©2014, American College of Veterinary Ophthalmologists

OCULAR DISORDERS REPORT

AMERICAN STAFFORDSHIRE TERRIER - 2

B. Distichiasis

Eyelashes abnormally located on the eyelid margin which may cause ocular irritation. Distichiasis may occur at any time in the life of a dog. It is difficult to make strong recommendations with regard to breeding dogs with this entity. The hereditary basis has not been established, although it seems probable due to the high incidence in some breeds. Reducing the incidence is a logical goal. When diagnosed, distichiasis should be recorded; breeding discretion is advised.

C. Persistent pupillary membranes (PPM)

Persistent blood vessel remnants in the anterior chamber of the eye which fail to regress normally by 3 months of age. These strands may bridge from iris to iris, iris to cornea, iris to lens, or form sheets of tissue in the anterior chamber. The last three forms pose the greatest threat to vision and when severe, vision impairment or blindness may occur.

D. Cataract

A partial or complete opacity of the lens and/or its capsule. In cases where cataracts are complete and affect both eyes, blindness results. The prudent approach is to assume cataracts to be hereditary except in cases known to be associated with trauma, other causes of ocular inflammation, specific metabolic diseases, persistent pupillary membrane, persistent hyaloid or nutritional deficiencies. Cataracts may involve the lens completely (diffuse) or in a localized region.

In this breed, cataracts usually develop by one year of age. There is initial opacification of the suture lines progressing to nuclear and cortical cataract formation; complete cataracts and blindness develop by three years of age. A simple autosomal recessive mode of inheritance has been proposed; however, the genetics have not been defined and additional studies will be required.

E. Persistent hyperplastic primary vitreous (PHPV)/Persistent hyperplastic tunica vasculosa lentis (PHTVL)

Persistent hyperplastic primary vitreous is a congenital defect resulting from abnormalities in the development and regression of the hyaloid artery (the primary vitreous) and the interaction of this blood vessel with the posterior lens capsule/cortex during embryogenesis. This condition is often associated with persistent hyperplastic tunica vasculosa lentis which results from failure of regression of the embryologic vascular network which surrounds the developing lens.

The majority of affected dogs have a retrolental fibrovascular plaque and variable lenticular defects which include posterior lenticonus/globus, colobomata, intralenticular hemorrhage and/or secondary cataracts. Vision impairment may result. The disease is an inherited disorder in the breed, but the mode of inheritance has not been defined. The results of current studies cannot rule out autosomal recessive or a dominant trait with incomplete penetrance.

OCULAR DISORDERS REPORT

AMERICAN STAFFORDSHIRE TERRIER - 3

F. Retinal Atrophy

Cone-rod dystrophy 1 (crd-1) and Cone-rod dystrophy 2 (crd-2)

Early-onset autosomal recessive retinal degeneration. Affects very young dogs less than 1-year of age, with severe photopic and scotopic visual impairment. Ophthalmic signs of disease become apparent in affected animals between 3 and 6 months of age. By 12 months, affected dogs show fixed dilated pupils and generalized retinal degeneration on funduscopic examination, and ERGs are non-recordable. The severity of blindness progresses into early adulthood. A DNA test is available.

G. Retinal dysplasia - folds

Linear, triangular, curved or curvilinear foci of retinal folding that may be single or multiple. When seen in puppies, this condition may partially or completely resolve with maturity. Its significance to vision is unknown. There are two other forms of retinal dysplasia (geographic, detached) which are known to be inherited in other breeds and, in their most severe form, cause blindness. The genetic relationship between folds and more severe forms of retinal dysplasia is undetermined.

References

1. ACVO Genetics Committee, 1999 and/or Data from CERF All-Breeds Report, 1991-1998.
2. ACVO Genetics Committee, 2005 and/or Data from CERF All-Breeds Report 2003-2004.
3. ACVO Genetics Committee, 2002-2003 and/or Data from CERF All-Breeds Report, 2002-2003.
4. Barnett KC. Hereditary cataract in the dog. *J Small Anim Pract.* 1978; 19: 109-120.
5. Barnett KC. The diagnosis and differential diagnosis of cataract in the dog. *J Small Anim Pract.* 1985; 26: 305.
6. Leon A, Curtis R, Barnett KC. Hereditary persistent hyperplastic primary vitreous in the Staffordshire Bull Terrier. *J Am Anim Hosp Assoc.* 1986; 22: 765-774.
7. Curtis R, Barnett KC, Leon A. Persistent hyperplastic primary vitreous in the Staffordshire bull terrier. *Vet Rec.* 1984; 115: 385.
8. Goldstein O, Mezey JG, Schweitzer P, et al. IQCB1 and PDE6B mutations cause similar early onset retinal degenerations in two closely related terrier dog breeds. *Invest Ophthalmol.* 2013;54:7005-7019.

OCULAR DISORDERS REPORT AMERICAN STAFFORDSHIRE TERRIER

Diagnostic Name	TOTAL DOGS EXAMINED		1991-1999 125		2000-2009 451		2010-2013 129		2014 19	
	#	%	#	%	#	%	#	%	#	%
EYELIDS										
21.000	entropion, unspecified	0		2	0.4%	0		0		0
25.110	distichiasis	7	5.6%	25	5.5%	2	1.6%	0		0
CORNEA										
70.210	corneal pannus	1	0.8%	0		0		0		0
70.220	pigmentary keratitis	0		1	0.2%	0		0		0
70.730	corneal endothelial degeneration	1	0.8%	0		0		0		0
UVEA										
93.120	iris cyst	0		1	0.2%	0		0		0
93.170	anterior chamber cyst	0		0		0		0		1 5.3%
93.710	persistent pupillary membranes, iris to iris	5	4.0%	18	4.0%	7	5.4%	0		0
93.720	persistent pupillary membranes, iris to lens	0		1	0.2%	1	0.8%	0		0
93.730	persistent pupillary membranes, iris to cornea	0		1	0.2%	0		0		0
93.750	persistent pupillary membranes, lens pigment foci/no strands	0		0		1	0.8%	0		0
93.760	persistent pupillary membranes, endothelial opacity/no strands	0		1	0.2%	0		0		0
LENS										
100.200	cataract, unspecified	1	0.8%	0		0		0		0
100.210	cataract, significance unknown	2	1.6%	26	5.8%	0		0		0
100.301	punctate cataract, anterior cortex	1	0.8%	0		0		0		0
100.302	punctate cataract, posterior cortex	1	0.8%	1	0.2%	0		0		0
100.303	punctate cataract, equatorial cortex	1	0.8%	0		1	0.8%	0		0
100.304	punctate cataract, anterior sutures	0		1	0.2%	0		0		0
100.305	punctate cataract, posterior sutures	1	0.8%	0		0		0		0
100.311	incipient cataract, anterior cortex	0		4	0.9%	0		0		0
100.312	incipient cataract, posterior cortex	0		2	0.4%	1	0.8%	0		0
100.313	incipient cataract, equatorial cortex	1	0.8%	2	0.4%	1	0.8%	0		0
100.330	generalized/complete cataract	1	0.8%	0		0		0		0
100.375	subluxation/luxation, unspecified	0		2	0.4%	0		0		0
VITREOUS										
110.120	persistant hyaloid artery/remnant	0		2	0.4%	0		0		0
110.320	vitreous degeneration syneresis	0		2	0.4%	0		0		0
110.330	vitreous degeneration anterior chamber	0		1	0.2%	0		0		0
RETINA										
120.170	retinal dysplasia, folds	0		8	1.8%	0		0		0
120.180	retinal dysplasia, geographic	0		2	0.4%	0		0		0
120.310	generalized progressive retinal atrophy (PRA)	0		3	0.7%	0		0		0
OTHER										
900.000	other, unspecified	0		2	0.4%	6	4.7%	0		0
900.100	other, not inherited	0		30	6.7%	0		2	10.5%	0
900.110	other, suspected as inherited	1	0.8%	2	0.4%	0		0		0
NORMAL										
0.000	normal globe	108	86.4%	373	82.7%	124	96.1%	17	89.5%	0

OCULAR DISORDERS REPORT

AMERICAN WATER SPANIEL - 1

AMERICAN WATER SPANIEL

	DISORDER	INHERITANCE	REFERENCE	BREEDING ADVICE
A.	Microphthalmia	Not defined	1	NO
B.	Entropion	Not defined	1	Breeder option
C.	Distichiasis	Not defined	1	Breeder option
D.	Persistent pupillary membranes - iris to iris	Not defined	2	Breeder option
E.	Cataract	Not defined	1	NO

Description and Comments

A. Microphthalmia

Microphthalmia is a congenital defect characterized by a small eye. The condition may be seen alone without vision impairment but it is most often associated with defects of the cornea, iris (coloboma), anterior chamber, lens (cataract) and/or retina (retinal dysplasia).

B. Entropion

A conformational defect resulting in an "in-rolling" of one or both of the eyelids which may cause ocular irritation. It is likely that entropion is influenced by several genes (polygenic), defining the skin and other structures which make up the eyelids, the amount and weight of the skin covering the head and face, the orbital contents, and the conformation of the skull.

C. Distichiasis

Eyelashes abnormally located on the eyelid margin which may cause ocular irritation. Distichiasis may occur at any time in the life of a dog. It is difficult to make a strong recommendation with regard to breeding dogs with this entity. The hereditary basis has not been established, although it seems probable due to the high incidence in some breeds. Reducing the incidence is a logical goal. When diagnosed, distichiasis should be recorded; breeding discretion is advised.

OCULAR DISORDERS REPORT

AMERICAN WATER SPANIEL - 2

D. Persistent pupillary membranes (PPM)

Persistent blood vessel remnants in the anterior chamber of the eye which fail to regress normally by 3 months of age. These strands may bridge from iris to iris, iris to cornea, iris to lens, or form sheets of tissue in the anterior chamber. The last three forms pose the greatest threat to vision and when severe, vision impairment or blindness may occur.

E. Cataract

A partial or complete opacity of the lens and/or its capsule. In cases where cataracts are complete and affect both eyes, blindness results. The prudent approach is to assume cataracts to be hereditary except in cases known to be associated with trauma, other causes of ocular inflammation, specific metabolic diseases, persistent pupillary membrane, persistent hyaloid or nutritional deficiencies. Cataracts may involve the lens completely (diffuse) or in a localized region.

References

There are no references providing detailed descriptions of hereditary ocular conditions of the American Water Spaniel breed. The conditions listed above are generally recognized to exist in this breed, as evidenced by identification on breed eye screening examinations and/or clinical experience of veterinary ophthalmologists.

1. ACVO Genetics Committee, 1999 and/or Data from CERF All-Breeds Report, 1991-1998.
2. ACVO Genetics Committee, 2005 and/or Data from CERF All-Breeds Report 2003-2004.

OCULAR DISORDERS REPORT AMERICAN WATER SPANIEL

Diagnostic Name	TOTAL DOGS EXAMINED		1991-1999		2000-2009		2010-2013		2014	
	#	%	#	%	#	%	#	%	#	%
GLOBE										
0.110 microphthalmia	2	0.5%	0		0		0		0	
10.000 glaucoma	2	0.5%	0		0		1	0.8%	0	
EYELIDS										
20.160 macropalpebral fissure	1	0.2%	0		0		1	0.8%	0	
21.000 entropion, unspecified	5	1.2%	0		0		1	0.8%	1	4.5%
22.000 ectropion, unspecified	0		1	0.2%	1	0.2%	1	0.8%	0	
25.110 distichiasis	113	27.0%	160	34.3%	48	36.1%	13	59.1%		
CORNEA										
70.220 pigmentary keratitis	0		0		1	0.8%	0		0	
70.700 corneal dystrophy	1	0.2%	2	0.4%	1	0.8%	1	4.5%		
UVEA										
93.120 iris cyst	0		1	0.2%	0		0		0	
93.150 iris coloboma	1	0.2%	0		1	0.8%	0		0	
93.710 persistent pupillary membranes, iris to iris	3	0.7%	7	1.5%	0		0		0	
93.730 persistent pupillary membranes, iris to cornea	1	0.2%	0		0		0		0	
93.740 persistent pupillary membranes, iris sheets	1	0.2%	1	0.2%	0		0		0	
93.750 persistent pupillary membranes, lens pigment foci/no strands	0		0		2	1.5%	3	13.6%		
LENS										
100.200 cataract, unspecified	5	1.2%	0		0		0		0	
100.210 cataract, significance unknown	10	2.4%	20	4.3%	6	4.5%	0		0	
100.301 punctate cataract, anterior cortex	2	0.5%	1	0.2%	1	0.8%	0		0	
100.302 punctate cataract, posterior cortex	3	0.7%	3	0.6%	0		0		0	
100.303 punctate cataract, equatorial cortex	0		1	0.2%	0		0		0	
100.305 punctate cataract, posterior sutures	1	0.2%	2	0.4%	1	0.8%	1	4.5%		
100.306 punctate cataract, nucleus	1	0.2%	0		0		0		0	
100.307 punctate cataract, capsular	0		1	0.2%	0		0		0	
100.311 incipient cataract, anterior cortex	4	1.0%	2	0.4%	2	1.5%	0		0	
100.312 incipient cataract, posterior cortex	7	1.7%	4	0.9%	0		0		0	
100.315 incipient cataract, posterior sutures	3	0.7%	2	0.4%	0		0		0	
100.317 incipient cataract, capsular	0		0		1	0.8%	0		0	
100.330 generalized/complete cataract	1	0.2%	0		0		0		0	
VITREOUS										
110.120 persistent hyaloid artery/remnant	0		2	0.4%	0		0		0	
RETINA										
120.170 retinal dysplasia, folds	1	0.2%	5	1.1%	3	2.3%	0		0	
120.180 retinal dysplasia, geographic	0		1	0.2%	0		0		0	
120.310 generalized progressive retinal atrophy (PRA)	3	0.7%	1	0.2%	1	0.8%	0		0	
120.960 retinopathy	0		0		1	0.8%	0		0	
OTHER										
900.000 other, unspecified	0		0		5	3.8%	0		0	
900.100 other, not inherited	0		18	3.9%	0		0		0	
900.110 other, suspected as inherited	0		1	0.2%	0		0		0	

OCULAR DISORDERS REPORT AMERICAN WATER SPANIEL

	1991-1999	2000-2009	2010-2013	2014
NORMAL 0.000 normal globe	271 64.8%	295 63.3%	84 63.2%	10 45.5%

OCULAR DISORDERS REPORT

ARGENTINE DOGO - 1

ARGENTINE DOGO

	DISORDER	INHERITANCE	REFERENCE	BREEDING ADVICE
A.	Persistent pupillary membranes - iris to iris	Not defined	1	Breeder option

Description and Comments

A. Persistent pupillary membranes (PPM)

Persistent blood vessel remnants in the anterior chamber of the eye which fail to regress normally by 3 months of age. These strands may bridge from iris to iris, iris to cornea, iris to lens, or form sheets of tissue in the anterior chamber. The last three forms pose the greatest threat to vision and when severe, vision impairment or blindness may occur

References

There are no references providing detailed descriptions of hereditary ocular conditions of the Argentine Dogo breed. The conditions listed above are generally recognized to exist in the breed, as evidenced by identification on breed eye screening examinations and/or clinical experience of veterinary ophthalmologists.

1. ACVO Genetics Committee, 2005 and/or Data from CERF All-Breeds Report 2003-2004.

OCULAR DISORDERS REPORT ARGENTINE DOGO

Diagnostic Name	TOTAL DOGS EXAMINED	1991-1999		2000-2009		2010-2013		2014	
		#	%	#	%	#	%	#	%
CORNEA									
70.700	corneal dystrophy	1	1.2%	0		0		0	
70.730	corneal endothelial degeneration	1	1.2%	0		0		0	
UVEA									
93.710	persistent pupillary membranes, iris to iris	12	14.3%	2	6.9%	0		0	
93.720	persistent pupillary membranes, iris to lens	1	1.2%	0		0		0	
LENS									
100.200	cataract, unspecified	1	1.2%	0		0		0	
100.210	cataract, significance unknown	1	1.2%	0		0		0	
100.302	punctate cataract, posterior cortex	0		0		1	10.0%	0	
100.312	incipient cataract, posterior cortex	0		1	3.4%	1	10.0%	0	
100.316	incipient cataract, nucleus	1	1.2%	1	3.4%	0		0	
100.330	generalized/complete cataract	1	1.2%	0		0		0	
VITREOUS									
110.120	persistant hyaloid artery/remnant	1	1.2%	0		0		0	
OTHER									
900.100	other, not inherited	0		1	3.4%	0		0	
900.110	other, suspected as inherited	1	1.2%	0		0		0	
NORMAL									
0.000	normal globe	71	84.5%	25	86.2%	8	80.0%	2	100.0%

OCULAR DISORDERS REPORT

AUSTRALIAN CATTLE DOG - 1

AUSTRALIAN CATTLE DOG

(Queensland Heeler or Blue Heeler)

	DISORDER	INHERITANCE	REFERENCE	BREEDING ADVICE
A.	Glaucoma	Not defined	1,2	NO
B.	Corneal dystrophy - epithelial/stromal	Not defined	3	Breeder option
C.	Persistent pupillary membranes - iris to iris	Not defined	4	Breeder option
D.	Cataract	Not defined	5	NO
E.	Lens luxation * a DNA test is available	Not defined	1,5,6	NO
F.	Retinal atrophy - generalized (<i>prcd</i>) * a DNA test is available	Autosomal recessive	5,7,8,9	NO
G.	Retinal atrophy - rod-cone dysplasia type 4 (<i>rcd4</i>) * a DNA test is available	Autosomal recessive	10 optigen test	NO
H.	Retinal dysplasia - folds	Not defined	11	Breeder option
I.	Ceroid lipofuscinosis	Not defined	5, 12	NO

Description and Comments

A. Glaucoma

An elevation of intraocular pressure (IOP) which, when sustained, causes intraocular damage resulting in blindness. The elevated IOP occurs because the fluid cannot leave through the iridocorneal angle. Diagnosis and classification of glaucoma requires measurement of IOP (tonometry) and examination of the iridocorneal angle (gonioscopy).

B. Corneal Dystrophy - epithelial/stromal

©2014, American College of Veterinary Ophthalmologists

OCULAR DISORDERS REPORT

AUSTRALIAN CATTLE DOG - 2

A non-inflammatory corneal opacity (white to gray) present in one or more of the corneal layers. Corneal dystrophy implies a probable inherited basis and is usually bilateral.

C. Persistent pupillary membranes (PPM)

Persistent blood vessel remnants in the anterior chamber of the eye which fail to regress normally by 3 months of age. These strands may bridge from iris to iris, iris to cornea, iris to lens, or form sheets of tissue in the anterior chamber. The last three forms pose the greatest threat to vision and when severe, vision impairment or blindness may occur.

D. Cataract

A partial or complete opacity of the lens and/or its capsule. In cases where cataracts are complete and affect both eyes, blindness results. The prudent approach is to assume cataracts to be hereditary except in cases known to be associated with trauma, other causes of ocular inflammation, specific metabolic diseases, persistent pupillary membrane, persistent hyaloid or nutritional deficiencies. Cataracts may involve the lens completely (diffuse) or in a localized region.

E. Lens luxation

Partial (subluxation) or complete displacement of the lens from the normal anatomic site behind the pupil. Lens luxation not associated with trauma or inflammation is presumed to be inherited. Lens luxation may result in elevated intraocular pressure (glaucoma) causing vision impairment or blindness. A DNA test is available.

Cases have been reported in Australia (J. Smith), but no references have been found. The lens luxates at middle age and is often found with concurrent glaucoma.

F. Retinal atrophy - generalized (*prcd*)

A degenerative disease of the retinal visual cells which progresses to blindness. This abnormality, also known as progressive retinal atrophy or PRA, may be detected by electroretinogram (not part of a routine eye screening examination) before it is apparent clinically. PRA is inherited as an autosomal recessive trait in most breeds.

This photoreceptor degeneration is characterized by slow death of visual cells following their normal development. The disease begins clinically with signs of night blindness followed by day blindness.

There are cases reported in the United States and Australia. Animals at the 3-5 year age range have had ophthalmoscopically typical signs of diffuse retinal degeneration which can be confirmed by electroretinography. Clinically there were only subtle signs of night blindness in the younger animals. Owners have reported obvious night and day blindness in animals at 5-6 years of age. Clinical experiences of Australian clinicians indicate the disease is a significant problem. There is no referenced proof of the mode of inheritance. However, it is presumed to be an autosomal recessive trait based on studies of similar disease in other breeds. Some ACVO diplomates have indicated that there may be more

OCULAR DISORDERS REPORT

AUSTRALIAN CATTLE DOG - 3

than one manifestation of the disease: an early emerging disease (2-4 years of age) and a later disease (5-6 year of age). Because of the significance of blindness, suspicious and affected animals are not to be recommended for breeding foundation. Parents of affected animals should be presumed to be carriers and siblings of affected animals should not be used as breed foundation.

G. Retinal atrophy - rod-cone dysplasia, type 4 (*rcd4*)

A form of PRA identified also in the Australian Cattle Dog breed. Clinical night blindness is observed on average as late as 10 years of age and progresses to total blindness. This form of PRA has been referred to as late-onset PRA (LOPRA). The disorder is caused by a mutation present in the *C2orf71* gene. A mutation-based gene test is now available that will unequivocally identify genetically normal, affected and carrier dogs. The test is accurate only for this mutation and is of no value in identifying other forms of PRA

H. Retinal dysplasia - folds

Linear, triangular, curved or curvilinear foci of retinal folding that may be single or multiple. When seen in puppies, this condition may partially or completely resolve with maturity. Its significance to vision is unknown. There are two other forms of retinal dysplasia (geographic, detached) which are known to be inherited in other breeds and, in their most severe form, cause blindness. The genetic relationship between folds and more severe forms of retinal dysplasia is undetermined.

I. Ceroid lipofuscinosis

A metabolic disorder of the retina and retinal pigment epithelium with accumulation of lipopigments resulting in retinal degeneration.

References

1. Collier L, McCalla T, Moore CP. Anterior lens luxation in Queensland Healer (Australian Cattle) dogs. *Proc Am Coll Vet Ophthalmol*. 1989;20:185.
2. Gelatt KN, MacKay EO. Prevalence of the breed-related glaucomas in pure-bred dogs in North America. *Vet Ophthalmol*. 2004;7:97-111.
3. ACVO Genetics Committee, 2007 and/or Data from CERF All-Breeds Report 2002-2006.
4. ACVO Genetics Committee, 2000-2002 and/or Data from CERF All-Breeds Report, 2000-2002.
5. ACVO Genetics Committee, 1999 and/or Data from CERF All-Breeds Report, 1991-1998.
6. Farias FH, Johnson GS, Taylor JF, et al. An ADAMTS17 splice donor site mutation in dogs with primary lens luxation. *Invest Ophthalmol Vis Sci*. 2010;51:4716-4721.
7. Laratta LJ, Sims MH, Brooks DE. Progressive retinal degeneration in the Australian cattle

OCULAR DISORDERS REPORT

AUSTRALIAN CATTLE DOG - 4

- dog. *Proc Am Coll Vet Ophthalmol.* 1988;19:9.
8. Dekomien G, Epplen JT. Exclusion of the PDE6A gene for generalised progressive retinal atrophy in 11 breeds of dog. *Anim Genet.* 2000;31:135-139.
 9. Zangerl B, Goldstein O, Philp AR, et al. Identical mutation in a novel retinal gene causes progressive rod-cone degeneration in dogs and retinitis pigmentosa in humans. *Genomics.* 2006;88:551-563.
 10. Downs LM, Bell JS, Freeman J, et al. Late-onset progressive retinal atrophy in the Gordon and Irish Setter breeds is associated with a frameshift mutation in *C2orf71*. *Anim Genet.* 2012.
 11. ACVO Genetics Committee, 2005 and/or Data from CERF All-Breeds Report 2003-2004.
 12. Wood PA, Sisk DB, Styer E, et al. Animal model: ceroidosis (ceroid-lipofuscinosis) in Australian cattle dogs. *Am J Med Genet.* 1987;26:891-898.

OCULAR DISORDERS REPORT AUSTRALIAN CATTLE DOG

Diagnostic Name	TOTAL DOGS EXAMINED	1991-1999 2298		2000-2009 1805		2010-2013 374		2014 110		
		#	%	#	%	#	%	#	%	
EYELIDS										
22.000	ectropion, unspecified	1	0.0%	0		0		0		
25.110	distichiasis	7	0.3%	5	0.3%	3	0.8%	0		
NASOLACRIMAL										
32.110	imperforate lower nasolacrimal punctum	1	0.0%	0		0		0		
NICTITANS										
50.210	pannus of third eyelid	0		0		2	0.5%	0		
CORNEA										
70.210	corneal pannus	0		2	0.1%	0		0		
70.700	corneal dystrophy	9	0.4%	10	0.6%	5	1.3%	0		
70.730	corneal endothelial degeneration	1	0.0%	3	0.2%	0		0		
UVEA										
93.120	iris cyst	3	0.1%	7	0.4%	0		0		
93.170	anterior chamber cyst	0		0		0		1	0.9%	
93.710	persistent pupillary membranes, iris to iris	16	0.7%	18	1.0%	7	1.9%	2	1.8%	
93.720	persistent pupillary membranes, iris to lens	1	0.0%	1	0.1%	0		0		
93.730	persistent pupillary membranes, iris to cornea	2	0.1%	0		1	0.3%	0		
93.740	persistent pupillary membranes, iris sheets	5	0.2%	1	0.1%	0		0		
93.760	persistent pupillary membranes, endothelial opacity/no strands	0		1	0.1%	1	0.3%	0		
LENS										
100.200	cataract, unspecified	35	1.5%	0		0		0		
100.210	cataract, significance unknown	89	3.9%	155	8.6%	25	6.7%	7	6.4%	
100.301	punctate cataract, anterior cortex	15	0.7%	19	1.1%	6	1.6%	1	0.9%	
100.302	punctate cataract, posterior cortex	20	0.9%	9	0.5%	2	0.5%	4	3.6%	
100.303	punctate cataract, equatorial cortex	12	0.5%	7	0.4%	0		0		
100.304	punctate cataract, anterior sutures	2	0.1%	1	0.1%	1	0.3%	0		
100.305	punctate cataract, posterior sutures	4	0.2%	5	0.3%	5	1.3%	1	0.9%	
100.306	punctate cataract, nucleus	1	0.0%	2	0.1%	2	0.5%	0		
100.307	punctate cataract, capsular	1	0.0%	2	0.1%	2	0.5%	0		
100.311	incipient cataract, anterior cortex	18	0.8%	23	1.3%	2	0.5%	1	0.9%	
100.312	incipient cataract, posterior cortex	30	1.3%	34	1.9%	4	1.1%	0		
100.313	incipient cataract, equatorial cortex	23	1.0%	25	1.4%	2	0.5%	1	0.9%	
100.314	incipient cataract, anterior sutures	2	0.1%	0		0		0		
100.315	incipient cataract, posterior sutures	5	0.2%	13	0.7%	0		0		
100.316	incipient cataract, nucleus	1	0.0%	2	0.1%	1	0.3%	0		
100.317	incipient cataract, capsular	0		3	0.2%	1	0.3%	0		
100.330	generalized/complete cataract	11	0.5%	11	0.6%	0		0		
100.375	subluxation/luxation, unspecified	2	0.1%	1	0.1%	0		0		
VITREOUS										
110.120	persistant hyaloid artery/remnant	5	0.2%	3	0.2%	0		0		
110.135	PHPV/PTVL	0		1	0.1%	0		0		
110.320	vitreous degeneration syneresis	5	0.2%	7	0.4%	0		0		
110.330	vitreous degeneration anterior chamber	0		1	0.1%	0		0		

OCULAR DISORDERS REPORT AUSTRALIAN CATTLE DOG

	1991-1999	2000-2009	2010-2013	2014
FUNDUS				
97.110 choroidal hypoplasia	0	0	3 0.8%	0
97.120 coloboma	1 0.0%	0	0	0
RETINA				
120.170 retinal dysplasia, folds	15 0.7%	20 1.1%	1 0.3%	1 0.9%
120.180 retinal dysplasia, geographic	4 0.2%	8 0.4%	0	0
120.190 retinal dysplasia, detached	0	1 0.1%	0	0
120.200 retinitis	0	0	1 0.3%	0
120.310 generalized progressive retinal atrophy (PRA)	122 5.3%	114 6.3%	12 3.2%	1 0.9%
120.400 retinal hemorrhage	1 0.0%	0	0	0
120.910 retinal detachment without dialysis	0	2 0.1%	1 0.3%	0
120.960 retinopathy	0	0	1 0.3%	0
OPTIC NERVE				
130.120 optic nerve hypoplasia	2 0.1%	0	0	0
130.150 optic disc coloboma	0	0	1 0.3%	0
OTHER				
900.000 other, unspecified	0	10 0.6%	10 2.7%	0
900.100 other, not inherited	14 0.6%	111 6.1%	6 1.6%	5 4.5%
900.110 other, suspected as inherited	13 0.6%	4 0.2%	2 0.5%	0
NORMAL				
0.000 normal globe	1925 83.8%	1446 80.1%	341 91.2%	101 91.8%

OCULAR DISORDERS REPORT

AUSTRALIAN KELPIE - 1

AUSTRALIAN KELPIE

	DISORDER	INHERITANCE	REFERENCE	BREEDING ADVICE
A.	Cataract	Not defined	1	NO
B.	Retinal atrophy - generalized	Not defined	2	NO

Description and Comments

A. Cataract

A partial or complete opacity of the lens and/or its capsule. In cases where cataracts are complete and affect both eyes, blindness results. The prudent approach is to assume cataracts to be hereditary except in cases known to be associated with trauma, other causes of ocular inflammation, specific metabolic diseases, persistent pupillary membrane, persistent hyaloid or nutritional deficiencies. Cataracts may involve the lens completely (diffuse) or in a localized region.

B. Retinal atrophy - generalized

A degenerative disease of the retinal visual cells which progresses to blindness. This abnormality, also known as Progressive Retinal Atrophy or PRA, may be detected by electroretinogram (not part of a routine eye screening examination) before it is apparent clinically. Except for X-linked PRA in the Siberian Husky, in all breeds studied to date, PRA is inherited as an autosomal recessive trait.

The age of onset has been reported to be between 2 and 3 years of age with initial loss of night vision progressing to complete blindness.

References

There are no references providing detailed descriptions of hereditary ocular conditions of the Australian Kelpie breed. The conditions listed above are generally recognized to exist in this breed, as evidenced by identification on breed eye screening examinations and/or clinical experience of veterinary ophthalmologists.

1. ACVO Genetics Committee, 2005 and/or Data from CERF All-Breeds Report 2003-2004.
2. ACVO Genetics Committee, 2000-2002 and/or Data from CERF All-Breeds Report, 2000-2002.

OCULAR DISORDERS REPORT AUSTRALIAN KELPIE

Diagnostic Name	TOTAL DOGS EXAMINED	1991-1999		2000-2009		2010-2013		2014	
		#	%	#	%	#	%	#	%
CORNEA									
70.700	corneal dystrophy	1	1.3%	0		0		0	
UVEA									
93.710	persistent pupillary membranes, iris to iris	0		1	0.9%	0		0	
93.810	uveal melanoma	0		1	0.9%	2	6.9%	0	
LENS									
100.200	cataract, unspecified	5	6.5%	0		0		0	
100.210	cataract, significance unknown	7	9.1%	15	13.3%	6	20.7%	1	12.5%
100.301	punctate cataract, anterior cortex	2	2.6%	3	2.7%	1	3.4%	2	25.0%
100.302	punctate cataract, posterior cortex	1	1.3%	7	6.2%	0		0	
100.306	punctate cataract, nucleus	1	1.3%	0		0		0	
100.311	incipient cataract, anterior cortex	1	1.3%	8	7.1%	0		0	
100.312	incipient cataract, posterior cortex	5	6.5%	2	1.8%	0		0	
100.313	incipient cataract, equatorial cortex	0		2	1.8%	0		0	
100.315	incipient cataract, posterior sutures	1	1.3%	0		0		0	
100.330	generalized/complete cataract	1	1.3%	0		0		0	
VITREOUS									
110.320	vitreous degeneration syneresis	1	1.3%	0		0		0	
110.330	vitreous degeneration anterior chamber	0		1	0.9%	1	3.4%	0	
FUNDUS									
97.110	choroidal hypoplasia	1	1.3%	0		0		0	
RETINA									
120.170	retinal dysplasia, folds	4	5.2%	0		1	3.4%	0	
120.310	generalized progressive retinal atrophy (PRA)	8	10.4%	3	2.7%	0		0	
OTHER									
900.000	other, unspecified	0		4	3.5%	3	10.3%	0	
900.100	other, not inherited	0		8	7.1%	0		0	
900.110	other, suspected as inherited	0		1	0.9%	0		0	
NORMAL									
0.000	normal globe	52	67.5%	89	78.8%	28	96.6%	8	100.0%

OCULAR DISORDERS REPORT

AUSTRALIAN SHEPHERD - 1

AUSTRALIAN SHEPHERD

	DISORDER	INHERITANCE	REFERENCE	BREEDING ADVICE
A.	Microphthalmia with multiple ocular defects	Presumed autosomal recessive with incomplete penetrance	1-6	NO
B.	Distichiasis	Not defined	1, 7	Breeder option
C.	Corneal dystrophy - epithelial/stromal	Not defined	8	Breeder option
D.	Iris coloboma	Not defined	1	NO
E.	Iris hypoplasia	Not defined	9	Breeder option
F.	Persistent pupillary membranes - iris to iris - all other forms	Not defined Not defined	1 1,8	Breeder option NO
G.	Cataract * a DNA test is available	Suspect autosomal dominant	1, 10, 11	NO
H.	Persistent hyaloid artery	Not defined	8	Breeder option
I.	Retinal atrophy - generalized (<i>prcd</i>) * a DNA test is available	Autosomal recessive	1,7,8,9,18	NO
J.	Cone degeneration - day blindness * a DNA test is available	Autosomal recessive	*	NO
K.	Multifocal retinopathy - <i>cmr1</i> * a DNA test is available	Autosomal	17	Breeder option
L.	Retinal dysplasia - folds	Not defined	8	Breeder option

OCULAR DISORDERS REPORT

AUSTRALIAN SHEPHERD - 2

M.	Choroidal hypoplasia, +/- coloboma, +/- retinal detachment * a DNA test is available	Simple recessive	1,7,12-15	NO
N.	Coloboma/ staphyloma without microphthalmia	Not defined	1	NO
O.	Micropapilla	Not defined	16	Breeder option

It is recommended that this breed be examined prior to pharmacological dilation to best facilitate identification of iris coloboma.

Description and Comments

A. Microphthalmia with multiple ocular defects

Microphthalmia is a congenital defect characterized by a small eye with associated defects of the cornea, iris (coloboma), anterior chamber, lens (cataract) and/or retina (dysplasia). In the Australian Shepherd, microphthalmia has long been suspected to be associated with merled coat coloration but a definitive genetic relationship has not been established. The eyes of affected homozygous merle (usually white) dogs have extreme forms of this entity and are usually blind at birth. Affected heterozygous merle-coated dogs demonstrate less severe manifestations.

B. Distichiasis

Eyelashes abnormally located on the eyelid margin which may cause ocular irritation. Distichiasis may occur at any time in the life of a dog. It is difficult to make a strong recommendation with regard to breeding dogs with this entity. The hereditary basis has not been established although it seems probable due to the high incidence in some breeds. Reducing the incidence is a logical goal. When diagnosed, distichiasis should be recorded; breeding discretion is advised.

C. Corneal Dystrophy - epithelial/stromal

A non-inflammatory corneal opacity (white to gray) present in one or more of the corneal layers. Corneal dystrophy implies a probable inherited basis and is usually bilateral.

OCULAR DISORDERS REPORT

AUSTRALIAN SHEPHERD - 3

D. Iris coloboma

A congenital abnormality in iris development usually characterized by a full-thickness defect in iris tissue, commonly (though not exclusively) located at the 6 o'clock position associated with failure of closure of the optic fissure. A partial-thickness defect in iris tissue should be recorded as iris hypoplasia on the OFA form.

E. Iris hypoplasia

A congenital abnormality in iris development usually characterized by a reduced quantity of tissue identified as a partial-thickness defect in iris tissue. Full-thickness iris hypoplasia is rare and should be recorded as an iris coloboma on the OFA form.

F. Persistent pupillary membranes (PPM)

Persistent blood vessel remnants in the anterior chamber of the eye which fail to regress normally by 3 months of age. These strands may bridge from iris to iris, iris to cornea, iris to lens, or form sheets of tissue in the anterior chamber. The last three forms pose the greatest threat to vision and when severe, vision impairment or blindness may occur.

G. Cataract

A partial or complete opacity of the lens and/or its capsule. In cases where cataracts are complete and affect both eyes, blindness results. The prudent approach is to assume cataracts to be hereditary except in cases known to be associated with trauma, other causes of ocular inflammation, specific metabolic diseases, persistent pupillary membrane, persistent hyaloid or nutritional deficiencies. Cataracts may involve the lens completely (diffuse) or in a localized region. The condition is inherited as a co-dominant mutation in the HSF4 gene (HSF4-2). Genetic testing is available. Please refer to Genetic Testing for Canine Ocular Disorders Section.

H. Persistent hyaloid artery (PHA)

Congenital defect resulting from abnormalities in the development and regression of the hyaloid artery. The blood vessel remnant can be present in the vitreous as a small patent vascular strand (PHA) or as a non-vascular strand that appears gray-white (persistent hyaloid remnant).

I. Retinal atrophy - generalized (*prcd*)

A degenerative disease of the retinal visual cells which progresses to blindness. This abnormality may be detected by electroretinogram before it is apparent clinically. In most breeds studied to date, PRA is recessively inherited. The disease in the Australian Shepherd has not been characterized sufficiently to establish the disease frequency, the disease mechanism, or the age when early diagnosis by ophthalmoscopy and/or

OCULAR DISORDERS REPORT

AUSTRALIAN SHEPHERD - 4

electroretinography is possible. A DNA test is available

J. Cone degeneration - day blindness or hemeralopia

Autosomal recessively inherited early degeneration of the cone photoreceptors. Affected puppies develop day-blindness, colorblindness, and photophobia between 8 and 12 weeks of age. Affected dogs remain ophthalmoscopically normal their entire life. Electroretinography is required to definitively diagnose the disorder. A DNA test is available.

K. Multifocal retinopathy

Canine Multi-focal Retinopathy type 1 (cmr1) is characterized by numerous distinct (i.e. multi-focal), roughly circular patches of elevated retina (multifocal bullous retinal detachments). There may be a serous subretinal fluid, or accumulation of subretinal material that produces gray-tan-pink colored lesions. These lesions, looking somewhat like blisters, vary in location and size, although typically they are present in both eyes of the affected dog.

The disease generally develops in young dogs between 11-20 weeks of age and there is minimal progression after 1 year of age. The lesions may flatten, leaving areas of retinal thinning and RPE hypertrophy, hyperplasia, and pigmentation. Discrete areas of tapetal hyper-reflectivity may be seen in areas of previous retinal and RPE detachments. Most dogs exhibit no noticeable problem with vision or electroretinographic abnormalities despite their abnormal appearing retinas.

Canine Multi-focal Retinopathy type 1 is caused by a mutation in the Bestrophin 1 gene (BEST1) and is described to be recessively inherited in the Great Pyrenees, Dogue de Bordeaux, Bullmastiff, and Mastiff.

L. Retinal dysplasia - folds

Linear, triangular, curved or curvilinear foci of retinal folding that may be single or multiple. When seen in puppies, this condition may partially or completely resolve with maturity. Its significance to vision is unknown. There are two other forms of retinal dysplasia (geographic, detached) which are known to be inherited in other breeds and, in their most severe form, cause blindness. The genetic relationship between folds and more severe forms of retinal dysplasia is undetermined.

OCULAR DISORDERS REPORT

AUSTRALIAN SHEPHERD - 5

M. Choroidal hypoplasia (with or without coloboma and retinal detachment)

A congenital defect in which the choroid develops incompletely. The clinical appearance is similar to the same condition reported in Collies and Shetland Sheepdogs. A DNA test is available.

This disorder is collectively referred to as "Collie Eye Anomaly". Although there is a lack of scientific evidence, it is believed that the incidence and severity of this entity in Collies was decreased by breeding only "mildly affected" animals. At this time, the Genetics Committee of the ACVO recommends against breeding dogs with any form of the Collie Eye Anomaly.

N. Coloboma/staphyloma (unassociated with microphthalmia)

A coloboma is a congenital defect which may affect the iris, choroid or optic disc. Iris colobomas are seen as notches in the pupillary margin. Scleral ectasia is defined as a congenital thinning and secondary distention of the sclera; when lined by uveal tissue it is called a staphyloma. These may be anteriorly located, apparent as a bulge beneath the upper eyelid or posteriorly located, requiring visualization with an ophthalmoscope. These conditions may or may not be genetically related to the same anomalies seen associated with microphthalmia (entity "A" above).

O. Micropapilla

Micropapilla refers to a small optic disc which is not associated with vision impairment. Optic nerve hypoplasia refers to a congenital defect of the optic nerve which causes blindness and abnormal pupil response in the affected eye. It may be difficult to differentiate between micropapilla and optic nerve hypoplasia on a routine (dilated) screening ophthalmoscopic exam.

References

1. ACVO Genetics Committee, 1999 and/or Data from CERF All-Breeds Report, 1991-1998.
2. Gelatt KN, McGill LD. Clinical characteristics of microphthalmia with colobomas of the Australian shepherd dog. *J Am Vet Med Assoc.* 1971; 162.
3. Gelatt KN, Veith LA. Hereditary multiple ocular anomalies in Australian shepherd dogs. *Vet Med Small Anim Clin.* 1970; 65.
4. Cook CS, Burling K, Nelson EJ. Embryogenesis of posterior segment colobomas in the Australian shepherd dog. *Prog in Vet Comp Ophthalmol.* 1991; 1.
5. Bertram T, Coignoul F, Cheville N. Ocular dysgenesis in Australian shepherd dogs. *J Am Anim Hosp Assoc.* 1984; 20: 177.

©2014, American College of Veterinary Ophthalmologists

OCULAR DISORDERS REPORT

AUSTRALIAN SHEPHERD - 6

6. Gelatt KN, Powell NG. Inheritance of microphthalmia with coloboma. *Am J Vet Res.* 1981; 1.
7. ACVO Genetics Committee, 2008 and/or Data from CERF All-Breeds Report, 2003-2007.
8. ACVO Genetics Committee, 2005 and/or Data from CERF All-Breeds Report 2003-2004.
9. ACVO Genetics Committee, 2011 and/or Data from CERF All-Breeds Report, 2010.
10. Mellersh CS, Pettitt L, Forman OP, et al. Identification of mutations in HSF4 in dogs of three different breeds with hereditary cataracts. *Vet Ophthalmol.* 2006; 9: 369-378.
11. Mellersh CS, McLaughlin B, Ahonen S, et al. Mutation in HSF4 is associated with hereditary cataract in the Australian Shepherd. *Vet Ophthalmol.* 2009; 12: 372-378.
12. Rubin LF, Nelson EJ, Sharp CA. Collie eye anomaly in Australian shepherd dogs. *Prog in Vet Comp Ophthalmol.* 1991; 1.
13. Lowe JK, Kukekova AV, Kirkness EF, et al. Linkage mapping of the primary disease locus for collie eye anomaly. *Genomics.* 2003; 82: 86-95.
14. Parker HG, Kukekova AV, Akey DT, et al. Breed relationships facilitate fine-mapping studies: a 7.8-kb deletion cosegregates with Collie eye anomaly across multiple dog breeds. *Genome Res.* 2007; 17: 1562-1571.
15. Munyard KA, Sherry CR, Sherry L. A retrospective evaluation of congenital ocular defects in Australian Shepherd dogs in Australia. *Vet Ophthalmol.* 2007; 10: 19-22.
16. ACVO Genetics Committee, 2007 and/or Data from CERF All-Breeds Report 2002-2006.
17. Hoffman I, Guzewicz KE, Zangler B, et al. Canine multifocal retinopathy in the Australian Shepherd: a case report. *Vet Ophthalmol.* 2012; 15: 134-138.
18. ACVO Genetics Committee, 2014 and/or Data from OFA/CERF All-Breeds Report 2013.

OCULAR DISORDERS REPORT AUSTRALIAN SHEPHERD

Diagnostic Name	TOTAL DOGS EXAMINED		1991-1999 26846		2000-2009 44675		2010-2013 17389		2014 4224	
	#	%	#	%	#	%	#	%	#	%
GLOBE										
0.110 microphthalmia	42	0.2%	36	0.1%	9	0.1%	1	0.0%		
10.000 glaucoma	6	0.0%	2	0.0%	0		0			
EYELIDS										
20.110 eyelid dermoid	1	0.0%	0		0		0		0	
20.140 ectopic cilia	1	0.0%	4	0.0%	0		0		0	
20.160 macropalpebral fissure	0		3	0.0%	1	0.0%	0		0	
21.000 entropion, unspecified	2	0.0%	6	0.0%	4	0.0%	3	0.1%		
22.000 ectropion, unspecified	2	0.0%	3	0.0%	1	0.0%	0			
25.110 distichiasis	410	1.5%	726	1.6%	328	1.9%	64	1.5%		
NASOLACRIMAL										
32.110 imperforate lower nasolacrimal punctum	2	0.0%	0		1	0.0%	1	0.0%		
NICTITANS										
51.100 third eyelid cartilage anomaly	2	0.0%	1	0.0%	1	0.0%	0			
52.110 prolapsed gland of the third eyelid	0		1	0.0%	1	0.0%	0			
CORNEA										
70.210 corneal pannus	5	0.0%	1	0.0%	2	0.0%	0			
70.220 pigmentary keratitis	0		1	0.0%	0		0			
70.700 corneal dystrophy	123	0.5%	156	0.3%	98	0.6%	21	0.5%		
70.730 corneal endothelial degeneration	6	0.0%	6	0.0%	2	0.0%	0			
UVEA										
93.110 iris hypoplasia	0		63	0.1%	108	0.6%	24	0.6%		
93.120 iris cyst	9	0.0%	19	0.0%	9	0.1%	0			
93.140 corneal endothelial pigment without PPM	0		1	0.0%	0		0			
93.150 iris coloboma	402	1.5%	697	1.6%	226	1.3%	51	1.2%		
93.170 anterior chamber cyst	0		0		4	0.0%	0			
93.710 persistent pupillary membranes, iris to iris	679	2.5%	2164	4.8%	1142	6.6%	277	6.6%		
93.720 persistent pupillary membranes, iris to lens	27	0.1%	36	0.1%	21	0.1%	3	0.1%		
93.730 persistent pupillary membranes, iris to cornea	17	0.1%	20	0.0%	5	0.0%	0			
93.740 persistent pupillary membranes, iris sheets	50	0.2%	42	0.1%	0		0			
93.750 persistent pupillary membranes, lens pigment foci/no strands	0		2	0.0%	16	0.1%	6	0.1%		
93.760 persistent pupillary membranes, endothelial opacity/no strands	0		5	0.0%	14	0.1%	0			
93.810 uveal melanoma	0		2	0.0%	5	0.0%	0			
97.150 chorioretinal coloboma, congenital	0		0		0		10	0.2%		
LENS										
100.200 cataract, unspecified	169	0.6%	0		0		0			
100.210 cataract, significance unknown	495	1.8%	1249	2.8%	406	2.3%	87	2.1%		
100.301 punctate cataract, anterior cortex	66	0.2%	95	0.2%	46	0.3%	11	0.3%		
100.302 punctate cataract, posterior cortex	111	0.4%	158	0.4%	34	0.2%	6	0.1%		
100.303 punctate cataract, equatorial cortex	34	0.1%	38	0.1%	8	0.0%	3	0.1%		
100.304 punctate cataract, anterior sutures	4	0.0%	19	0.0%	7	0.0%	0			
100.305 punctate cataract, posterior sutures	55	0.2%	98	0.2%	56	0.3%	1	0.0%		
100.306 punctate cataract, nucleus	35	0.1%	73	0.2%	33	0.2%	5	0.1%		
100.307 punctate cataract, capsular	5	0.0%	58	0.1%	13	0.1%	2	0.0%		

OCULAR DISORDERS REPORT AUSTRALIAN SHEPHERD

LENS CONTINUED	1991-1999		2000-2009		2010-2013		2014	
100.311 incipient cataract, anterior cortex	92	0.3%	142	0.3%	51	0.3%	10	0.2%
100.312 incipient cataract, posterior cortex	211	0.8%	380	0.9%	109	0.6%	24	0.6%
100.313 incipient cataract, equatorial cortex	60	0.2%	90	0.2%	30	0.2%	3	0.1%
100.314 incipient cataract, anterior sutures	3	0.0%	17	0.0%	3	0.0%	1	0.0%
100.315 incipient cataract, posterior sutures	54	0.2%	76	0.2%	17	0.1%	0	
100.316 incipient cataract, nucleus	49	0.2%	120	0.3%	21	0.1%	6	0.1%
100.317 incipient cataract, capsular	7	0.0%	73	0.2%	19	0.1%	6	0.1%
100.321 incomplete cataract, anterior cortex	0		0		0		4	0.1%
100.322 incomplete cataract, posterior cortex	0		0		2	0.0%	8	0.2%
100.326 incomplete cataract, nucleus	0		0		2	0.0%	1	0.0%
100.327 incomplete cataract, capsular	0		0		1	0.0%	0	
100.330 generalized/complete cataract	94	0.4%	110	0.2%	23	0.1%	3	0.1%
100.340 resorbing/hypermature cataract	0		0		1	0.0%	0	
100.375 subluxation/luxation, unspecified	2	0.0%	12	0.0%	2	0.0%	1	0.0%
VITREOUS								
110.120 persistent hyaloid artery/remnant	213	0.8%	195	0.4%	35	0.2%	27	0.6%
110.135 PHPV/PTVL	24	0.1%	45	0.1%	33	0.2%	3	0.1%
110.200 vitritis	0		0		2	0.0%	0	
110.320 vitreous degeneration syneresis	50	0.2%	106	0.2%	41	0.2%	12	0.3%
110.330 vitreous degeneration anterior chamber	0		26	0.1%	12	0.1%	0	
FUNDUS								
97.110 choroidal hypoplasia	46	0.2%	50	0.1%	25	0.1%	16	0.4%
97.120 coloboma	44	0.2%	44	0.1%	10	0.1%	0	
RETINA								
120.170 retinal dysplasia, folds	191	0.7%	421	0.9%	218	1.3%	49	1.2%
120.180 retinal dysplasia, geographic	18	0.1%	16	0.0%	8	0.0%	1	0.0%
120.190 retinal dysplasia, detached	3	0.0%	1	0.0%	4	0.0%	1	0.0%
120.310 generalized progressive retinal atrophy (PRA)	47	0.2%	73	0.2%	10	0.1%	0	
120.400 retinal hemorrhage	10	0.0%	3	0.0%	0		0	
120.910 retinal detachment without dialysis	31	0.1%	24	0.1%	6	0.0%	0	
120.920 retinal detachment with dialysis	0		0		2	0.0%	4	0.1%
120.960 retinopathy	0		0		5	0.0%	0	
OPTIC NERVE								
130.110 micropapilla	8	0.0%	90	0.2%	60	0.3%	19	0.4%
130.120 optic nerve hypoplasia	71	0.3%	32	0.1%	6	0.0%	3	0.1%
130.150 optic disc coloboma	64	0.2%	49	0.1%	25	0.1%	9	0.2%
OTHER								
900.000 other, unspecified	0		148	0.3%	397	2.3%	0	
900.100 other, not inherited	70	0.3%	1173	2.6%	98	0.6%	99	2.3%
900.110 other, suspected as inherited	153	0.6%	96	0.2%	20	0.1%	7	0.2%
NORMAL								
0.000 normal globe	23562	87.8%	39799	89.1%	15548	89.4%	3813	90.3%

OCULAR DISORDERS REPORT

AUSTRALIAN STUMPY TAIL CATTLE DOG - 1

AUSTRALIAN STUMPY TAIL CATTLE DOG

	DISORDER	INHERITANCE	REFERENCE	BREEDING ADVICE
A.	Retinal atrophy - generalized (<i>prcd</i>) * a DNA test is available	Autosomal recessive	1	NO

Description and Comments

A. Retinal atrophy - generalized (*prcd*)

A degenerative disease of the retinal visual cells which progresses to blindness. This abnormality, also known as progressive retinal atrophy or PRA, may be detected by electroretinogram (not part of a routine eye screening examination) before it is apparent clinically. Except for X-linked PRA in the Siberian Husky, in all breeds studied to date, PRA is inherited as an autosomal recessive trait.

This photoreceptor degeneration is characterized by slow death of visual cells following their normal development. The disease begins clinically with signs of night blindness followed by day blindness.

References

1. Zangerl B, Goldstein O, Philp AR, et al. Identical mutation in a novel retinal gene causes progressive rod-cone degeneration in dogs and retinitis pigmentosa in humans. *Genomics*. 2006 Nov;88:551-563.

OCULAR DISORDERS REPORT AUSTRALIAN STUMPY TAIL CATTLE DOG

Diagnostic Name	TOTAL DOGS EXAMINED	1991-1999		2000-2009		2010-2013		2014	
		#	%	#	%	#	%	#	%
LENS									
100.210	cataract, significance unknown	0		2	4.5%	0		0	
100.301	punctate cataract, anterior cortex	0		1	2.3%	0		0	
100.305	punctate cataract, posterior sutures	0		1	2.3%	0		0	
100.311	incipient cataract, anterior cortex	0		1	2.3%	0		0	
100.312	incipient cataract, posterior cortex	0		2	4.5%	0		0	
100.313	incipient cataract, equatorial cortex	0		2	4.5%	0		0	
100.316	incipient cataract, nucleus	0		1	2.3%	0		0	
RETINA									
120.170	retinal dysplasia, folds	0		1	2.3%	0		0	
120.180	retinal dysplasia, geographic	0		1	2.3%	0		0	
120.310	generalized progressive retinal atrophy (PRA)	0		3	6.8%	0		0	
OTHER									
900.100	other, not inherited	0		1	2.3%	0		0	
900.110	other, suspected as inherited	0		1	2.3%	0		0	
NORMAL									
0.000	normal globe	0		38	86.4%	0		0	

OCULAR DISORDERS REPORT

AUSTRALIAN TERRIER - 1

AUSTRALIAN TERRIER

	DISORDER	INHERITANCE	REFERENCE	BREEDING ADVICE
A.	Persistent pupillary membranes - iris to iris	Not defined	1	Breeder option
B.	Cataract	Not defined	2	NO

Description and Comments

A. Persistent pupillary membranes (PPM)

Persistent blood vessel remnants in the anterior chamber of the eye which fail to regress normally by 3 months of age. These strands may bridge from iris to iris, iris to cornea, iris to lens, or form sheets of tissue in the anterior chamber. The last three forms pose the greatest threat to vision and when severe, vision impairment or blindness may occur.

B. Cataract

A partial or complete opacity of the lens and/or its capsule. In cases where cataracts are complete and affect both eyes, blindness results. The prudent approach is to assume cataracts to be hereditary except in cases known to be associated with trauma, other causes of ocular inflammation, specific metabolic diseases, persistent pupillary membrane, persistent hyaloid or nutritional deficiencies. Cataracts may involve the lens completely (diffuse) or in a localized region.

References

There are no references providing detailed descriptions of hereditary ocular conditions of the Australian Terrier breed. The conditions listed above are generally recognized to exist in this breed, as evidenced by identification on breed eye screening examinations and/or clinical experience of veterinary ophthalmologists.

1. ACVO Genetics Committee, 2007 and/or Data from CERF All-Breeds Report 2002-2006.
2. ACVO Genetics Committee, 2005 and/or Data from CERF All-Breeds Report 2003-2004.

OCULAR DISORDERS REPORT AUSTRALIAN TERRIER

Diagnostic Name	TOTAL DOGS EXAMINED	1991-1999		2000-2009		2010-2013		2014	
		#	%	#	%	#	%	#	%
GLOBE									
10.000 glaucoma		0		1	0.4%	0		0	
EYELIDS									
21.000 entropion, unspecified		2	0.6%	0		0		0	
25.110 distichiasis		0		3	1.3%	0		0	
CORNEA									
70.700 corneal dystrophy		3	0.8%	1	0.4%	0		0	
UVEA									
93.710 persistent pupillary membranes, iris to iris		7	1.9%	5	2.2%	2	1.2%	2	4.8%
93.720 persistent pupillary membranes, iris to lens		1	0.3%	0		0		0	
93.730 persistent pupillary membranes, iris to cornea		3	0.8%	0		0		0	
93.750 persistent pupillary membranes, lens pigment foci/no strands		0		0		6	3.6%	1	2.4%
93.760 persistent pupillary membranes, endothelial opacity/no strands		0		0		1	0.6%	0	
LENS									
100.200 cataract, unspecified		2	0.6%	0		0		0	
100.210 cataract, significance unknown		10	2.8%	7	3.1%	4	2.4%	5	11.9%
100.301 punctate cataract, anterior cortex		2	0.6%	0		1	0.6%	0	
100.302 punctate cataract, posterior cortex		1	0.3%	0		2	1.2%	0	
100.305 punctate cataract, posterior sutures		1	0.3%	0		1	0.6%	0	
100.306 punctate cataract, nucleus		0		0		1	0.6%	0	
100.311 incipient cataract, anterior cortex		1	0.3%	2	0.9%	2	1.2%	0	
100.312 incipient cataract, posterior cortex		2	0.6%	2	0.9%	0		0	
100.313 incipient cataract, equatorial cortex		2	0.6%	1	0.4%	1	0.6%	0	
100.314 incipient cataract, anterior sutures		0		1	0.4%	0		0	
100.316 incipient cataract, nucleus		0		0		0		1	2.4%
100.323 incomplete cataract, equatorial cortex		0		0		0		1	2.4%
100.326 incomplete cataract, nucleus		0		0		0		1	2.4%
100.330 generalized/complete cataract		3	0.8%	2	0.9%	3	1.8%	0	
100.375 subluxation/luxation, unspecified		1	0.3%	0		0		0	
VITREOUS									
110.320 vitreous degeneration syneresis		0		2	0.9%	0		0	
RETINA									
120.170 retinal dysplasia, folds		2	0.6%	1	0.4%	0		0	
120.310 generalized progressive retinal atrophy (PRA)		2	0.6%	1	0.4%	0		0	
120.400 retinal hemorrhage		1	0.3%	0		0		0	
OPTIC NERVE									
130.110 micropapilla		0		0		0		1	2.4%
OTHER									
900.000 other, unspecified		0		3	1.3%	1	0.6%	0	
900.100 other, not inherited		1	0.3%	7	3.1%	1	0.6%	1	2.4%
900.110 other, suspected as inherited		1	0.3%	0		0		0	

OCULAR DISORDERS REPORT AUSTRALIAN TERRIER

	1991-1999	2000-2009	2010-2013	2014
NORMAL 0.000 normal globe	325 90.3%	204 90.7%	154 93.3%	35 83.3%

OCULAR DISORDERS REPORT

BASENJI - 1

BASENJI

	DISORDER	INHERITANCE	REFERENCE	BREEDING ADVICE
A.	Corneal dystrophy - epithelial/stromal	Not defined	1	Breeder option
B.	Corneal dystrophy - endothelial	Not defined	1	NO
C.	Persistent pupillary membranes			
	- iris to iris	Not defined	1-6	Breeder option
	- iris to cornea	Not defined	6	NO
	- iris to lens	Not defined	6	NO
	- iris sheets	Not defined	6	NO
	- endothelial opacity / no strands	Not defined	7	NO
D.	Cataract	Not defined	1	NO
E.	Retinal atrophy - generalized * a DNA test is available	Not defined	1, 8, 9	NO
F.	Optic nerve coloboma	Not defined	1, 2	NO

It is recommended that this breed be examined prior to pharmacological dilation to best facilitate identification of persistent pupillary membranes.

Description and Comments

A. Corneal dystrophy - epithelial/stromal

A non-inflammatory corneal opacity (white to gray) present in one or more of the corneal layers; usually inherited and bilateral.

B. Corneal dystrophy - endothelial

Corneal endothelial dystrophy is an abnormal loss of the inner lining of the cornea that causes progressive fluid retention (edema). With time the edema results in keratitis and decreased vision. This usually does not occur until the animal is older. In the Basenji, this condition is less common than corneal endothelial disease caused by attachment of

OCULAR DISORDERS REPORT

BASENJI - 2

persistent pupillary membranes.

C. Persistent pupillary membranes (PPM)

Persistent blood vessel remnants in the anterior chamber of the eye which fail to regress normally by 3 months of age. These strands may bridge from iris to iris, iris to cornea, iris to lens, or form sheets of tissue in the anterior chamber. The last three forms pose the greatest threat to vision and when severe, vision impairment or blindness may occur.

In the Basenji, this is a particularly significant problem with many cases reported where the strands bridge between the iris and the cornea resulting in localized corneal opacities which may cause vision impairment. This has also been associated with optic nerve coloboma (see "F" below).

D. Cataract

A partial or complete opacity of the lens and/or its capsule. In cases where cataracts are complete and affect both eyes, blindness results. The prudent approach is to assume cataracts to be hereditary except in cases known to be associated with trauma, other causes of ocular inflammation, specific metabolic diseases, persistent pupillary membrane, persistent hyaloid or nutritional deficiencies. Cataracts may involve the lens completely (diffuse) or in a localized region.

E. Retinal atrophy - generalized

A degenerative disease of the retinal visual cells which progresses to blindness. This abnormality, also known as progressive retinal atrophy or PRA, may be detected by electroretinogram (not part of a routine eye screening examination) before it is apparent clinically. Except for X-linked PRA in the Siberian Husky, in all breeds studied to date, PRA is inherited as an autosomal recessive trait.

Bas_PRA1

A specific mutation has been located in the S-antigen (*SAG*) gene that causes a late onset form of retinal degeneration in the Basenji. The condition is inherited in an autosomal recessive fashion. Initial thinning of the retina evidenced by irregular hypo and hyper-reflectivity of the tapetal fundus is typically noted at 5 years of age with retinal vascular attenuation noted by 6-7 years of age. Clinically the disease closely resembles *prcd*-PRA. The retinal degeneration progresses gradually and ultimately results in complete vision loss. This mutation is responsible for the majority, but not all cases of PRA within the Basenji breed.

F. Optic nerve coloboma

A congenital cavity in the optic nerve which, if large, may cause blindness or vision impairment.

In the Basenji, this condition has been associated with persistent pupillary membranes (see "C" above).

OCULAR DISORDERS REPORT

BASENJI - 3

References

1. ACVO Genetics Committee, 1999 and/or Data from CERF All-Breeds Report, 1991-1998.
2. Barnett KC and Knight CG. Persistent pupillary membrane and associated defects in the Basenji. *Vet Rec.* 1969 Aug 30;85:242-248.
3. Roberts SR and Bistner SI. Persistent pupillary membrane in Basenji dogs. *J Am Vet Med Assoc.* 1968 Sep 1;153:533-542.
4. Mason TA. Persistent pupillary membrane in the Basenji. *Aust Vet J.* 1976 Aug;52:343-344.
5. Bistner SI, Rubin LF and Roberts SR. A review of persistent pupillary membranes in the Basenji dog. *J Am Anim Hosp Assoc.* 1971;7:143.
6. ACVO Genetics Committee, 2000-2002 and/or Data from CERF All-Breeds Report, 2000-2002.
7. ACVO Genetics Committee, 2008 and/or Data from CERF All-Breeds Report, 2003-2007.
8. Priester W. Canine progressive retinal atrophy: Occurrence by age, breed, and sex. *American Journal of Veterinary Research.* 1974;35:571-574.
9. Goldstein O, Jordan JA, Aguirre GD, et al. A non-stop S-antigen gene mutation is associated with late onset hereditary retinal degeneration in dogs. *Mol Vis.* 2013;19:1871-1884.

OCULAR DISORDERS REPORT BASENJI

Diagnostic Name	TOTAL DOGS EXAMINED		1991-1999 4293		2000-2009 4463		2010-2013 1272		2014 226	
	#	%	#	%	#	%	#	%	#	%
GLOBE										
0.110 microphthalmia	7	0.2%	1	0.0%	0		0		0	
EYELIDS										
20.160 macropalpebral fissure	1	0.0%	0		0		0		0	
21.000 entropion, unspecified	0		3	0.1%	3	0.2%	1	0.4%	1	0.4%
22.000 ectropion, unspecified	0		1	0.0%	0		0		0	
25.110 distichiasis	28	0.7%	25	0.6%	4	0.3%	1	0.4%	1	0.4%
CORNEA										
70.210 corneal pannus	2	0.0%	0		0		0		0	
70.220 pigmentary keratitis	0		2	0.0%	0		0		0	
70.700 corneal dystrophy	137	3.2%	120	2.7%	39	3.1%	9	4.0%	9	4.0%
70.730 corneal endothelial degeneration	118	2.7%	106	2.4%	7	0.6%	3	1.3%	3	1.3%
UVEA										
90.250 pigmentary uveitis	0		1	0.0%	0		0		0	
93.120 iris cyst	1	0.0%	0		0		0		0	
93.140 corneal endothelial pigment without PPM	0		18	0.4%	0		0		0	
93.150 iris coloboma	6	0.1%	3	0.1%	0		0		0	
93.710 persistent pupillary membranes, iris to iris	2112	49.2%	2199	49.3%	695	54.6%	131	58.0%	131	58.0%
93.720 persistent pupillary membranes, iris to lens	221	5.1%	165	3.7%	56	4.4%	9	4.0%	9	4.0%
93.730 persistent pupillary membranes, iris to cornea	591	13.8%	391	8.8%	85	6.7%	17	7.5%	17	7.5%
93.740 persistent pupillary membranes, iris sheets	20	0.5%	19	0.4%	0		0		0	
93.750 persistent pupillary membranes, lens pigment foci/no strands	0		0		12	0.9%	3	1.3%	3	1.3%
93.760 persistent pupillary membranes, endothelial opacity/no strands	0		22	0.5%	112	8.8%	18	8.0%	18	8.0%
LENS										
100.200 cataract, unspecified	47	1.1%	0		0		0		0	
100.210 cataract, significance unknown	138	3.2%	248	5.6%	53	4.2%	8	3.5%	8	3.5%
100.301 punctate cataract, anterior cortex	20	0.5%	17	0.4%	5	0.4%	0		0	
100.302 punctate cataract, posterior cortex	8	0.2%	4	0.1%	5	0.4%	0		0	
100.303 punctate cataract, equatorial cortex	4	0.1%	4	0.1%	1	0.1%	0		0	
100.304 punctate cataract, anterior sutures	1	0.0%	2	0.0%	0		1	0.4%	1	0.4%
100.305 punctate cataract, posterior sutures	25	0.6%	23	0.5%	15	1.2%	2	0.9%	2	0.9%
100.306 punctate cataract, nucleus	6	0.1%	8	0.2%	2	0.2%	0		0	
100.307 punctate cataract, capsular	10	0.2%	42	0.9%	6	0.5%	1	0.4%	1	0.4%
100.311 incipient cataract, anterior cortex	10	0.2%	14	0.3%	2	0.2%	2	0.9%	2	0.9%
100.312 incipient cataract, posterior cortex	12	0.3%	9	0.2%	5	0.4%	0		0	
100.313 incipient cataract, equatorial cortex	11	0.3%	5	0.1%	1	0.1%	0		0	
100.314 incipient cataract, anterior sutures	2	0.0%	1	0.0%	0		0		0	
100.315 incipient cataract, posterior sutures	14	0.3%	11	0.2%	4	0.3%	1	0.4%	1	0.4%
100.316 incipient cataract, nucleus	4	0.1%	11	0.2%	6	0.5%	0		0	
100.317 incipient cataract, capsular	0		20	0.4%	2	0.2%	1	0.4%	1	0.4%
100.330 generalized/complete cataract	13	0.3%	7	0.2%	2	0.2%	0		0	
100.375 subluxation/luxation, unspecified	3	0.1%	5	0.1%	0		1	0.4%	1	0.4%
VITREOUS										
110.120 persistent hyaloid artery/remnant	5	0.1%	3	0.1%	0		1	0.4%	1	0.4%
110.135 PHPV/PTVL	0		8	0.2%	0		0		0	

OCULAR DISORDERS REPORT BASENJI

VITREOUS CONTINUED	1991-1999	2000-2009	2010-2013	2014
110.320 vitreous degeneration syneresis	8 0.2%	13 0.3%	4 0.3%	0
110.330 vitreous degeneration anterior chamber	0	3 0.1%	1 0.1%	0
FUNDUS				
97.110 choroidal hypoplasia	1 0.0%	0	0	0
97.120 coloboma	8 0.2%	5 0.1%	1 0.1%	0
RETINA				
120.170 retinal dysplasia, folds	7 0.2%	9 0.2%	2 0.2%	1 0.4%
120.180 retinal dysplasia, geographic	4 0.1%	11 0.2%	4 0.3%	0
120.190 retinal dysplasia, detached	1 0.0%	3 0.1%	0	0
120.200 retinitis	0	0	1 0.1%	2 0.9%
120.310 generalized progressive retinal atrophy (PRA)	237 5.5%	125 2.8%	13 1.0%	2 0.9%
120.400 retinal hemorrhage	1 0.0%	4 0.1%	0	0
120.910 retinal detachment without dialysis	2 0.0%	5 0.1%	0	0
120.960 retinopathy	0	0	5 0.4%	0
OPTIC NERVE				
130.110 micropapilla	1 0.0%	0	0	0
130.120 optic nerve hypoplasia	2 0.0%	1 0.0%	0	0
130.150 optic disc coloboma	63 1.5%	28 0.6%	7 0.6%	0
OTHER				
900.000 other, unspecified	0	23 0.5%	55 4.3%	0
900.100 other, not inherited	29 0.7%	189 4.2%	13 1.0%	8 3.5%
900.110 other, suspected as inherited	135 3.1%	85 1.9%	4 0.3%	1 0.4%
NORMAL				
0.000 normal globe	1501 35.0%	2008 45.0%	566 44.5%	86 38.1%

OCULAR DISORDERS REPORT

BASSET HOUND - 1

BASSET HOUND

	DISORDER	INHERITANCE	REFERENCE	BREEDING ADVICE
A.	Glaucoma	Not defined	1, 9-13	NO
B.	Entropion	Not defined	1	Breeder option
C.	Ectropion	Not defined	1-3	Breeder option
D.	Macroblepharon	Not defined	1-3	Breeder option
E.	Distichiasis	Not defined	4	Breeder option
F.	Nictitans cartilage anomaly/eversion	Not defined	5	Breeder option
G.	Persistent pupillary membranes			
	- iris to iris	Not defined	1, 6	Breeder option
	- iris to lens	Not defined	7, 8	NO
	- iris to cornea	Not defined	6	NO
H.	Cataract	Not defined	1	NO
I.	Persistent hyaloid artery	Not defined	3	Breeder option
J.	Retinal dysplasia - folds	Not defined	3	Breeder option

Description and Comments

A. Glaucoma

Glaucoma is characterized by an elevation of intraocular pressure which, when sustained even for a brief period of time, causes intraocular damage resulting in blindness. The elevated intraocular pressure occurs because the fluid cannot leave through the iridocorneal angle. Diagnosis and classification of glaucoma requires measurement of IOP (tonometry) and examination of the iridocorneal angle (gonioscopy). Neither of these tests is part of a routine breed eye screening exam.

Some Basset Hounds have an abnormality of the iridocorneal angle termed goniodysgenesis. This abnormality is not visible during routine ophthalmologic examination

©2014, American College of Veterinary Ophthalmologists

OCULAR DISORDERS REPORT

BASSET HOUND - 2

using an indirect ophthalmoscope or a slitlamp microscope. There appears to be an association between goniodysgenesis and glaucoma, but the mechanism by which the angle defect results in glaucoma has not been determined. It is suspected that mild to severe anterior uveitis impairs outflow of aqueous through the small perforations that are present in the sheet of tissue in the iridocorneal angle; this results in a secondary and often irreversible rise in intraocular pressure that causes blindness. The inheritance of goniodysgenesis in the Basset Hound is not known. Until the inheritance is determined, control should be directed to removing dogs from breeding that have glaucoma and have goniodysgenesis, as well as those dogs that produce progeny affected with glaucoma.

B. Entropion

A conformational defect resulting in an "in-rolling" of one or both of the eyelids which may cause ocular irritation. It is likely that entropion is influenced by several genes (polygenic) defining the skin and other structures which make up the eyelids, the amount and weight of the skin covering the head and face, the orbital contents and the conformation of the skull.

C. Ectropion

A conformational defect resulting in eversion of the eyelids, which may cause ocular irritation. It is likely that ectropion is influenced by several genes (polygenic) defining the skin and other structures which make up the eyelids, the amount and weight of the skin covering the head and face, the orbital contents and the conformation of the skull.

In the Basset Hound, ectropion is associated with an exceptionally large palpebral fissure (macroblepharon) and laxity of the canthal structures. Central lower lid ectropion is often associated with entropion of the adjacent lid segment. This causes severe ocular irritation.

It is acknowledged that factors other than genetics may play a role or be the cause of entropion and/or ectropion. However, when non-genetic factors can be ruled out, selection should be directed to a more normal head conformation that minimizes or eliminates the likelihood of the defects.

D. Macroblepharon

Defined as an exceptionally large palpebral fissure, macroblepharon in conjunction with laxity of the lateral canthal structures may lead to lower lid ectropion and upper lid entropion. Either of these conditions may lead to severe ocular irritation.

E. Distichiasis

Eyelashes abnormally located on the eyelid margin which may cause ocular irritation. Distichiasis may occur at any time in the life of a dog. It is difficult to make a strong recommendation with regard to breeding dogs with this entity. The hereditary basis has not been established although it seems probable due to the high incidence in some breeds. Reducing the incidence is a logical goal. When diagnosed, distichiasis should be recorded; breeding discretion is advised.

OCULAR DISORDERS REPORT

BASSET HOUND - 3

F. Nictitans cartilage anomaly/eversion

A scroll-like curling of the cartilage of the third eyelid, usually everting the margin. This condition may occur in one or both eyes and may cause mild ocular irritation.

G. Persistent pupillary membrane

Persistent blood vessel remnants in the anterior chamber of the eye which fail to regress normally by 3 months of age. These strands may bridge from iris to iris, iris to cornea, iris to lens, or form sheets of tissue in the anterior chamber. The last three forms pose the greatest threat to vision and when severe, vision impairment or blindness may occur.

H. Cataract

A partial or complete opacity of the lens and/or its capsule. In cases where cataracts are complete and affect both eyes, blindness results. The prudent approach is to assume cataracts to be hereditary except in cases known to be associated with trauma, other causes of ocular inflammation, specific metabolic diseases, persistent pupillary membrane, persistent hyaloid or nutritional deficiencies. Cataracts may involve the lens completely (diffuse) or in a localized region.

I. Persistent hyaloid artery (PHA)

Congenital defect resulting from abnormalities in the development and regression of the hyaloid artery. The blood vessel remnant can be present in the vitreous as a small patent vascular strand (PHA) or as a non-vascular strand that appears gray-white (persistent hyaloid remnant).

J. Retinal dysplasia - folds

Linear, triangular, curved or curvilinear foci of retinal folding that may be single or multiple. When seen in puppies, this condition may partially or completely resolve with maturity. Its significance to vision is unknown. There are two other forms of retinal dysplasia (geographic, detached), which are known to be inherited in other breeds and, in their most severe form, cause blindness. The genetic relationship between folds and more severe forms of retinal dysplasia is undetermined.

References

1. ACVO Genetics Committee, 1999 and/or Data from CERF All-Breeds Report, 1991-1998.
2. Priester WA. Congenital ocular defects in cattle, horses, cats, and dogs. *J Am Vet Med Assoc.* 1972 Jun 1;160:1504-1511.
3. ACVO Genetics Committee, 2006 and/or Data from CERF All-Breeds Report, 2001-2005.
4. ACVO Genetics Committee, 2002-2003 and/or Data from CERF All-Breeds Report, 2002-

OCULAR DISORDERS REPORT

BASSET HOUND - 4

2003.

5. ACVO Genetics Committee, 2009 and/or Data from CERF All-Breeds Report, 2008.
6. ACVO Genetics Committee, 2005 and/or Data from CERF All-Breeds Report 2003-2004.
7. ACVO Genetics Committee, 2007 and/or Data from CERF All-Breeds Report 2002-2006.
8. ACVO Genetics Committee, 2008 and/or Data from CERF All-Breeds Report, 2003-2007.
9. Ahram DF, Cook AC, Kecova H, et al. Identification of genetic loci associated with primary angle-closure glaucoma in the basset hound. *Mol Vis*. 2014;20:497-510.
10. Bedford PG. The aetiology of primary glaucoma in the dog. *J Small Anim Pract*. 1975 Apr;16:217-239.
11. Bedford PGC. A gonioscopic study of the iridocorneal angle in the English and America breeds of Cocker Spaniel and the Bassest Hound. *J Small Anim Pract*. 1977;18:631-642.
12. Slater MR and Erb HN. Effects of risk factors and prophylactic treatment on primary glaucoma in the dog. *J Am Vet Med Assoc*. 1986 May 1;188:1028-1030.
13. Martin CL and Wyman M. Glaucoma in the Basset Hound. *J Am Vet Med Assoc*. 1968;155:1320.

OCULAR DISORDERS REPORT BASSET HOUND

Diagnostic Name	TOTAL DOGS EXAMINED		1991-1999		2000-2009		2010-2013		2014	
	#	%	#	%	#	%	#	%	#	%
GLOBE										
0.110 microphthalmia	0		1	0.1%	0		0		0	
EYELIDS										
20.140 ectopic cilia	0		1	0.1%	0		0		0	
20.160 macropalpebral fissure	2	0.4%	15	1.6%	0		0		0	
21.000 entropion, unspecified	2	0.4%	10	1.1%	6	2.6%	1	3.3%	1	3.3%
22.000 ectropion, unspecified	28	5.0%	85	9.2%	8	3.4%	1	3.3%	1	3.3%
25.110 distichiasis	6	1.1%	11	1.2%	6	2.6%	0		0	
NASOLACRIMAL										
40.910 keratoconjunctivitis sicca	2	0.4%	1	0.1%	1	0.4%	0		0	
NICTITANS										
51.100 third eyelid cartilage anomaly	3	0.5%	7	0.8%	6	2.6%	2	6.7%	2	6.7%
52.110 prolapsed gland of the third eyelid	5	0.9%	3	0.3%	1	0.4%	0		0	
CORNEA										
70.210 corneal pannus	3	0.5%	0		0		0		0	
70.220 pigmentary keratitis	2	0.4%	0		0		0		0	
70.700 corneal dystrophy	1	0.2%	2	0.2%	1	0.4%	0		0	
70.730 corneal endothelial degeneration	3	0.5%	1	0.1%	0		0		0	
UVEA										
93.120 iris cyst	1	0.2%	3	0.3%	0		0		0	
93.140 corneal endothelial pigment without PPM	0		1	0.1%	0		0		0	
93.710 persistent pupillary membranes, iris to iris	12	2.1%	31	3.4%	4	1.7%	1	3.3%	1	3.3%
93.720 persistent pupillary membranes, iris to lens	2	0.4%	8	0.9%	1	0.4%	0		0	
93.730 persistent pupillary membranes, iris to cornea	10	1.8%	16	1.7%	2	0.9%	0		0	
93.740 persistent pupillary membranes, iris sheets	1	0.2%	0		0		0		0	
93.750 persistent pupillary membranes, lens pigment foci/no strands	0		0		1	0.4%	0		0	
93.760 persistent pupillary membranes, endothelial opacity/no strands	0		1	0.1%	3	1.3%	0		0	
LENS										
100.200 cataract, unspecified	6	1.1%	0		0		0		0	
100.210 cataract, significance unknown	9	1.6%	30	3.3%	9	3.9%	3	10.0%	3	10.0%
100.301 punctate cataract, anterior cortex	3	0.5%	9	1.0%	5	2.2%	0		0	
100.302 punctate cataract, posterior cortex	1	0.2%	6	0.7%	1	0.4%	0		0	
100.303 punctate cataract, equatorial cortex	0		0		4	1.7%	0		0	
100.304 punctate cataract, anterior sutures	0		3	0.3%	0		0		0	
100.305 punctate cataract, posterior sutures	0		4	0.4%	2	0.9%	0		0	
100.306 punctate cataract, nucleus	1	0.2%	1	0.1%	0		0		0	
100.307 punctate cataract, capsular	0		3	0.3%	1	0.4%	0		0	
100.311 incipient cataract, anterior cortex	2	0.4%	3	0.3%	2	0.9%	0		0	
100.312 incipient cataract, posterior cortex	6	1.1%	5	0.5%	1	0.4%	0		0	
100.313 incipient cataract, equatorial cortex	0		2	0.2%	0		0		0	
100.314 incipient cataract, anterior sutures	0		1	0.1%	0		0		0	
100.315 incipient cataract, posterior sutures	2	0.4%	1	0.1%	0		0		0	
100.316 incipient cataract, nucleus	2	0.4%	0		1	0.4%	0		0	
100.317 incipient cataract, capsular	0		3	0.3%	0		0		0	

OCULAR DISORDERS REPORT BASSET HOUND

LENS CONTINUED	1991-1999	2000-2009	2010-2013	2014
100.330 generalized/complete cataract	0	5 0.5%	0	0
100.375 subluxation/luxation, unspecified	1 0.2%	1 0.1%	0	0
VITREOUS				
110.120 persistent hyaloid artery/remnant	1 0.2%	6 0.7%	0	0
110.135 PHPV/PTVL	0	1 0.1%	0	0
110.320 vitreous degeneration syneresis	2 0.4%	0	1 0.4%	0
110.330 vitreous degeneration anterior chamber	0	1 0.1%	1 0.4%	0
RETINA				
120.170 retinal dysplasia, folds	3 0.5%	7 0.8%	0	0
120.310 generalized progressive retinal atrophy (PRA)	0	2 0.2%	0	0
120.400 retinal hemorrhage	1 0.2%	0	0	0
120.910 retinal detachment without dialysis	1 0.2%	0	1 0.4%	0
OPTIC NERVE				
130.120 optic nerve hypoplasia	1 0.2%	0	0	0
OTHER				
900.000 other, unspecified	0	4 0.4%	15 6.5%	0
900.100 other, not inherited	0	39 4.2%	2 0.9%	3 10.0%
900.110 other, suspected as inherited	46 8.2%	43 4.7%	1 0.4%	0
NORMAL				
0.000 normal globe	432 77.0%	711 77.4%	187 80.6%	28 93.3%

OCULAR DISORDERS REPORT

BEAGLE - 1

BEAGLE

	DISORDER	INHERITANCE	REFERENCE	BREEDING ADVICE
A.	Microphthalmia with multiple ocular defects	See below	1-3	NO
B.	Glaucoma * a DNA test is available	Presumed autosomal recessive	1, 4-16	NO
C.	Distichiasis	Not defined	1	Breeder option
D.	Prolapse of gland of third eyelid	Not defined	1	Breeder option
E.	Corneal dystrophy - epithelial/stromal	Not defined	17-22	Breeder option
F.	Persistent pupillary membranes - iris to iris	Not defined	23	Breeder option
G.	Cataract	Not defined	23, 2, 24, 25	NO
H.	Tapetal degeneration	Presumed autosomal recessive	26-29	Breeder option
I.	Retinal atrophy - generalized	Not defined	1	NO
J.	Retinal dysplasia - folds	Not defined	1	Breeder option

Description and Comments

A. Microphthalmia with multiple congenital ocular defects

A developmental anomaly in which the eyeball is abnormally small. This is often associated with other ocular malformations, including defects of the cornea, anterior chamber, lens, and/or retina.

©2014, American College of Veterinary Ophthalmologists

OCULAR DISORDERS REPORT

BEAGLE - 2

In the Beagle, the condition may be present unilaterally or bilaterally and is characterized by a small globe and associated ocular defects which are variable. Several forms of the condition, all apparently different, are recognized:

1) In one study, complete lens opacities were noted by 5-6 months of age; the severity of the cataract correlated closely with the extent of microphthalmia. Severely microphthalmic eyes also had multiple retinal folds. The disorder appeared to be inherited; the exact mode was not fully defined, although an X-linked disorder could not be ruled out.

2) A different form of microphthalmia is recognized in association with microphakia and persistent pupillary membrane (PPM). Based on a limited pedigree of one cross, a dominant inheritance was proposed; heterozygotes have PPM and microphakia / cataract and homozygous affected show microphthalmia and multiple congenital ocular anomalies.

3) A third form of microphthalmia is recognized in the breed. This condition is usually unilateral and the fellow eye is normal. The mode of inheritance has not been defined, but autosomal recessive inheritance is suspected.

B. Glaucoma

Glaucoma is an elevation of intraocular pressure (IOP) which, when sustained, causes intraocular damage resulting in blindness. The elevated IOP occurs because the fluid cannot leave through the iridocorneal angle. Diagnosis and classification of glaucoma requires measurement of IOP (tonometry) and examination of the iridocorneal angle (gonioscopy). Neither of these tests is part of a routine breed eye screening exam.

Primary open angle glaucoma is present in the breed, and extensive breeding studies have demonstrated its inheritance as autosomal recessive. By one year of age, the intraocular pressure (IOP) is elevated, but the filtration angle is open (early glaucoma). Animals with moderate glaucoma show sustained elevations of IOP, focal disinsertions of the lens zonules and focal closures of the iridocorneal angle. Later the globe enlarges, the lens luxates and the eyes become blind and show the effects of chronic glaucoma. A DNA test is available.

C. Distichiasis

Eyelashes abnormally located on the eyelid margin which may cause ocular irritation. Distichiasis may occur at any time in the life of a dog. It is difficult to make a strong recommendation with regard to breeding dogs with this entity. The hereditary basis has not been established although it seems probable due to the high incidence in some breeds. Reducing the incidence is a logical goal. When diagnosed, distichiasis should be recorded; breeding discretion is advised.

D. Prolapse of the gland of the third eyelid

Protrusion of the tear gland associated with the third eyelid. The mode of inheritance of this disorder is unknown. The exposed gland may become irritated. Commonly referred to as

OCULAR DISORDERS REPORT

BEAGLE - 3

"cherry eye". In the Beagle, there is an association between this condition and keratoconjunctivitis sicca (KCS).

E. Corneal dystrophy - epithelial/stromal

A non-inflammatory corneal opacity (white to gray) present in one or more of the corneal layers. Corneal dystrophy implies a probable inherited basis and is usually bilateral.

In the Beagle, corneal dystrophy has been described as an oval opacity located at the junction at the middle and inferior thirds of the cornea. The opacities are caused by accumulation of cholesterol and other lipids within the cornea. Progression was noted with possible vision impairment.

F. Persistent pupillary membranes (PPM)

Persistent blood vessel remnants in the anterior chamber of the eye which fail to regress normally by 3 months of age. These strands may bridge from iris to iris, iris to cornea, iris to lens, or form sheets of tissue in the anterior chamber. The last three forms pose the greatest threat to vision and when severe, vision impairment or blindness may occur

G. Cataract

A partial or complete opacity of the lens and/or its capsule. In cases where cataracts are complete and affect both eyes, blindness results. The prudent approach is to assume cataracts to be hereditary except in cases known to be associated with trauma, other causes of ocular inflammation, specific metabolic diseases, persistent pupillary membrane, persistent hyaloid or nutritional deficiencies. Cataracts may involve the lens completely (diffuse) or in a localized region.

Several different types of cataract (anterior capsular, posterior cortical, other) have been reported in the Beagle, but the mode of inheritance of the defects, is unknown. When one considers that this breed, particularly the laboratory-bred Beagle, has been the subject of extensive ophthalmological examination, the relatively low incidence of cataracts is surprising.

H. Tapetal degeneration

The tapetum lucidum is a modified choroidal structure present in the eyes of many animals that have good night vision. In Beagles there is a recessively inherited defect of the tapetal layer. Absence of this layer is determined by ophthalmoscopy which shows that the fundus has a uniform reddish coloration. The degeneration of the tapetum occurs as a result of abnormal postnatal development of this structure. The degeneration of the tapetum does not affect vision and does not result in functional or structural damage to the retina. As such, the condition probably represents an insignificant inherited variation of no functional significance.

I. Retinal atrophy - generalized (PRA)

OCULAR DISORDERS REPORT

BEAGLE - 4

A degenerative disease of the retinal visual cells which progresses to blindness. This abnormality may be detected by electroretinogram before it is apparent clinically. In all breeds studied to date, PRA is recessively inherited. The disease in the Beagle has not been characterized sufficiently to establish the disease frequency, the disease mechanism, or the age when early diagnosis by ophthalmoscopy and/or electroretinography is possible.

J. Retinal dysplasia - folds

Linear, triangular, curved or curvilinear foci of retinal folding that may be single or multiple. When seen in puppies, this condition may partially or completely resolve with maturity. Its significance to vision is unknown. There are two other forms of retinal dysplasia (geographic, detached) which are known to be inherited in other breeds and, in their most severe form, cause blindness. The genetic relationship between folds and more severe forms of retinal dysplasia is undetermined.

References

1. ACVO Genetics Committee, 1999 and/or Data from CERF All-Breeds Report, 1991-1998.
2. Rubin LF, editor Hereditary microphakia and microphthalmia syndrome in the beagle. *Trans Am Coll Vet Ophthalmol*; 1971.
3. Anderson AC and Shultz FT. Inherited (congenital) cataract in the dog. *Am J Pathol*. 1958;34:956.
4. Gelatt KN. Familial glaucoma in the Beagle dog. *J Am Anim Hosp Assoc*. 1972;8:23.
5. Gelatt KN, Peiffer RL, Gwin RM, et al., editors. Glaucoma in the beagle. *Trans Am Acad Ophthalmol Otolaryngol* 1976.
6. Gelatt KN, Peiffer RL, Gwin RM, et al. Clinical manifestations of inherited glaucoma in the beagle. *Invest Ophthalmol Vis Sci*. 1977 Dec;16:1135-1142.
7. Peiffer RL, Jr. and Gelatt KN. Aqueous humor outflow in Beagles with inherited glaucoma: gross and light microscopic observations of the iridocorneal angle. *Am J Vet Res*. 1980 Jun;41:861-867.
8. Gelatt KN and Gum GG. Inheritance of primary glaucoma in the beagle. *Am J Vet Res*. 1981;42:1691.
9. Slater MR and Erb HN. Effects of risk factors and prophylactic treatment on primary glaucoma in the dog. *J Am Vet Med Assoc*. 1986 May 1;188:1028-1030.
10. Brooks DE, Samuelson DA and Gelatt KN. Ultrastructural changes in laminar optic nerve capillaries of beagles with primary open-angle glaucoma. *Am J Vet Res*. 1989 Jun;50:929-935.

OCULAR DISORDERS REPORT

BEAGLE - 5

11. Brooks DE, Samuelson DA, Gelatt KN, et al. Morphologic changes in the lamina cribrosa of beagles with primary open-angle glaucoma. *Am J Vet Res.* 1989 Jun;50:936-941.
12. Samuelson DA, Gum GG and Gelatt KN. Ultrastructural changes in the aqueous outflow apparatus of beagles with inherited glaucoma. *Invest Ophthalmol Vis Sci.* 1989 Mar;30:550-561.
13. Brooks DE, Strubbe DT, Kubilis PS, et al. Histomorphometry of the optic nerves of normal dogs and dogs with hereditary glaucoma. *Exp Eye Res.* 1995 Jan;60:71-89.
14. Gum GG, Gelatt KN and Knepper PA. Histochemical localization of glycosaminoglycans in the aqueous outflow pathways in normal beagles and beagles with inherited glaucoma. *Prog Vet Comp Ophthalmol.* 1993;3.
15. Gelatt KN, Gum GG, MacKay EO, et al. Estimations of aqueous humor outflow facility by pneumotonography in the normal, genetic carrier and glaucomatous beagles. *Vet Comp Ophthalmol.* 1996;6:148.
16. Kuchtey J, Olson LM, Rinkoski T, et al. Mapping of the disease locus and identification of ADAMTS10 as a candidate gene in a canine model of primary open angle glaucoma. *PLoS genetics.* 2011 Feb;7:e1001306.
17. American Kennel Club Genetic Disease Registry. Univ of Penn, 1989.
18. Roth AM, Ekins MB, Waring GO, 3rd, et al. Oval corneal opacities in beagles. III. Histochemical demonstration of stromal lipids without hyperlipidemia. *Invest Ophthalmol Vis Sci.* 1981 Jul;21:95-106.
19. Ekins MB, Sgoutas DS, Waring GO, 3rd, et al. Oval lipid corneal opacities in beagles: VI. Quantitation of excess stromal cholesterol and phospholipid. *Exp Eye Res.* 1983 Feb;36:279-286.
20. Morrin LA, Waring GO, 3rd and Spangler W. Oval lipid corneal opacities in beagles: ultrastructure of normal beagle cornea. *Am J Vet Res.* 1982 Mar;43:443-453.
21. Spangler W, et al. Oval corneal opacities in Beagles, V. Ultrastructure. *Vet Pathol.* 1982;19:150.
22. Waring GO, et al. Oval lipid corneal opacities in beagles and crystalline lipid corneal opacities in Siberian Huskies. *Metab Pediatr Ophthalmol.* 1979;3.
23. ACVO Genetics Committee, 2006 and/or Data from CERF All-Breeds Report, 2001-2005.
24. Heywood R. Juvenile cataracts in the Beagle dog. *J Small Anim Pract.* 1971;12.
25. Hirth RS, Greenstein ET and Peer RL. Anterior capsular opacities (spurious cataracts) in Beagle dogs. *Vet Pathol.* 1974;11:181-194.
26. Belhorn R, et al. Hereditary tapetal abnormality in the Beagle. *Ophtho Res.* 1975;7.

©2014, American College of Veterinary Ophthalmologists

OCULAR DISORDERS REPORT

BEAGLE - 6

27. Wen GY, et al. Changes in the tapetum of Beagles with heredity abnormality. *Invest Ophthalmol Vis Sci.* 1982;23.
28. Burns MS, Bellhorn RW, Impellizzeri CW, et al. Development of hereditary tapetal degeneration in the beagle dog. *Current eye research.* 1988 Feb;7:103-114.
29. Burns MS, Tyler NK and Bellhorn RW. Melanosome abnormalities of ocular pigmented epithelial cells in beagle dogs with hereditary tapetal degeneration. *Current eye research.* 1988 Feb;7:115-123.

OCULAR DISORDERS REPORT BEAGLE

Diagnostic Name	TOTAL DOGS EXAMINED		1991-1999		2000-2009		2010-2013		2014	
	#	%	#	%	#	%	#	%	#	%
GLOBE										
0.110 microphthalmia	2	0.5%	2	0.3%	0		0		0	
10.000 glaucoma	0		0		1	0.3%	0		0	
EYELIDS										
21.000 entropion, unspecified	1	0.2%	1	0.1%	0		0		0	
22.000 ectropion, unspecified	0		1	0.1%	0		0		0	
25.110 distichiasis	55	12.8%	143	18.9%	73	23.0%	9	15.3%		
NASOLACRIMAL										
32.110 imperforate lower nasolacrimal punctum	1	0.2%	0		0		2	3.4%		
40.910 keratoconjunctivitis sicca	1	0.2%	1	0.1%	0		1	1.7%		
NICTITANS										
51.100 third eyelid cartilage anomaly	0		0		1	0.3%	0		0	
52.110 prolapsed gland of the third eyelid	0		8	1.1%	2	0.6%	0		0	
CORNEA										
70.220 pigmentary keratitis	0		1	0.1%	0		0		0	
70.700 corneal dystrophy	1	0.2%	2	0.3%	3	0.9%	0		0	
70.730 corneal endothelial degeneration	1	0.2%	1	0.1%	0		0		0	
UVEA										
93.120 iris cyst	0		1	0.1%	0		0		0	
93.170 anterior chamber cyst	0		0		0		1	1.7%		
93.710 persistent pupillary membranes, iris to iris	3	0.7%	13	1.7%	2	0.6%	0		0	
93.730 persistent pupillary membranes, iris to cornea	1	0.2%	2	0.3%	0		0		0	
93.750 persistent pupillary membranes, lens pigment foci/no strands	0		0		0		1	1.7%		
93.760 persistent pupillary membranes, endothelial opacity/no strands	0		0		1	0.3%	0		0	
LENS										
100.200 cataract, unspecified	9	2.1%	0		0		0		0	
100.210 cataract, significance unknown	8	1.9%	24	3.2%	9	2.8%	3	5.1%		
100.301 punctate cataract, anterior cortex	1	0.2%	4	0.5%	1	0.3%	1	1.7%		
100.302 punctate cataract, posterior cortex	1	0.2%	4	0.5%	1	0.3%	0		0	
100.303 punctate cataract, equatorial cortex	0		1	0.1%	0		1	1.7%		
100.305 punctate cataract, posterior sutures	0		3	0.4%	1	0.3%	0		0	
100.307 punctate cataract, capsular	0		3	0.4%	0		0		0	
100.311 incipient cataract, anterior cortex	3	0.7%	0		0		0		0	
100.312 incipient cataract, posterior cortex	8	1.9%	5	0.7%	0		1	1.7%		
100.313 incipient cataract, equatorial cortex	4	0.9%	2	0.3%	0		0		0	
100.315 incipient cataract, posterior sutures	1	0.2%	0		0		0		0	
100.316 incipient cataract, nucleus	1	0.2%	3	0.4%	0		0		0	
100.317 incipient cataract, capsular	0		2	0.3%	0		0		0	
100.322 incomplete cataract, posterior cortex	0		0		0		1	1.7%		
100.330 generalized/complete cataract	12	2.8%	6	0.8%	0		1	1.7%		
100.375 subluxation/luxation, unspecified	0		1	0.1%	0		0		0	

OCULAR DISORDERS REPORT BEAGLE

	1991-1999	2000-2009	2010-2013	2014
VITREOUS				
110.120 persistant hyaloid artery/remnant	1 0.2%	0	0	0
110.135 PHPV/PTVL	1 0.2%	0	0	0
110.320 vitreous degeneration syneresis	0	1 0.1%	1 0.3%	1 1.7%
110.330 vitreous degeneration anterior chamber	0	1 0.1%	1 0.3%	0
RETINA				
120.170 retinal dysplasia, folds	11 2.6%	18 2.4%	3 0.9%	0
120.180 retinal dysplasia, geographic	0	2 0.3%	2 0.6%	1 1.7%
120.310 generalized progressive retinal atrophy (PRA)	6 1.4%	2 0.3%	0	0
120.910 retinal detachment without dialysis	2 0.5%	0	0	0
OPTIC NERVE				
130.110 micropapilla	0	1 0.1%	0	0
130.120 optic nerve hypoplasia	2 0.5%	2 0.3%	0	0
130.150 optic disc coloboma	0	1 0.1%	0	0
OTHER				
900.000 other, unspecified	0	4 0.5%	14 4.4%	0
900.100 other, not inherited	2 0.5%	42 5.5%	5 1.6%	5 8.5%
900.110 other, suspected as inherited	5 1.2%	3 0.4%	1 0.3%	0
NORMAL				
0.000 normal globe	329 76.7%	556 73.4%	250 78.6%	46 78.0%

OCULAR DISORDERS REPORT

BEARDED COLLIE - 1

BEARDED COLLIE

	DISORDER	INHERITANCE	REFERENCE	BREEDING ADVICE
A.	Corneal dystrophy - epithelial/stromal	Not defined	1	Breeder option
B.	Persistent pupillary membranes - iris to iris - all other forms	Not defined Not defined	1, 2 2	Breeder option NO
C.	Cataract	Not defined	1	NO
D.	Retinal dysplasia - folds	Not defined	1	Breeder option
E.	Choroidal hypoplasia (Collie Eye Anomaly) - staphyloma/coloboma - retinal detachment - retinal hemorrhage - optic nerve coloboma * a DNA test is available	Not defined	2-5	NO

Description and Comments

A. Corneal dystrophy - epithelial/stromal

A non-inflammatory corneal opacity (white to gray) present in one or more of the corneal layers; usually inherited and bilateral.

B. Persistent pupillary membranes (PPM)

Persistent blood vessel remnants in the anterior chamber of the eye which fail to regress normally by 3 months of age. These strands may bridge from iris to iris, iris to cornea, iris to lens, or form sheets of tissue in the anterior chamber. The last three forms pose the greatest threat to vision and when severe, vision impairment or blindness may occur.

C. Cataract

A partial or complete opacity of the lens and/or its capsule. In cases where cataracts are complete and affect both eyes, blindness results. The prudent approach is to assume cataracts to be hereditary except in cases known to be associated with trauma, other causes

OCULAR DISORDERS REPORT

BEARDED COLLIE - 2

of ocular inflammation, specific metabolic diseases, persistent pupillary membrane, persistent hyaloid or nutritional deficiencies. Cataracts may involve the lens completely (diffuse) or in a localized region.

D. Retinal dysplasia - folds

Linear, triangular, curved or curvilinear foci of retinal folding that may be single or multiple. When seen in puppies, this condition may partially or completely resolve with maturity. Its significance to vision is unknown. There are two other forms of retinal dysplasia (geographic, detached), which are known to be inherited in other breeds and, in their most severe form, cause blindness. The genetic relationship between folds and more severe forms of retinal dysplasia is undetermined.

E. Choroidal hypoplasia (Collie Eye Anomaly)

- staphyloma/coloboma
- retinal detachment
- retinal hemorrhage
- optic nerve coloboma

A spectrum of malformations present at birth and ranging from inadequate development of the choroid (choroidal hypoplasia) to defects of the choroid, retina, or optic nerve (coloboma/staphyloma) to complete retinal detachment (with or without hemorrhage). Mildly affected animals will have no detectable vision deficit. This disorder is collectively referred to as "Collie Eye Anomaly". A DNA test is available.

References

1. ACVO Genetics Committee, 1999 and/or Data from CERF All-Breeds Report, 1991-1998.
2. ACVO Genetics Committee, 2005 and/or Data from CERF All-Breeds Report 2003-2004.
3. ACVO Genetics Committee, 2000-2002 and/or Data from CERF All-Breeds Report, 2000-2002.
4. Parker HG, Kukekova AV, Akey DT, et al. Breed relationships facilitate fine-mapping studies: a 7.8-kb deletion cosegregates with Collie eye anomaly across multiple dog breeds. *Genome Res.* 2007 Nov;17:1562-1571.
5. Lowe JK, Kukekova AV, Kirkness EF, et al. Linkage mapping of the primary disease locus for collie eye anomaly. *Genomics.* 2003;82:86-95.

OCULAR DISORDERS REPORT BEARDED COLLIE

Diagnostic Name	TOTAL DOGS EXAMINED	1991-1999		2000-2009		2010-2013		2014	
		#	%	#	%	#	%	#	%
GLOBE									
0.110 microphthalmia		2	0.1%	0		0		0	
EYELIDS									
25.110 distichiasis		8	0.5%	10	0.6%	4	0.9%	3	3.4%
CORNEA									
70.700 corneal dystrophy		18	1.2%	22	1.3%	7	1.6%	2	2.2%
70.730 corneal endothelial degeneration		0		1	0.1%	0		0	
UVEA									
93.120 iris cyst		1	0.1%	4	0.2%	0		0	
93.150 iris coloboma		1	0.1%	0		0		0	
93.710 persistent pupillary membranes, iris to iris		45	3.0%	79	4.6%	20	4.7%	6	6.7%
93.720 persistent pupillary membranes, iris to lens		1	0.1%	4	0.2%	2	0.5%	1	1.1%
93.730 persistent pupillary membranes, iris to cornea		1	0.1%	1	0.1%	0		0	
93.740 persistent pupillary membranes, iris sheets		1	0.1%	0		0		0	
95.120 ciliary body cyst		0		0		0		3	3.4%
LENS									
100.200 cataract, unspecified		12	0.8%	0		0		0	
100.210 cataract, significance unknown		114	7.7%	187	10.8%	59	13.8%	9	10.1%
100.301 punctate cataract, anterior cortex		24	1.6%	8	0.5%	6	1.4%	1	1.1%
100.302 punctate cataract, posterior cortex		10	0.7%	3	0.2%	2	0.5%	0	
100.303 punctate cataract, equatorial cortex		14	0.9%	12	0.7%	1	0.2%	0	
100.304 punctate cataract, anterior sutures		3	0.2%	2	0.1%	0		0	
100.305 punctate cataract, posterior sutures		13	0.9%	5	0.3%	6	1.4%	0	
100.306 punctate cataract, nucleus		1	0.1%	3	0.2%	2	0.5%	1	1.1%
100.307 punctate cataract, capsular		3	0.2%	3	0.2%	1	0.2%	0	
100.311 incipient cataract, anterior cortex		13	0.9%	19	1.1%	4	0.9%	2	2.2%
100.312 incipient cataract, posterior cortex		9	0.6%	18	1.0%	2	0.5%	3	3.4%
100.313 incipient cataract, equatorial cortex		5	0.3%	15	0.9%	2	0.5%	0	
100.314 incipient cataract, anterior sutures		1	0.1%	2	0.1%	0		0	
100.315 incipient cataract, posterior sutures		0		10	0.6%	0		0	
100.316 incipient cataract, nucleus		8	0.5%	4	0.2%	0		0	
100.317 incipient cataract, capsular		2	0.1%	5	0.3%	2	0.5%	0	
100.321 incomplete cataract, anterior cortex		0		0		4	0.9%	0	
100.330 generalized/complete cataract		2	0.1%	3	0.2%	0		0	
100.375 subluxation/luxation, unspecified		1	0.1%	4	0.2%	0		0	
VITREOUS									
110.120 persistent hyaloid artery/remnant		5	0.3%	1	0.1%	0		0	
110.320 vitreous degeneration syneresis		1	0.1%	3	0.2%	1	0.2%	1	1.1%
110.330 vitreous degeneration anterior chamber		0		1	0.1%	0		0	
FUNDUS									
97.110 choroidal hypoplasia		7	0.5%	15	0.9%	0		0	
97.120 coloboma		1	0.1%	3	0.2%	0		0	

OCULAR DISORDERS REPORT BEARDED COLLIE

	1991-1999	2000-2009	2010-2013	2014
RETINA				
120.170 retinal dysplasia, folds	21 1.4%	26 1.5%	5 1.2%	0
120.180 retinal dysplasia, geographic	0	0	1 0.2%	0
120.310 generalized progressive retinal atrophy (PRA)	4 0.3%	4 0.2%	0	0
120.960 retinopathy	0	0	1 0.2%	0
OPTIC NERVE				
130.150 optic disc coloboma	0	1 0.1%	0	0
OTHER				
900.000 other, unspecified	0	14 0.8%	23 5.4%	0
900.100 other, not inherited	10 0.7%	63 3.6%	2 0.5%	2 2.2%
900.110 other, suspected as inherited	15 1.0%	5 0.3%	0	0
NORMAL				
0.000 normal globe	1191 80.2%	1411 81.4%	367 86.2%	70 78.7%

OCULAR DISORDERS REPORT

BEDLINGTON TERRIER - 1

BEDLINGTON TERRIER

	DISORDER	INHERITANCE	REFERENCE	BREEDING ADVICE
A.	Microphthalmia	Not defined	1	NO
B.	Distichiasis	Not defined	1	Breeder option
C.	Imperforate lacrimal punctum	Not defined	1, 2	Breeder option
D.	Persistent pupillary membranes			
	- iris to iris	Not defined	3, 4	Breeder option
	- all other forms	Not defined	4	NO
E.	Cataract	Not defined	1	NO
F.	Retinal dysplasia - folds	Not defined	1	Breeder option
G.	Retinal dysplasia - geographic - detached	Presumed autosomal recessive	1, 5, 6	NO

Description and Comments

A. Microphthalmia

Microphthalmia is a congenital defect characterized by a small eye. The condition may be seen alone without vision impairment but it is most often associated with defects of the cornea, iris (coloboma), anterior chamber, lens (cataract) and/or retina (retinal dysplasia).

B. Distichiasis

Eyelashes abnormally located on the eyelid margin which may cause ocular irritation. Distichiasis may occur at any time in the life of a dog. It is difficult to make a strong recommendation with regard to breeding dogs with this entity. The hereditary basis has not been established although it seems probable due to the high incidence in some breeds. Reducing the incidence is a logical goal. When diagnosed, distichiasis should be recorded. Breeding discretion is advised.

OCULAR DISORDERS REPORT

BEDLINGTON TERRIER - 2

C. Imperforate lacrimal punctum

A developmental anomaly resulting in failure of opening of the lacrimal duct located at the medial lid margins. The lower punctum is more frequently affected. This defect usually results in epiphora, an overflow of tears onto the face.

D. Persistent pupillary membranes (PPM)

Persistent blood vessel remnants in the anterior chamber of the eye which fail to regress normally by 3 months of age. These strands may bridge from iris to iris, iris to cornea, iris to lens, or form sheets of tissue in the anterior chamber. The last three forms pose the greatest threat to vision and when severe, vision impairment or blindness may occur.

E. Cataract

A partial or complete opacity of the lens and/or its capsule. In cases where cataracts are complete and affect both eyes, blindness results. The prudent approach is to assume cataracts to be hereditary except in cases known to be associated with trauma, other causes of ocular inflammation, specific metabolic diseases, persistent pupillary membrane, persistent hyaloid or nutritional deficiencies. Cataracts may involve the lens completely (diffuse) or in a localized region.

F. Retinal dysplasia - folds

Linear, triangular, curved or curvilinear foci of retinal folding that may be single or multiple. When seen in puppies, this condition may partially or completely resolve with maturity. Its significance to vision is unknown. There are two other forms of retinal dysplasia (geographic, detached) which are known to be inherited and, in their most severe form, cause blindness. The genetic relationship between folds and more severe forms of retinal dysplasia is undetermined.

G. Retinal dysplasia - geographic, detached

Abnormal development of the retina present at birth.

Retinal dysplasia - geographic: Any irregularly shaped area of abnormal retinal development containing both areas of thinning and areas of elevation representing folds and retinal disorganization.

Retinal dysplasia - detached: Severe retinal disorganization associated with separation (detachment) of the retina.

These two forms are associated with vision impairment or blindness. Retinal dysplasia is known to be inherited in many breeds. The genetic relationship between the three forms of retinal dysplasia is not known for all breeds.

In the Bedlington Terrier, studies have indicated an autosomal recessive mode of inheritance for this form of retinal dysplasia. Affected animals are generally blind at birth due

OCULAR DISORDERS REPORT

BEDLINGTON TERRIER - 3

to complete retinal detachment and disorganization. Cataracts may also be seen with this condition.

References

1. ACVO Genetics Committee, 1999 and/or Data from CERF All-Breeds Report, 1991-1998.
2. Barnett KC. Imperforate and micro-lachrymal puncta in the dog. *J Small Anim Pract.* 1979 Aug;20:481-490.
3. ACVO Genetics Committee, 2000-2002 and/or Data from CERF All-Breeds Report, 2000-2002.
4. ACVO Genetics Committee, 2005 and/or Data from CERF All-Breeds Report 2003-2004.
5. Rubin LF. Heredity of retinal dysplasia in the Bedlington terrier. *J Am Vet Med Assoc.* 1968;152:260.
6. Rubin LF. Hereditary retinal detachment in Bedlington terriers. *Vet Med Small Anim Clin.* 1963;3:387.

OCULAR DISORDERS REPORT BEDLINGTON TERRIER

Diagnostic Name	TOTAL DOGS EXAMINED	1991-1999		2000-2009		2010-2013		2014	
		#	%	#	%	#	%	#	%
GLOBE									
0.110 microphthalmia		1	0.2%	2	0.3%	1	0.4%	0	
EYELIDS									
20.140 ectopic cilia		2	0.5%	0		0		0	
21.000 entropion, unspecified		1	0.2%	1	0.1%	0		0	
25.110 distichiasis		49	11.8%	51	6.5%	11	4.3%	9	12.2%
NASOLACRIMAL									
32.110 imperforate lower nasolacrimal punctum		4	1.0%	0		2	0.8%	4	5.4%
NICTITANS									
52.110 prolapsed gland of the third eyelid		0		0		1	0.4%	0	
CORNEA									
70.220 pigmentary keratitis		0		0		1	0.4%	0	
70.700 corneal dystrophy		1	0.2%	5	0.6%	1	0.4%	0	
UVEA									
93.710 persistent pupillary membranes, iris to iris		5	1.2%	73	9.4%	31	12.1%	5	6.8%
93.720 persistent pupillary membranes, iris to lens		1	0.2%	1	0.1%	0		0	
93.730 persistent pupillary membranes, iris to cornea		4	1.0%	1	0.1%	0		0	
93.740 persistent pupillary membranes, iris sheets		2	0.5%	1	0.1%	0		0	
93.760 persistent pupillary membranes, endothelial opacity/no strands		0		1	0.1%	0		0	
LENS									
100.200 cataract, unspecified		13	3.1%	0		0		0	
100.210 cataract, significance unknown		24	5.8%	53	6.8%	15	5.9%	15	20.3%
100.301 punctate cataract, anterior cortex		0		6	0.8%	1	0.4%	0	
100.302 punctate cataract, posterior cortex		1	0.2%	1	0.1%	1	0.4%	0	
100.303 punctate cataract, equatorial cortex		0		6	0.8%	1	0.4%	1	1.4%
100.304 punctate cataract, anterior sutures		1	0.2%	0		1	0.4%	0	
100.305 punctate cataract, posterior sutures		0		9	1.2%	4	1.6%	2	2.7%
100.306 punctate cataract, nucleus		0		0		1	0.4%	0	
100.307 punctate cataract, capsular		0		1	0.1%	1	0.4%	0	
100.311 incipient cataract, anterior cortex		7	1.7%	23	2.9%	8	3.1%	0	
100.312 incipient cataract, posterior cortex		5	1.2%	8	1.0%	5	2.0%	0	
100.313 incipient cataract, equatorial cortex		10	2.4%	13	1.7%	9	3.5%	0	
100.314 incipient cataract, anterior sutures		0		4	0.5%	0		0	
100.315 incipient cataract, posterior sutures		0		7	0.9%	0		2	2.7%
100.316 incipient cataract, nucleus		0		3	0.4%	0		0	
100.317 incipient cataract, capsular		0		0		1	0.4%	0	
100.321 incomplete cataract, anterior cortex		0		0		0		1	1.4%
100.322 incomplete cataract, posterior cortex		0		0		0		1	1.4%
100.330 generalized/complete cataract		3	0.7%	11	1.4%	0		0	
100.375 subluxation/luxation, unspecified		0		1	0.1%	0		0	
VITREOUS									
110.320 vitreous degeneration syneresis		1	0.2%	1	0.1%	1	0.4%	2	2.7%
110.330 vitreous degeneration anterior chamber		0		1	0.1%	1	0.4%	0	

OCULAR DISORDERS REPORT BEDLINGTON TERRIER

	1991-1999	2000-2009	2010-2013	2014
RETINA				
120.170 retinal dysplasia, folds	3 0.7%	3 0.4%	0	0
120.190 retinal dysplasia, detached	0	1 0.1%	0	0
120.310 generalized progressive retinal atrophy (PRA)	1 0.2%	0	2 0.8%	0
120.910 retinal detachment without dialysis	0	1 0.1%	0	0
120.960 retinopathy	0	0	1 0.4%	0
OPTIC NERVE				
130.120 optic nerve hypoplasia	1 0.2%	0	0	0
130.150 optic disc coloboma	1 0.2%	4 0.5%	0	0
OTHER				
900.000 other, unspecified	0	8 1.0%	5 2.0%	0
900.100 other, not inherited	2 0.5%	31 4.0%	2 0.8%	4 5.4%
900.110 other, suspected as inherited	3 0.7%	3 0.4%	0	1 1.4%
NORMAL				
0.000 normal globe	324 77.9%	590 75.6%	196 76.6%	51 68.9%

OCULAR DISORDERS REPORT

BELGIAN LAEKENOIS - 1

BELGIAN LAEKENOIS

There are 4 varieties of Belgian Shepherd- the Groenendael, Laekenois, Malinois and Tervuren. In Europe these varieties may be interbred and are not considered genetically distinct thus it is likely that the same genetic diseases exist in all four. In the United States the Groenendael (known as the Belgian Sheepdog), Malinois, Tervuren and Laekenois are recognized as separate breeds.

	DISORDER	INHERITANCE	REFERENCE	BREEDING ADVICE
A.	Distichiasis	Not defined	1	Breeder option

Description and Comments

A. Distichiasis

Eyelashes abnormally located on the eyelid margin which may cause ocular irritation. Distichiasis may occur at any time in the life of a dog. It is difficult to make a strong recommendation with regard to breeding dogs with this entity. The hereditary basis has not been established although it seems probable due to the high incidence in some breeds. Reducing the incidence is a logical goal. When diagnosed, distichiasis should be recorded; breeding discretion is advised.

References

There are few references providing detailed descriptions of hereditary ocular conditions of the Belgian Laekenois breed. The conditions listed above are generally recognized to exist in this breed, as evidenced by identification on breed eye screening examinations and/or clinical experience of veterinary ophthalmologists.

1. ACVO Genetics Committee, 2007 and/or Data from CERF All-Breeds Report 2002-2006.

OCULAR DISORDERS REPORT BELGIAN LAEKENOIS

Diagnostic Name	TOTAL DOGS EXAMINED	1991-1999		2000-2009		2010-2013		2014	
		#	%	#	%	#	%	#	%
EYELIDS									
25.110 distichiasis		0		5	5.3%	0		0	
CORNEA									
70.700 corneal dystrophy		0		1	1.1%	0		0	
UVEA									
93.710 persistent pupillary membranes, iris to iris		0		1	1.1%	0		0	
LENS									
100.210 cataract, significance unknown		0		8	8.5%	7	21.9%	0	
100.307 punctate cataract, capsular		0		0		1	3.1%	0	
100.314 incipient cataract, anterior sutures		0		0		1	3.1%	0	
VITREOUS									
110.320 vitreous degeneration syneresis		0		1	1.1%	3	9.4%	0	
110.330 vitreous degeneration anterior chamber		0		1	1.1%	0		0	
RETINA									
120.170 retinal dysplasia, folds		1	5.6%	5	5.3%	0		0	
OTHER									
900.000 other, unspecified		0		3	3.2%	1	3.1%	0	
900.100 other, not inherited		0		4	4.3%	0		1	11.1%
NORMAL									
0.000 normal globe		17	94.4%	76	80.9%	27	84.4%	9	100.0%

OCULAR DISORDERS REPORT

BELGIAN MALINOIS - 1

BELGIAN MALINOIS

There are 4 varieties of Belgian Shepherd- the Groenendael, Laekenois, Malinois and Tervuren. In Europe these varieties may be interbred and are not considered genetically distinct thus it is likely that the same genetic diseases exist in all four. In the United States the Groenendael (known as the Belgian Sheepdog), Malinois, Tervuren and Laekenois are recognized as separate breeds.

	DISORDER	INHERITANCE	REFERENCE	BREEDING ADVICE
A.	Chronic superficial keratitis/pannus	Not defined	1	NO
B.	Persistent pupillary membranes - iris to iris	Not defined	2	Breeder option
C.	Cataract	Not defined	3	NO
D.	Vitreous degeneration	Not defined	4	Breeder Option
E.	Retinal dysplasia - folds	Not defined	3	Breeder option
F.	Retinal atrophy - generalized/ Retinopathy	Not defined	2, 5	NO

Description and Comments

A. Chronic superficial keratitis/pannus

A bilateral inflammatory disease of the cornea which usually starts as a grayish haze to the ventral or ventrolateral cornea, followed by the formation of a vascularized subepithelial growth that begins to spread toward the central cornea; pigmentation follows the vascularization. If severe, vision impairment occurs. Pannus may be associated with plasma cell infiltration of the nictitans.

B. Persistent pupillary membranes (PPM)

Persistent blood vessel remnants in the anterior chamber of the eye which fail to regress normally by 3 months of age.. These strands may bridge from iris to iris, iris to cornea, iris to lens, or form sheets of tissue in the anterior chamber. The last three forms pose the greatest threat to vision and when severe, vision impairment or blindness may occur.

OCULAR DISORDERS REPORT

BELGIAN MALINOIS - 2

C. Cataract

A partial or complete opacity of the lens and/or its capsule. In cases where cataracts are complete and affect both eyes, blindness results. The prudent approach is to assume cataracts to be hereditary except in cases known to be associated with trauma, other causes of ocular inflammation, specific metabolic diseases, persistent pupillary membrane, persistent hyaloid or nutritional deficiencies. Cataracts may involve the lens completely (diffuse) or in a localized region.

In the Belgian Malinois, cataract most often occurs as a nonprogressive, triangular opacity in the posterior cortex.

D. Vitreous degeneration

Liquefaction of the vitreous gel which may predispose to retinal detachment.

E. Retinal dysplasia - folds

Linear, triangular, curved or curvilinear foci of retinal folding that may be single or multiple. When seen in puppies, this condition may partially or completely resolve with maturity. Its significance to vision is unknown. There are two other forms of retinal dysplasia (geographic, detached) which are known to be inherited in other breeds and, in their most severe form, cause blindness. The genetic relationship between folds and more severe forms of retinal dysplasia is undetermined.

F. Retinal degeneration – generalized / Retinopathy

A unilateral or bilateral retinal disease which can be progressive. When bilateral, the ophthalmoscopic lesions are sometimes asymmetrical, particularly in the early stages of the disease. Fundus examination shows initially single or multiple focal retinal lesions that appear active (local infiltrative inflammation or granulation) or inactive. The lesions can progress resulting in widespread retinal atrophy. The end-stage ophthalmoscopic lesions vary and may appear indistinguishable from PRA, or may be more characteristic of an inflammatory retinopathy. The asymmetry of the fundus abnormalities and the presence of inflammatory lesions in the retina and choroid help to differentiate this disorder from PRA. The mode of inheritance of this disease is not known; however, studies of different families suggest that it is possibly inherited. An intriguing aspect of the disease has been the preponderance of affected males compared to females. This has been confirmed in a recent unpublished survey.

References

There are no references providing detailed descriptions of hereditary ocular conditions of the Belgian Malinois breed. The conditions listed above are generally recognized to exist in this breed, as evidenced by identification on breed eye screening examinations and/or clinical experience of veterinary ophthalmologists.

1. ACVO Genetics Committee, 2000-2002 and/or Data from CERF All-Breeds Report, 2000-

©2014, American College of Veterinary Ophthalmologists

OCULAR DISORDERS REPORT

BELGIAN MALINOIS - 3

2002.

2. ACVO Genetics Committee, 2005 and/or Data from CERF All-Breeds Report 2003-2004.
3. ACVO Genetics Committee, 1999 and/or Data from CERF All-Breeds Report, 1991-1998.
4. ACVO Genetics Committee, 2009 and/or Data from CERF All-Breeds Report, 2008.
5. ACVO Genetics Committee, 2002-2003 and/or Data from CERF All-Breeds Report, 2002-2003.

OCULAR DISORDERS REPORT BELGIAN MALINOIS

Diagnostic Name	TOTAL DOGS EXAMINED	1991-1999		2000-2009		2010-2013		2014	
		#	%	#	%	#	%	#	%
GLOBE									
0.110	microphthalmia	0		1	0.1%	0		0	
EYELIDS									
22.000	ectropion, unspecified	0		0		1	0.2%	0	
25.110	distichiasis	2	0.4%	0		0		0	
CORNEA									
70.210	corneal pannus	2	0.4%	5	0.4%	3	0.5%	0	
70.220	pigmentary keratitis	0		1	0.1%	0		0	
70.700	corneal dystrophy	7	1.2%	5	0.4%	2	0.4%	1	0.9%
70.730	corneal endothelial degeneration	0		2	0.2%	0		0	
UVEA									
93.120	iris cyst	1	0.2%	7	0.6%	0		1	0.9%
93.170	anterior chamber cyst	0		0		1	0.2%	0	
93.710	persistent pupillary membranes, iris to iris	4	0.7%	13	1.0%	10	1.8%	1	0.9%
93.760	persistent pupillary membranes, endothelial opacity/no strands	0		0		1	0.2%	0	
LENS									
100.200	cataract, unspecified	3	0.5%	0		0		0	
100.210	cataract, significance unknown	16	2.8%	49	3.9%	23	4.2%	11	10.0%
100.301	punctate cataract, anterior cortex	4	0.7%	6	0.5%	1	0.2%	0	
100.302	punctate cataract, posterior cortex	0		4	0.3%	4	0.7%	0	
100.303	punctate cataract, equatorial cortex	0		1	0.1%	0		0	
100.304	punctate cataract, anterior sutures	2	0.4%	0		0		0	
100.305	punctate cataract, posterior sutures	1	0.2%	6	0.5%	4	0.7%	0	
100.306	punctate cataract, nucleus	0		1	0.1%	2	0.4%	0	
100.307	punctate cataract, capsular	0		1	0.1%	0		0	
100.311	incipient cataract, anterior cortex	1	0.2%	8	0.6%	3	0.5%	0	
100.312	incipient cataract, posterior cortex	6	1.1%	11	0.9%	3	0.5%	0	
100.313	incipient cataract, equatorial cortex	1	0.2%	4	0.3%	1	0.2%	0	
100.314	incipient cataract, anterior sutures	4	0.7%	3	0.2%	0		0	
100.315	incipient cataract, posterior sutures	2	0.4%	6	0.5%	0		0	
100.316	incipient cataract, nucleus	8	1.4%	6	0.5%	0		0	
100.317	incipient cataract, capsular	0		0		1	0.2%	0	
100.324	incomplete cataract, anterior sutures	0		0		0		1	0.9%
100.330	generalized/complete cataract	1	0.2%	4	0.3%	0		0	
100.375	subluxation/luxation, unspecified	1	0.2%	0		0		0	
VITREOUS									
110.120	persistant hyaloid artery/remnant	0		1	0.1%	0		0	
110.135	PHPV/PTVL	0		0		2	0.4%	0	
110.320	vitreous degeneration syneresis	3	0.5%	11	0.9%	0		1	0.9%
110.330	vitreous degeneration anterior chamber	0		2	0.2%	0		0	
FUNDUS									
97.120	coloboma	0		0		1	0.2%	0	

OCULAR DISORDERS REPORT BELGIAN MALINOIS

	1991-1999	2000-2009	2010-2013	2014
RETINA				
120.170 retinal dysplasia, folds	14 2.5%	6 0.5%	2 0.4%	0
120.180 retinal dysplasia, geographic	4 0.7%	0	1 0.2%	1 0.9%
120.190 retinal dysplasia, detached	1 0.2%	0	0	0
120.200 retinitis	0	0	1 0.2%	0
120.310 generalized progressive retinal atrophy (PRA)	7 1.2%	5 0.4%	2 0.4%	0
120.910 retinal detachment without dialysis	2 0.4%	2 0.2%	0	0
120.960 retinopathy	0	0	1 0.2%	0
OPTIC NERVE				
130.150 optic disc coloboma	0	0	1 0.2%	0
OTHER				
900.000 other, unspecified	0	6 0.5%	15 2.7%	0
900.100 other, not inherited	4 0.7%	74 5.9%	0	5 4.5%
900.110 other, suspected as inherited	8 1.4%	1 0.1%	0	0
NORMAL				
0.000 normal globe	484 86.1%	1128 90.4%	510 92.6%	101 91.8%

OCULAR DISORDERS REPORT

BELGIAN SHEEPDOG - 1

BELGIAN SHEEPDOG (BELGIAN SHEPHERD-GROENENDAEL)

There are 4 varieties of Belgian Shepherd- the Groenendael, Laekenois, Malinois and Tervuren. In Europe these varieties may be interbred and are not considered genetically distinct thus it is likely that the same genetic diseases exist in all four. In the United States the Groenendael (known as the Belgian Sheepdog), Malinois, Tervuren and Lakenois are recognized as separate breeds.

	DISORDER	INHERITANCE	REFERENCE	BREEDING ADVICE
A.	Corneal dystrophy - epithelial/stromal	Not defined	1	Breeder option
B.	Chronic superficial keratitis/pannus	Not defined	1	NO
C.	Persistent pupillary membranes - iris to iris - all other forms	Not defined Not defined	1, 2 2	Breeder option NO
D.	Cataract	Not defined	1	NO
E.	Retinal atrophy - generalized	Presumed autosomal recessive	1, 3	NO
F.	Retinal dysplasia - folds	Not defined	2, 4	Breeder option
G.	Micropapilla	Not defined	1	Breeder option
H.	Achiasmic optic nerves with nystagmus	Autosomal recessive	5	NO

Description and Comments

A. Corneal dystrophy - epithelial/stromal

A non-inflammatory corneal opacity (white to gray) present in one or more of the corneal layers; usually inherited and bilateral.

OCULAR DISORDERS REPORT

BELGIAN SHEEPDOG - 2

B. Chronic superficial keratitis/pannus

A bilateral inflammatory disease of the cornea which usually starts as a grayish haze to the ventral or ventrolateral cornea, followed by the formation of a vascularized subepithelial growth that begins to spread toward the central cornea; pigmentation follows the vascularization. If severe, vision impairment occurs. Pannus may be associated with plasma cell infiltration of the nictitans.

C. Persistent pupillary membranes (PPM)

Persistent blood vessel remnants in the anterior chamber of the eye which fail to regress normally by 3 months of age. These strands may bridge from iris to iris, iris to cornea, iris to lens, or form sheets of tissue in the anterior chamber. The last three forms pose the greatest threat to vision and when severe, vision impairment or blindness may occur.

D. Cataract

A partial or complete opacity of the lens and/or its capsule. In cases where cataracts are complete and affect both eyes, blindness results. The prudent approach is to assume cataracts to be hereditary except in cases known to be associated with trauma, other causes of ocular inflammation, specific metabolic diseases, persistent pupillary membrane, persistent hyaloid or nutritional deficiencies. Cataracts may involve the lens completely (diffuse) or in a localized region.

In the Belgian Sheepdog, cataract most often occurs as a nonprogressive, triangular opacity in the posterior cortex.

E. Retinal atrophy - generalized

A degenerative disease of the retinal visual cells which progresses to blindness. This abnormality, also known as progressive retinal atrophy or PRA, may be detected by electroretinogram (not part of a routine eye screening examination) before it is apparent clinically. Limited breeding studies in the Belgian Sheepdog suggest an autosomal recessive mode of inheritance.

F. Retinal dysplasia - folds

Linear, triangular, curved or curvilinear foci of retinal folding that may be single or multiple. When seen in puppies, this condition may partially or completely resolve with maturity. Its significance to vision is unknown. There are two other forms of retinal dysplasia (geographic, detached) which are known to be inherited in other breeds and, in their most severe form, cause blindness. The genetic relationship between folds and more severe forms of retinal dysplasia is undetermined.

OCULAR DISORDERS REPORT

BELGIAN SHEEPDOG - 3

G. Micropapilla

Micropapilla refers to a small optic disc which is not associated with vision impairment. Optic nerve hypoplasia refers to a congenital defect of the optic nerve which causes blindness and abnormal pupil response in the affected eye. It may be difficult to differentiate between micropapilla and optic nerve hypoplasia on a routine (dilated) screening ophthalmoscopic exam.

H. Achiasmic optic nerves with nystagmus

Achiasmic optic nerves with nystagmus have been described in a small family of black Belgian Sheepdogs. Congenital nystagmus is the clinical sign most commonly noted. All retinal ganglion cell axons extend directly into the ipsilateral optic disc with no chiasmal decussation. No optic nerve hypoplasia/micropapilla was noted in the animals studied and reported.

References

1. ACVO Genetics Committee, 1999 and/or Data from CERF All-Breeds Report, 1991-1998.
2. ACVO Genetics Committee, 2005 and/or Data from CERF All-Breeds Report 2003-2004.
3. Miller TR. Generalized retinopathy in the Belgian shepherds. *Invest Ophthalmol Vis Sci.* 1986;27 (Suppl):310.
4. ACVO Genetics Committee, 2002-2003 and/or Data from CERF All-Breeds Report, 2002-2003.
5. Hogan D and Williams RW. Analysis of the retinas and optic nerves of achiasmatic Belgian sheepdogs. *The Journal of comparative neurology.* 1995 Feb 13;352:367-380.

OCULAR DISORDERS REPORT BELGIAN SHEEPDOG

Diagnostic Name	TOTAL DOGS EXAMINED	1991-1999		2000-2009		2010-2013		2014	
		#	%	#	%	#	%	#	%
GLOBE									
10.000 glaucoma		0		1	0.0%	0		0	
EYELIDS									
22.000 ectropion, unspecified		0		1	0.0%	0		0	
25.110 distichiasis		4	0.2%	4	0.2%	3	0.3%	0	
NICTITANS									
50.210 pannus of third eyelid		0		0		1	0.1%	0	
51.100 third eyelid cartilage anomaly		0		1	0.0%	0		2	1.1%
CORNEA									
70.210 corneal pannus		11	0.6%	23	0.9%	8	0.8%	2	1.1%
70.220 pigmentary keratitis		1	0.1%	2	0.1%	0		0	
70.700 corneal dystrophy		11	0.6%	15	0.6%	4	0.4%	1	0.6%
70.730 corneal endothelial degeneration		1	0.1%	0		0		0	
UVEA									
93.120 iris cyst		0		3	0.1%	0		0	
93.140 corneal endothelial pigment without PPM		0		1	0.0%	0		0	
93.710 persistent pupillary membranes, iris to iris		78	4.5%	204	7.7%	105	10.4%	22	12.2%
93.720 persistent pupillary membranes, iris to lens		0		3	0.1%	0		0	
93.730 persistent pupillary membranes, iris to cornea		0		3	0.1%	0		0	
93.740 persistent pupillary membranes, iris sheets		2	0.1%	3	0.1%	0		0	
93.750 persistent pupillary membranes, lens pigment foci/no strands		0		0		7	0.7%	0	
93.760 persistent pupillary membranes, endothelial opacity/no strands		0		0		3	0.3%	0	
LENS									
100.200 cataract, unspecified		13	0.7%	0		0		0	
100.210 cataract, significance unknown		48	2.8%	95	3.6%	47	4.6%	6	3.3%
100.301 punctate cataract, anterior cortex		2	0.1%	9	0.3%	6	0.6%	3	1.7%
100.302 punctate cataract, posterior cortex		12	0.7%	24	0.9%	4	0.4%	0	
100.303 punctate cataract, equatorial cortex		1	0.1%	4	0.2%	0		0	
100.304 punctate cataract, anterior sutures		1	0.1%	1	0.0%	2	0.2%	0	
100.305 punctate cataract, posterior sutures		4	0.2%	5	0.2%	7	0.7%	1	0.6%
100.306 punctate cataract, nucleus		1	0.1%	3	0.1%	1	0.1%	0	
100.307 punctate cataract, capsular		0		3	0.1%	6	0.6%	0	
100.311 incipient cataract, anterior cortex		3	0.2%	17	0.6%	4	0.4%	0	
100.312 incipient cataract, posterior cortex		15	0.9%	32	1.2%	9	0.9%	3	1.7%
100.313 incipient cataract, equatorial cortex		6	0.3%	4	0.2%	2	0.2%	0	
100.314 incipient cataract, anterior sutures		1	0.1%	3	0.1%	0		0	
100.315 incipient cataract, posterior sutures		5	0.3%	8	0.3%	0		1	0.6%
100.316 incipient cataract, nucleus		10	0.6%	1	0.0%	0		0	
100.317 incipient cataract, capsular		0		4	0.2%	3	0.3%	0	
100.322 incomplete cataract, posterior cortex		0		0		1	0.1%	0	
100.330 generalized/complete cataract		0		3	0.1%	4	0.4%	0	
VITREOUS									
110.120 persistent hyaloid artery/remnant		1	0.1%	2	0.1%	0		0	
110.320 vitreous degeneration syneresis		0		1	0.0%	1	0.1%	0	

OCULAR DISORDERS REPORT BELGIAN SHEEPDOG

VITREOUS CONTINUED	1991-1999	2000-2009	2010-2013	2014
110.330 vitreous degeneration anterior chamber	0	0	1 0.1%	0
FUNDUS				
97.120 coloboma	1 0.1%	1 0.0%	0	0
RETINA				
120.170 retinal dysplasia, folds	6 0.3%	28 1.1%	2 0.2%	0
120.180 retinal dysplasia, geographic	2 0.1%	3 0.1%	0	1 0.6%
120.310 generalized progressive retinal atrophy (PRA)	1 0.1%	3 0.1%	0	0
120.910 retinal detachment without dialysis	0	1 0.0%	1 0.1%	0
OPTIC NERVE				
130.110 micropapilla	1 0.1%	11 0.4%	12 1.2%	3 1.7%
130.120 optic nerve hypoplasia	11 0.6%	1 0.0%	0	0
130.150 optic disc coloboma	5 0.3%	0	0	0
OTHER				
900.000 other, unspecified	0	20 0.8%	34 3.4%	0
900.100 other, not inherited	5 0.3%	107 4.0%	12 1.2%	6 3.3%
900.110 other, suspected as inherited	11 0.6%	8 0.3%	4 0.4%	0
NORMAL				
0.000 normal globe	1503 86.3%	2305 87.0%	904 89.2%	159 87.8%

OCULAR DISORDERS REPORT

BELGIAN TERVUREN - 1

BELGIAN TERVUREN

There are 4 varieties of Belgian Shepherd- the Groenendael, Laekenois, Malinois and Tervuren. In Europe these varieties may be interbred and are not considered genetically distinct thus it is likely that the same genetic diseases exist in all four. In the United States the Groenendael (known as the Belgian Sheepdog), Malinois, Tervuren and Laekenois are recognized as separate breeds.

	DISORDER	INHERITANCE	REFERENCE	BREEDING ADVICE
A.	Distichiasis	Not defined	1	Breeder option
B.	Chronic superficial keratitis/pannus	Not defined	2, 3	NO
C.	Persistent pupillary membranes			
	- iris to iris	Not defined	1, 2	Breeder option
	- all other forms	Not defined	1	NO
D.	Cataract	Not defined	2	NO
E.	Retinal atrophy	Presumed	2	NO
	- generalized	autosomal recessive		
F.	Retinal dysplasia	Not defined	1, 4	Breeder option
	- folds			
G.	Retinal dysplasia	Not defined	1	NO
	- geographic			
H.	Micropapilla	Not defined	2	Breeder option

Description and Comments

A. Distichiasis

Eyelashes abnormally located on the eyelid margin which may cause ocular irritation. Distichiasis may occur at any time in the life of a dog. It is difficult to make a strong recommendation with regard to breeding dogs with this entity. The hereditary basis has not been established although it seems probable due to the high incidence in some breeds. Reducing the incidence is a logical goal. When diagnosed, distichiasis should be recorded; breeding discretion is advised.

©2014, American College of Veterinary Ophthalmologists

OCULAR DISORDERS REPORT

BELGIAN TERVUREN - 2

B. Chronic superficial keratitis/pannus

A bilateral inflammatory disease of the cornea which usually starts as a grayish haze to the ventral or ventrolateral cornea, followed by the formation of a vascularized subepithelial growth that begins to spread toward the central cornea; pigmentation follows the vascularization. If severe, vision impairment occurs. Pannus may be associated with plasma cell infiltration of the nictitans.

C. Persistent pupillary membranes (PPM)

Persistent blood vessel remnants in the anterior chamber of the eye which fail to regress normally by 3 months of age. These strands may bridge from iris to iris, iris to cornea, iris to lens, or form sheets of tissue in the anterior chamber. The last three forms pose the greatest threat to vision and when severe, vision impairment or blindness may occur.

D. Cataract

A partial or complete opacity of the lens and/or its capsule. In cases where cataracts are complete and affect both eyes, blindness results. The prudent approach is to assume cataracts to be hereditary except in cases known to be associated with trauma, other causes of ocular inflammation, specific metabolic diseases, persistent pupillary membrane, persistent hyaloid or nutritional deficiencies. Cataracts may involve the lens completely (diffuse) or in a localized region.

In the Belgian Tervuren, cataract most often occurs as a nonprogressive, triangular opacity in the posterior cortex.

E. Retinal atrophy - generalized

A degenerative disease of the retinal visual cells which progresses to blindness. This abnormality, also known as progressive retinal atrophy or PRA, may be detected by electroretinogram (not part of a routine eye screening examination) before it is apparent clinically. Except for X-linked PRA in the Siberian Husky, in all breeds studied to date, PRA is inherited as an autosomal recessive trait.

In the Tervuren concern has been high regarding PRA. Recently, an entire litter from known carrier background were examined with 4 of 6 individuals affected. Age of clinical onset appears to be about 4-5yrs.

OCULAR DISORDERS REPORT

BELGIAN TERVUREN - 3

F. Retinal dysplasia - folds

Linear, triangular, curved or curvilinear foci of retinal folding that may be single or multiple. When seen in puppies, this condition may partially or completely resolve with maturity. Its significance to vision is unknown. There are two other forms of retinal dysplasia (geographic, detached) which are known to be inherited in other breeds and, in their most severe form, cause blindness. The genetic relationship between folds and more severe forms of retinal dysplasia is undetermined.

G. Retinal dysplasia - geographic

Abnormal development of the retina present at birth. Any irregularly shaped area of abnormal retinal development containing both areas of thinning and areas of elevation representing folds and retinal disorganization.

H. Micropapilla

Micropapilla refers to a small optic disc which is not associated with vision impairment. Optic nerve hypoplasia refers to a congenital defect of the optic nerve which causes blindness and abnormal pupil response in the affected eye. It may be difficult to differentiate between micropapilla and optic nerve hypoplasia on a routine (dilated) screening ophthalmoscopic exam.

References

There are few references providing detailed descriptions of hereditary ocular conditions of the Belgian Tervuren breed. The conditions listed above are generally recognized to exist in this breed, as evidenced by identification on breed eye screening examinations and/or clinical experience of veterinary ophthalmologists.

1. ACVO Genetics Committee, 2005 and/or Data from CERF All-Breeds Report 2003-2004.
2. ACVO Genetics Committee, 1999 and/or Data from CERF All-Breeds Report, 1991-1998.
3. Chavkin MJ, Roberts SM, Salman MD, et al. Risk factors for development of chronic superficial keratitis in dogs. *J Am Vet Med Assoc.* 1994 May 15;204:1630-1634.
4. ACVO Genetics Committee, 2002-2003 and/or Data from CERF All-Breeds Report, 2002-2003.

OCULAR DISORDERS REPORT BELGIAN TERVUREN

Diagnostic Name	TOTAL DOGS EXAMINED	1991-1999 4447		2000-2009 5570		2010-2013 1867		2014 390		
		#	%	#	%	#	%	#	%	
GLOBE										
0.110	microphthalmia	2	0.0%	2	0.0%	0		0		
10.000	glaucoma	1	0.0%	0		0		0		
EYELIDS										
21.000	entropion, unspecified	1	0.0%	2	0.0%	0		0		
25.110	distichiasis	36	0.8%	59	1.1%	22	1.2%	1	0.3%	
NASOLACRIMAL										
40.910	keratoconjunctivitis sicca	0		2	0.0%	0		0		
NICTITANS										
50.210	pannus of third eyelid	0		0		4	0.2%	2	0.5%	
51.100	third eyelid cartilage anomaly	1	0.0%	0		10	0.5%	1	0.3%	
52.110	prolapsed gland of the third eyelid	0		1	0.0%	0		0		
CORNEA										
70.210	corneal pannus	11	0.2%	41	0.7%	18	1.0%	4	1.0%	
70.220	pigmentary keratitis	0		2	0.0%	2	0.1%	1	0.3%	
70.700	corneal dystrophy	25	0.6%	28	0.5%	10	0.5%	0		
70.730	corneal endothelial degeneration	4	0.1%	3	0.1%	0		0		
UVEA										
93.120	iris cyst	5	0.1%	6	0.1%	5	0.3%	0		
93.150	iris coloboma	1	0.0%	1	0.0%	0		0		
93.710	persistent pupillary membranes, iris to iris	196	4.4%	485	8.7%	168	9.0%	42	10.8%	
93.720	persistent pupillary membranes, iris to lens	6	0.1%	6	0.1%	0		0		
93.730	persistent pupillary membranes, iris to cornea	2	0.0%	2	0.0%	1	0.1%	0		
93.740	persistent pupillary membranes, iris sheets	5	0.1%	9	0.2%	0		0		
93.750	persistent pupillary membranes, lens pigment foci/no strands	0		3	0.1%	17	0.9%	3	0.8%	
95.120	ciliary body cyst	0		0		1	0.1%	0		
LENS										
100.200	cataract, unspecified	66	1.5%	0		0		0		
100.210	cataract, significance unknown	174	3.9%	312	5.6%	107	5.7%	28	7.2%	
100.301	punctate cataract, anterior cortex	17	0.4%	29	0.5%	14	0.7%	2	0.5%	
100.302	punctate cataract, posterior cortex	26	0.6%	42	0.8%	21	1.1%	2	0.5%	
100.303	punctate cataract, equatorial cortex	5	0.1%	9	0.2%	3	0.2%	0		
100.304	punctate cataract, anterior sutures	1	0.0%	1	0.0%	2	0.1%	0		
100.305	punctate cataract, posterior sutures	10	0.2%	11	0.2%	12	0.6%	1	0.3%	
100.306	punctate cataract, nucleus	2	0.0%	1	0.0%	1	0.1%	0		
100.307	punctate cataract, capsular	2	0.0%	10	0.2%	9	0.5%	0		
100.311	incipient cataract, anterior cortex	22	0.5%	25	0.4%	5	0.3%	5	1.3%	
100.312	incipient cataract, posterior cortex	36	0.8%	67	1.2%	16	0.9%	5	1.3%	
100.313	incipient cataract, equatorial cortex	2	0.0%	14	0.3%	4	0.2%	0		
100.314	incipient cataract, anterior sutures	1	0.0%	4	0.1%	2	0.1%	0		
100.315	incipient cataract, posterior sutures	8	0.2%	14	0.3%	2	0.1%	1	0.3%	
100.316	incipient cataract, nucleus	0		2	0.0%	0		0		
100.317	incipient cataract, capsular	1	0.0%	12	0.2%	0		2	0.5%	
100.330	generalized/complete cataract	4	0.1%	8	0.1%	0		0		
100.375	subluxation/luxation, unspecified	1	0.0%	0		0		0		

OCULAR DISORDERS REPORT BELGIAN TERVUREN

	1991-1999	2000-2009	2010-2013	2014
VITREOUS				
110.120 persistant hyaloid artery/remnant	4 0.1%	2 0.0%	0	1 0.3%
110.135 PHPV/PTVL	0	2 0.0%	0	1 0.3%
110.320 vitreous degeneration syneresis	5 0.1%	15 0.3%	4 0.2%	1 0.3%
110.330 vitreous degeneration anterior chamber	0	3 0.1%	0	0
FUNDUS				
97.110 choroidal hypoplasia	1 0.0%	0	0	0
97.120 coloboma	0	2 0.0%	0	0
RETINA				
120.170 retinal dysplasia, folds	14 0.3%	21 0.4%	2 0.1%	0
120.180 retinal dysplasia, geographic	5 0.1%	3 0.1%	1 0.1%	1 0.3%
120.310 generalized progressive retinal atrophy (PRA)	15 0.3%	6 0.1%	2 0.1%	0
120.910 retinal detachment without dialysis	1 0.0%	0	0	0
120.960 retinopathy	0	0	1 0.1%	0
OPTIC NERVE				
130.110 micropapilla	8 0.2%	73 1.3%	26 1.4%	3 0.8%
130.120 optic nerve hypoplasia	84 1.9%	4 0.1%	1 0.1%	1 0.3%
130.150 optic disc coloboma	2 0.0%	2 0.0%	0	0
OTHER				
900.000 other, unspecified	0	33 0.6%	74 4.0%	0
900.100 other, not inherited	27 0.6%	222 4.0%	27 1.4%	27 6.9%
900.110 other, suspected as inherited	38 0.9%	9 0.2%	10 0.5%	1 0.3%
NORMAL				
0.000 normal globe	3748 84.3%	4708 84.5%	1649 88.3%	340 87.2%

OCULAR DISORDERS REPORT

BERGER PICARD - 1

BERGER PICARD (PICARDY SHEPHERD- PICARDIE)

	DISORDER	INHERITANCE	REFERENCE	BREEDING ADVICE
A.	Distichiasis	Not defined	1	Breeder option
B.	Nictitans cartilage anomaly/eversion	Not defined	2	Breeder option
C.	Corneal dystrophy - epithelial/stromal	Not defined	2	Breeder option
D.	Persistent pupillary membranes - iris to iris	Not defined	1	Breeder option
E.	Cataract	Not defined	1	NO
F.	Retinal atrophy - generalized	Not defined	2	NO
G.	Retinal dysplasia - folds	Not defined	3	Breeder option
H.	Retinopathy	Not defined	2	Breeder option

Description and Comments

A. Distichiasis

Eyelashes abnormally located on the eyelid margin which may cause ocular irritation. Distichiasis may occur at any time in the life of a dog. It is difficult to make a strong recommendation with regard to breeding dogs with this entity. The hereditary basis has not been established although it seems probable due to the high incidence in some breeds. Reducing the incidence is a logical goal. When diagnosed, distichiasis should be recorded; breeding discretion is advised.

B. Nictitans cartilage anomaly/eversion

A scroll-like curling of the cartilage of the third eyelid, usually everting the margin. This condition may occur in one or both eyes and may cause mild ocular irritation.

C. Corneal dystrophy- epithelial/stromal

OCULAR DISORDERS REPORT

BERGER PICARD-1

A non-inflammatory corneal opacity (white to gray) present in one or more of the corneal layers. Corneal dystrophy implies a probable inherited basis and is usually bilateral.

D. Persistent pupillary membranes (PPM)

Persistent blood vessel remnants in the anterior chamber of the eye which fail to regress normally by 3 months of age. These strands may bridge from iris to iris, iris to cornea, iris to lens, or form sheets of tissue in the anterior chamber. The last three forms pose the greatest threat to vision and when severe, vision impairment or blindness may occur

E. Cataract

A partial or complete opacity of the lens and/or its capsule. In cases where cataracts are complete and affect both eyes, blindness results. The prudent approach is to assume cataracts to be hereditary except in cases known to be associated with trauma, other causes of ocular inflammation, specific metabolic diseases, persistent pupillary membrane, persistent hyaloid or nutritional deficiencies. Cataracts may involve the lens completely (diffuse) or in a localized region.

F. Retinal atrophy - generalized

A degenerative disease of the retinal visual cells which progresses to blindness. This abnormality is also known as progressive retinal atrophy or PRA, and may be detected by electroretinogram (not part of a routine eye screening examination) before there are detectable funduscopic changes seen by ophthalmoscopy. There are multiple genetic types of PRA including the rod cone dysplasias described elsewhere.

G. Retinal dysplasia - folds

Linear, triangular, curved or curvilinear foci of retinal folding that may be single or multiple. When seen in puppies, this condition may partially or completely resolve with maturity. Its significance to vision is unknown. There are two other forms of retinal dysplasia (geographic, detached) which are known to be inherited in other breeds and, in their most severe form, cause blindness. The genetic relationship between folds and more severe forms of retinal dysplasia is undetermined.

H. Retinopathy

A lesion similar to canine multi-focal retinopathy has been noted in the Berger Picard. The lesions initially appear as multifocal subretinal fluid elevations that over time may become hyper-reflective lesions.

References

1. ACVO Genetics Committee, 2009 and/or Data from CERF All-Breeds Report, 2008.
2. ACVO Genetics Committee, 2013-2014 and Data from OFA All-Breeds Report, 2013-2014.

OCULAR DISORDERS REPORT

3. ACVO Genetics Committee, 2011 and/or Data from CERF All-Breeds Report, 2010.

OCULAR DISORDERS REPORT BERGER PICARD

Diagnostic Name	TOTAL DOGS EXAMINED	1991-1999		2000-2009		2010-2013		2014	
		#	%	#	%	#	%	#	%
EYELIDS									
25.110 distichiasis		0		10	9.2%	35	8.6%	9	5.8%
NASOLACRIMAL									
40.910 keratoconjunctivitis sicca		0		0		0		1	0.6%
NICTITANS									
51.100 third eyelid cartilage anomaly		0		0		5	1.2%	4	2.6%
CORNEA									
70.700 corneal dystrophy		0		1	0.9%	7	1.7%	2	1.3%
UVEA									
90.250 pigmentary uveitis		0		0		1	0.2%	0	
93.710 persistent pupillary membranes, iris to iris		0		29	26.6%	121	29.9%	28	17.9%
93.750 persistent pupillary membranes, lens pigment foci/no strands		0		0		0		1	0.6%
93.760 persistent pupillary membranes, endothelial opacity/no strands		0		0		1	0.2%	0	
93.810 uveal melanoma		0		0		1	0.2%	0	
LENS									
100.210 cataract, significance unknown		0		16	14.7%	52	12.8%	12	7.7%
100.305 punctate cataract, posterior sutures		0		5	4.6%	14	3.5%	3	1.9%
100.306 punctate cataract, nucleus		0		0		1	0.2%	0	
100.307 punctate cataract, capsular		0		0		1	0.2%	0	
100.312 incipient cataract, posterior cortex		0		0		1	0.2%	3	1.9%
100.314 incipient cataract, anterior sutures		0		1	0.9%	0		0	
100.315 incipient cataract, posterior sutures		0		4	3.7%	2	0.5%	1	0.6%
100.322 incomplete cataract, posterior cortex		0		0		1	0.2%	0	
VITREOUS									
110.120 persistent hyaloid artery/remnant		0		0		0		4	2.6%
110.320 vitreous degeneration syneresis		0		1	0.9%	0		0	
RETINA									
120.170 retinal dysplasia, folds		0		18	16.5%	94	23.2%	28	17.9%
120.180 retinal dysplasia, geographic		0		0		5	1.2%	2	1.3%
120.200 retinitis		0		0		1	0.2%	7	4.5%
120.310 generalized progressive retinal atrophy (PRA)		0		2	1.8%	12	3.0%	2	1.3%
120.960 retinopathy		0		0		15	3.7%	0	
OPTIC NERVE									
130.150 optic disc coloboma		0		0		1	0.2%	0	
OTHER									
900.000 other, unspecified		0		15	13.8%	10	2.5%	0	
900.100 other, not inherited		0		4	3.7%	4	1.0%	17	10.9%
900.110 other, suspected as inherited		0		1	0.9%	6	1.5%	0	

OCULAR DISORDERS REPORT BERGER PICARD

	1991-1999	2000-2009	2010-2013	2014
NORMAL 0.000 normal globe	0	50 45.9%	208 51.4%	81 51.9%

OCULAR DISORDERS REPORT

BERNESE MOUNTAIN DOG - 1

BERNESE MOUNTAIN DOG

	DISORDER	INHERITANCE	REFERENCE	BREEDING ADVICE
A.	Entropion	Not defined	1	Breeder option
B.	Ectropion	Not defined	2, 3	Breeder option
C.	Distichiasis	Not defined	4	Breeder option
D.	Persistent pupillary membranes - iris to iris	Not defined	3	Breeder option
E.	Cataract	Not defined	3, 4	NO
F.	Retinal atrophy - generalized	Not defined	1, 5	NO
G.	Systemic histiocytosis	Not defined	6-10	NO

Description and Comments

A. Entropion

A conformational defect resulting in an "in-rolling" of one or both of the eyelids which may cause ocular irritation. It is likely that entropion is influenced by several genes (polygenic) defining the skin and other structures which make up the eyelids, the amount and weight of the skin covering the head and face, the orbital contents and the conformation of the skull.

B. Ectropion

A conformational defect resulting in eversion of the eyelid(s), which may cause ocular irritation due to exposure. It is likely that ectropion is influenced by several genes (polygenic) defining the skin and other structures which make up the eyelids, the amount and weight of the skin covering the head and face, the orbital contents and the conformation of the skull.

OCULAR DISORDERS REPORT

BERNESE MOUNTAIN DOG - 2

C. Distichiasis

Eyelashes abnormally located on the eyelid margin which may cause ocular irritation. Distichiasis may occur at any time in the life of a dog. It is difficult to make a strong recommendation with regard to breeding dogs with this entity. The hereditary basis has not been established although it seems probable due to the high incidence in some breeds. Reducing the incidence is a logical goal. When diagnosed, distichiasis should be recorded; breeding discretion is advised.

D. Persistent pupillary membranes (PPM)

Persistent blood vessel remnants in the anterior chamber of the eye which fail to regress normally by 3 months of age. These strands may bridge from iris to iris, iris to cornea, iris to lens, or form sheets of tissue in the anterior chamber. The last three forms pose the greatest threat to vision and when severe, vision impairment or blindness may occur

E. Cataract

A partial or complete opacity of the lens and/or its capsule. In cases where cataracts are complete and affect both eyes, blindness results. The prudent approach is to assume cataracts to be hereditary except in cases known to be associated with trauma, other causes of ocular inflammation, specific metabolic diseases, persistent pupillary membrane, persistent hyaloid or nutritional deficiencies. Cataracts may involve the lens completely (diffuse) or in a localized region.

F. Retinal atrophy - generalized

A degenerative disease of the retinal visual cells which progresses to blindness. This abnormality, also known as progressive retinal atrophy or PRA, may be detected by electroretinogram (not part of a routine eye screening examination) before it is apparent clinically. Except for X-linked PRA in the Siberian Husky, in all breeds studied to date, PRA is inherited as an autosomal recessive trait.

In the Bernese Mountain Dog, one French report found the early onset retinopathy to be functionally and electroretinographically similar to the congenital stationary night blindness (retinal dystrophy) seen in the Briard.

G. Systemic histiocytosis

An inflammatory, non-neoplastic disease arising from activated dermal Langerhans cells with an absence of infectious agents that responds to immunoregulatory drugs suggesting immune dysregulatory mechanisms. Seen as conjunctivitis, episcleritis, anterior and posterior uveitis, retinal detachments, and glaucoma. Malignant histiocytosis is a malignant histiocytic disease that is familial in the Bernese Mountain Dog with a polygenic mode of inheritance that represents up to 25% of all tumors in the breed.

OCULAR DISORDERS REPORT

BERNESE MOUNTAIN DOG - 3

References

1. ACVO Genetics Committee, 1999 and/or Data from CERF All-Breeds Report, 1991-1998.
2. ACVO Genetics Committee, 2002-2003 and/or Data from CERF All-Breeds Report, 2002-2003.
3. ACVO Genetics Committee, 2005 and/or Data from CERF All-Breeds Report 2003-2004.
4. ACVO Genetics Committee, 2000-2002 and/or Data from CERF All-Breeds Report, 2000-2002.
5. Chaudieu G and Molon-Noblot S. Early retinopathy in the Bernese Mountain Dog in France: preliminary observations. *Vet Ophthalmol.* 2004 May-Jun;7:175-184.
6. Cherie PH, Smedes SL and Feltz T. Ocular manifestations of systemic histiocytosis in a dog. *J Am Vet Med Assoc.* 1992;201:1229.
7. Moore PF and Rosin A. Malignant histiocytosis of Bernese mountain dogs. *Vet Pathol.* 1986 Jan;23:1-10.
8. Padgett GA, Madewell BR, Keller ET, et al. Inheritance of histiocytosis in Bernese mountain dogs. *J Small Anim Pract.* 1995 Mar;36:93-98.
9. Paterson S, Boydell P and Pike R. Systemic histiocytosis in the Bernese mountain dog. *J Small Anim Pract.* 1995 May;36:233-236.
10. Rosin A, P Moore and Dubielzig R. Malignant histiocytosis in Bernese Mountain dogs. *J Am Vet Med Assoc.* 1986 May 1;188:1041-1045.

OCULAR DISORDERS REPORT BERNESE MOUNTAIN DOG

Diagnostic Name	TOTAL DOGS EXAMINED	1991-1999		2000-2009		2010-2013		2014	
		#	%	#	%	#	%	#	%
GLOBE									
0.110	microphthalmia	3	0.1%	2	0.0%	3	0.1%	0	
10.000	glaucoma	0		0		2	0.1%	0	
EYELIDS									
20.160	macropalpebral fissure	8	0.3%	13	0.1%	4	0.1%	0	
21.000	entropion, unspecified	52	1.8%	150	1.7%	29	0.9%	6	0.9%
22.000	ectropion, unspecified	24	0.8%	58	0.7%	13	0.4%	6	0.9%
25.110	distichiasis	23	0.8%	71	0.8%	34	1.1%	7	1.0%
NASOLACRIMAL									
40.910	keratoconjunctivitis sicca	0		0		2	0.1%	0	
NICTITANS									
51.100	third eyelid cartilage anomaly	0		13	0.1%	26	0.8%	0	
52.110	prolapsed gland of the third eyelid	0		1	0.0%	0		0	
CORNEA									
70.210	corneal pannus	0		2	0.0%	0		0	
70.700	corneal dystrophy	10	0.3%	37	0.4%	16	0.5%	0	
70.730	corneal endothelial degeneration	3	0.1%	1	0.0%	0		0	
UVEA									
90.200	uveitis	0		0		1	0.0%	0	
90.250	pigmentary uveitis	0		0		1	0.0%	0	
93.110	iris hypoplasia	0		0		3	0.1%	0	
93.120	iris cyst	7	0.2%	31	0.4%	8	0.3%	4	0.6%
93.150	iris coloboma	0		4	0.0%	7	0.2%	0	
93.170	anterior chamber cyst	0		0		1	0.0%	2	0.3%
93.710	persistent pupillary membranes, iris to iris	59	2.0%	359	4.1%	138	4.3%	21	3.0%
93.720	persistent pupillary membranes, iris to lens	7	0.2%	7	0.1%	0		0	
93.730	persistent pupillary membranes, iris to cornea	2	0.1%	3	0.0%	1	0.0%	0	
93.740	persistent pupillary membranes, iris sheets	0		4	0.0%	1	0.0%	0	
93.750	persistent pupillary membranes, lens pigment foci/no strands	0		1	0.0%	8	0.3%	6	0.9%
93.760	persistent pupillary membranes, endothelial opacity/no strands	0		0		7	0.2%	1	0.1%
93.810	uveal melanoma	0		0		2	0.1%	0	
LENS									
100.200	cataract, unspecified	6	0.2%	0		0		0	
100.210	cataract, significance unknown	134	4.7%	587	6.7%	160	5.0%	55	8.0%
100.301	punctate cataract, anterior cortex	13	0.5%	42	0.5%	24	0.8%	3	0.4%
100.302	punctate cataract, posterior cortex	18	0.6%	50	0.6%	10	0.3%	2	0.3%
100.303	punctate cataract, equatorial cortex	9	0.3%	24	0.3%	6	0.2%	0	
100.304	punctate cataract, anterior sutures	2	0.1%	8	0.1%	4	0.1%	0	
100.305	punctate cataract, posterior sutures	4	0.1%	21	0.2%	4	0.1%	2	0.3%
100.306	punctate cataract, nucleus	4	0.1%	8	0.1%	5	0.2%	4	0.6%
100.307	punctate cataract, capsular	1	0.0%	10	0.1%	5	0.2%	2	0.3%
100.311	incipient cataract, anterior cortex	10	0.3%	27	0.3%	13	0.4%	1	0.1%
100.312	incipient cataract, posterior cortex	33	1.1%	100	1.1%	27	0.8%	4	0.6%
100.313	incipient cataract, equatorial cortex	10	0.3%	71	0.8%	16	0.5%	2	0.3%

OCULAR DISORDERS REPORT BERNESE MOUNTAIN DOG

LENS CONTINUED	1991-1999	2000-2009	2010-2013	2014
100.314 incipient cataract, anterior sutures	0	6 0.1%	2 0.1%	0
100.315 incipient cataract, posterior sutures	7 0.2%	18 0.2%	4 0.1%	0
100.316 incipient cataract, nucleus	8 0.3%	15 0.2%	3 0.1%	2 0.3%
100.317 incipient cataract, capsular	6 0.2%	29 0.3%	9 0.3%	1 0.1%
100.323 incomplete cataract, equatorial cortex	0	0	0	1 0.1%
100.326 incomplete cataract, nucleus	0	0	2 0.1%	0
100.330 generalized/complete cataract	8 0.3%	18 0.2%	1 0.0%	1 0.1%
100.375 subluxation/luxation, unspecified	2 0.1%	5 0.1%	0	2 0.3%
VITREOUS				
110.120 persistent hyaloid artery/remnant	7 0.2%	12 0.1%	1 0.0%	2 0.3%
110.135 PHPV/PTVL	2 0.1%	2 0.0%	4 0.1%	1 0.1%
110.320 vitreous degeneration syneresis	7 0.2%	15 0.2%	0	0
110.330 vitreous degeneration anterior chamber	0	6 0.1%	1 0.0%	0
FUNDUS				
97.110 choroidal hypoplasia	0	1 0.0%	0	0
RETINA				
120.170 retinal dysplasia, folds	7 0.2%	14 0.2%	12 0.4%	1 0.1%
120.180 retinal dysplasia, geographic	1 0.0%	3 0.0%	1 0.0%	2 0.3%
120.190 retinal dysplasia, detached	0	1 0.0%	0	1 0.1%
120.200 retinitis	0	0	0	1 0.1%
120.310 generalized progressive retinal atrophy (PRA)	17 0.6%	29 0.3%	5 0.2%	0
120.400 retinal hemorrhage	0	2 0.0%	0	0
120.910 retinal detachment without dialysis	0	3 0.0%	0	0
OPTIC NERVE				
130.110 micropapilla	3 0.1%	10 0.1%	2 0.1%	2 0.3%
130.120 optic nerve hypoplasia	4 0.1%	15 0.2%	8 0.3%	2 0.3%
130.150 optic disc coloboma	7 0.2%	13 0.1%	0	0
OTHER				
900.000 other, unspecified	0	57 0.6%	136 4.3%	0
900.100 other, not inherited	38 1.3%	412 4.7%	36 1.1%	25 3.6%
900.110 other, suspected as inherited	15 0.5%	32 0.4%	14 0.4%	1 0.1%
NORMAL				
0.000 normal globe	2434 84.5%	7574 86.3%	2930 92.2%	620 90.0%

OCULAR DISORDERS REPORT

BICHON FRISE - 1

BICHON FRISE

	DISORDER	INHERITANCE	REFERENCE	BREEDING ADVICE
A.	Distichiasis	Not defined	1	Breeder option
B.	Corneal dystrophy - epithelial/stromal	Not defined	1	Breeder option
C.	Persistent pupillary membranes			
	- iris to iris	Not defined	1, 2	Breeder option
	- all other forms	Not defined	2	NO
D.	Cataract	Not defined	1, 3, 4	NO
E.	Vitreous degeneration	Not defined	5	Breeder option
F.	Retinal dysplasia - folds	Not defined	1	Breeder option

Description and Comments

A. Distichiasis

Eyelashes abnormally located on the eyelid margin which may cause ocular irritation. Distichiasis may occur at any time in the life of a dog. It is difficult to make a strong recommendation with regard to breeding dogs with this entity. The hereditary basis has not been established although it seems probable due to the high incidence in some breeds. Reducing the incidence is a logical goal. When diagnosed, distichiasis should be recorded; breeding discretion is advised.

B. Corneal dystrophy- epithelial/stromal

A non-inflammatory corneal opacity (white to gray) present in one or more of the corneal layers; usually inherited and bilateral.

OCULAR DISORDERS REPORT

BICHON FRISE - 2

C. Persistent pupillary membranes (PPM)

Persistent blood vessel remnants in the anterior chamber of the eye which fail to regress normally by 3 months of age. These strands may bridge from iris to iris, iris to cornea, iris to lens, or form sheets of tissue in the anterior chamber. The last three forms pose the greatest threat to vision and when severe, vision impairment or blindness may occur.

In the Bichon Frise, many of these strands bridge between the iris and cornea where they may be associated with corneal opacities and vision impairment.

D. Cataract

A partial or complete opacity of the lens and/or its capsule. In cases where cataracts are complete and affect both eyes, blindness results. The prudent approach is to assume cataracts to be hereditary except in cases known to be associated with trauma, other causes of ocular inflammation, specific metabolic diseases, persistent pupillary membrane, persistent hyaloid or nutritional deficiencies. Cataracts may involve the lens completely (diffuse) or in a localized region.

The range in age of animals affected with cataracts in one study was 1-2 years to 9-10 years old, with the peak age of 3 years old. The cataracts involved all regions of the lens, but in age groups of 2-4 years old, the predominant regions affected were the posterior cortex, and the anterior and posterior cortices combined. The earliest abnormalities usually consisted of small punctate opacities in the paracentral posterior cortex, independent of the posterior lens sutures.

E. Vitreous degeneration

Liquefaction of the vitreous gel which may predispose to retinal detachment.

F. Retinal dysplasia - folds

Linear, triangular, curved or curvilinear foci of retinal folding that may be single or multiple. When seen in puppies, this condition may partially or completely resolve with maturity. Its significance to vision is unknown. There are two other forms of retinal dysplasia (geographic, detached) which are known to be inherited in other breeds and, in their most severe form, cause blindness. The genetic relationship between folds and more severe forms of retinal dysplasia is undetermined.

References

1. ACVO Genetics Committee, 1999 and/or Data from CERF All-Breeds Report, 1991-1998.
2. ACVO Genetics Committee, 2005 and/or Data from CERF All-Breeds Report 2003-2004.
3. Gelatt KN, Wallace MR, Andrew SE, et al. Cataracts in the Bichon Frise. *Vet Ophthalmol.* 2003 Mar;6:3-9.

OCULAR DISORDERS REPORT

BICHON FRISE - 3

4. Schmidt GM and Vainisi SJ. Retrospective study of prophylactic random transscleral retinopexy in the Bichon Frise with cataract. *Vet Ophthalmol.* 2004 Sep-Oct;7:307-310.
5. ACVO Genetics Committee, 2008 and/or Data from CERF All Breeds Report, 2003-2007.

OCULAR DISORDERS REPORT BICHON FRISE

Diagnostic Name	TOTAL DOGS EXAMINED	1991-1999 3304		2000-2009 4804		2010-2013 1237		2014 294	
		#	%	#	%	#	%	#	%
GLOBE									
0.110 microphthalmia		1	0.0%	1	0.0%	0		0	
EYELIDS									
20.140 ectopic cilia		1	0.0%	0		1	0.1%	0	
21.000 entropion, unspecified		3	0.1%	3	0.1%	0		0	
22.000 ectropion, unspecified		0		0		0		1	0.3%
25.110 distichiasis		66	2.0%	181	3.8%	73	5.9%	22	7.5%
NASOLACRIMAL									
40.910 keratoconjunctivitis sicca		1	0.0%	1	0.0%	0		0	
NICTITANS									
51.100 third eyelid cartilage anomaly		0		0		1	0.1%	0	
CORNEA									
70.210 corneal pannus		2	0.1%	0		0		0	
70.220 pigmentary keratitis		1	0.0%	0		0		0	
70.700 corneal dystrophy		80	2.4%	175	3.6%	55	4.4%	16	5.4%
70.730 corneal endothelial degeneration		1	0.0%	3	0.1%	1	0.1%	0	
UVEA									
93.110 iris hypoplasia		0		0		2	0.2%	0	
93.140 corneal endothelial pigment without PPM		0		2	0.0%	0		0	
93.150 iris coloboma		1	0.0%	0		3	0.2%	0	
93.710 persistent pupillary membranes, iris to iris		48	1.5%	127	2.6%	37	3.0%	6	2.0%
93.720 persistent pupillary membranes, iris to lens		11	0.3%	2	0.0%	0		0	
93.730 persistent pupillary membranes, iris to cornea		22	0.7%	6	0.1%	2	0.2%	1	0.3%
93.740 persistent pupillary membranes, iris sheets		6	0.2%	2	0.0%	0		0	
93.760 persistent pupillary membranes, endothelial opacity/no strands		0		0		6	0.5%	1	0.3%
LENS									
100.200 cataract, unspecified		23	0.7%	0		0		0	
100.210 cataract, significance unknown		144	4.4%	274	5.7%	79	6.4%	22	7.5%
100.301 punctate cataract, anterior cortex		35	1.1%	42	0.9%	22	1.8%	0	
100.302 punctate cataract, posterior cortex		26	0.8%	41	0.9%	14	1.1%	1	0.3%
100.303 punctate cataract, equatorial cortex		4	0.1%	5	0.1%	2	0.2%	0	
100.304 punctate cataract, anterior sutures		2	0.1%	5	0.1%	1	0.1%	0	
100.305 punctate cataract, posterior sutures		11	0.3%	21	0.4%	3	0.2%	2	0.7%
100.306 punctate cataract, nucleus		1	0.0%	5	0.1%	5	0.4%	0	
100.307 punctate cataract, capsular		1	0.0%	5	0.1%	4	0.3%	1	0.3%
100.311 incipient cataract, anterior cortex		25	0.8%	49	1.0%	5	0.4%	1	0.3%
100.312 incipient cataract, posterior cortex		82	2.5%	100	2.1%	20	1.6%	5	1.7%
100.313 incipient cataract, equatorial cortex		9	0.3%	21	0.4%	1	0.1%	1	0.3%
100.314 incipient cataract, anterior sutures		1	0.0%	1	0.0%	0		0	
100.315 incipient cataract, posterior sutures		14	0.4%	26	0.5%	4	0.3%	0	
100.316 incipient cataract, nucleus		3	0.1%	5	0.1%	1	0.1%	0	
100.317 incipient cataract, capsular		2	0.1%	6	0.1%	3	0.2%	1	0.3%
100.322 incomplete cataract, posterior cortex		0		0		2	0.2%	0	
100.330 generalized/complete cataract		89	2.7%	53	1.1%	5	0.4%	0	

OCULAR DISORDERS REPORT BICHON FRISE

LENS CONTINUED	1991-1999	2000-2009	2010-2013	2014
100.375 subluxation/luxation, unspecified	1 0.0%	3 0.1%	0	0
VITREOUS				
110.120 persistant hyaloid artery/remnant	12 0.4%	4 0.1%	3 0.2%	0
110.135 PHPV/PTVL	0	1 0.0%	2 0.2%	0
110.200 vitritis	0	0	1 0.1%	0
110.320 vitreous degeneration syneresis	18 0.5%	38 0.8%	30 2.4%	3 1.0%
110.330 vitreous degeneration anterior chamber	0	2 0.0%	3 0.2%	0
FUNDUS				
97.120 coloboma	1 0.0%	0	0	0
RETINA				
120.170 retinal dysplasia, folds	24 0.7%	34 0.7%	7 0.6%	2 0.7%
120.180 retinal dysplasia, geographic	3 0.1%	0	0	0
120.310 generalized progressive retinal atrophy (PRA)	24 0.7%	29 0.6%	4 0.3%	1 0.3%
120.910 retinal detachment without dialysis	1 0.0%	0	0	0
120.960 retinopathy	0	0	1 0.1%	0
OPTIC NERVE				
130.110 micropapilla	0	1 0.0%	0	0
130.120 optic nerve hypoplasia	1 0.0%	0	0	0
130.150 optic disc coloboma	8 0.2%	2 0.0%	0	0
OTHER				
900.000 other, unspecified	0	15 0.3%	24 1.9%	0
900.100 other, not inherited	13 0.4%	130 2.7%	10 0.8%	9 3.1%
900.110 other, suspected as inherited	19 0.6%	11 0.2%	4 0.3%	0
NORMAL				
0.000 normal globe	2700 81.7%	4065 84.6%	1044 84.4%	236 80.3%

OCULAR DISORDERS REPORT

BLACK AND TAN COONHOUND - 1

BLACK AND TAN COONHOUND

	DISORDER	INHERITANCE	REFERENCE	BREEDING ADVICE
A.	Cataract	Not defined	1	NO
B.	Retinal dysplasia - folds	Not defined	2	Breeder option

Description and Comments

A. Cataract

A partial or complete opacity of the lens and/or its capsule. In cases where cataracts are complete and affect both eyes, blindness results. The prudent approach is to assume cataracts to be hereditary except in cases known to be associated with trauma, other causes of ocular inflammation, specific metabolic diseases, persistent pupillary membrane, persistent hyaloid or nutritional deficiencies. Cataracts may involve the lens completely (diffuse) or in a localized region.

B. Retinal dysplasia - folds

Linear, triangular, curved or curvilinear foci of retinal folding that may be single or multiple. When seen in puppies, this condition may partially or completely resolve with maturity. Its significance to vision is unknown. There are two other forms of retinal dysplasia (geographic, detached) which are known to be inherited in other breeds and, in their most severe form, cause blindness. The genetic relationship between folds and more severe forms of retinal dysplasia is undetermined.

References

There are no references providing detailed descriptions of hereditary ocular conditions of the Black and Tan Coonhound breed. The conditions listed above are generally recognized to exist in the breed, as evidenced by identification on breed eye screening examinations and/or clinical experience of veterinary ophthalmologists.

1. ACVO Genetics Committee, 1999 and/or Data from CERF All-Breeds Report, 1991-1998.
2. ACVO Genetics Committee, 2005 and/or Data from CERF All-Breeds Report 2003-2004.

OCULAR DISORDERS REPORT BLACK AND TAN COONHOUND

Diagnostic Name	TOTAL DOGS EXAMINED	1991-1999		2000-2009		2010-2013		2014	
		#	%	#	%	#	%	#	%
GLOBE									
0.110 microphthalmia		0		1	0.4%	0		0	
EYELIDS									
21.000 entropion, unspecified		3	1.7%	0		0		0	
22.000 ectropion, unspecified		3	1.7%	0		0		3	7.5%
25.110 distichiasis		2	1.1%	3	1.2%	0		1	2.5%
NICTITANS									
51.100 third eyelid cartilage anomaly		0		1	0.4%	1	4.2%	0	
52.110 prolapsed gland of the third eyelid		0		1	0.4%	0		0	
CORNEA									
70.210 corneal pannus		2	1.1%	0		0		0	
UVEA									
93.710 persistent pupillary membranes, iris to iris		1	0.6%	4	1.6%	0		0	
93.720 persistent pupillary membranes, iris to lens		1	0.6%	2	0.8%	0		0	
93.750 persistent pupillary membranes, lens pigment foci/no strands		0		0		2	8.3%	4	10.0%
LENS									
100.210 cataract, significance unknown		11	6.3%	21	8.4%	7	29.2%	0	
100.301 punctate cataract, anterior cortex		2	1.1%	2	0.8%	1	4.2%	0	
100.302 punctate cataract, posterior cortex		1	0.6%	0		0		0	
100.305 punctate cataract, posterior sutures		0		1	0.4%	0		0	
100.306 punctate cataract, nucleus		2	1.1%	2	0.8%	0		0	
100.307 punctate cataract, capsular		0		1	0.4%	0		0	
100.311 incipient cataract, anterior cortex		1	0.6%	0		0		0	
100.312 incipient cataract, posterior cortex		3	1.7%	2	0.8%	0		0	
100.314 incipient cataract, anterior sutures		0		1	0.4%	0		0	
100.316 incipient cataract, nucleus		3	1.7%	0		0		0	
100.323 incomplete cataract, equatorial cortex		0		0		0		1	2.5%
100.330 generalized/complete cataract		1	0.6%	2	0.8%	0		0	
VITREOUS									
110.135 PHPV/PTVL		0		1	0.4%	0		0	
110.320 vitreous degeneration syneresis		0		0		1	4.2%	0	
FUNDUS									
97.110 choroidal hypoplasia		1	0.6%	0		0		0	
RETINA									
120.170 retinal dysplasia, folds		2	1.1%	12	4.8%	2	8.3%	5	12.5%
OTHER									
900.000 other, unspecified		0		0		2	8.3%	0	
900.100 other, not inherited		0		11	4.4%	1	4.2%	1	2.5%
NORMAL									
0.000 normal globe		143	82.2%	202	81.1%	14	58.3%	32	80.0%

OCULAR DISORDERS REPORT

BLACK RUSSIAN TERRIER - 1

BLACK RUSSIAN TERRIER

	DISORDER	INHERITANCE	REFERENCE	BREEDING ADVICE
A.	Persistent pupillary membranes - iris to iris	Not defined	1	Breeder option
B.	Cataract	Not defined	2, 3	NO

Description and Comments

A. Persistent pupillary membranes (PPM)

Persistent blood vessel remnants in the anterior chamber of the eye which fail to regress normally by 3 months of age. These strands may bridge from iris to iris, iris to cornea, iris to lens, or form sheets of tissue in the anterior chamber. The last three forms pose the greatest threat to vision and when severe, vision impairment or blindness may occur.

B. Cataract

A partial or complete opacity of the lens and/or its capsule. In cases where cataracts are complete and affect both eyes, blindness results. The prudent approach is to assume cataracts to be hereditary except in cases known to be associated with trauma, other causes of ocular inflammation, specific metabolic diseases, persistent pupillary membrane, persistent hyaloid or nutritional deficiencies. Cataracts may involve the lens completely (diffuse) or in a localized region.

References

There are no references providing detailed descriptions of hereditary ocular conditions of the Black Russian Terrier breed. The conditions listed above are generally recognized to exist in this breed, as evidenced by identification on breed eye screening examinations and/or clinical experience of veterinary ophthalmologists.

1. ACVO Genetics Committee, 2013-2014 and Data from OFA All-Breeds Report, 2013-2014.
2. ACVO Genetics Committee, 2007 and/or Data from CERF All-Breeds Report 2002-2006.
3. ACVO Genetics Committee, 2008 and/or Data from CERF All Breeds Report, 2003-2007.

OCULAR DISORDERS REPORT BLACK RUSSIAN TERRIER

Diagnostic Name	TOTAL DOGS EXAMINED	1991-1999		2000-2009		2010-2013		2014	
		#	%	#	%	#	%	#	%
EYELIDS									
21.000	entropion, unspecified	0		1	0.5%	3	1.2%	0	
22.000	ectropion, unspecified	0		0		2	0.8%	0	
25.110	distichiasis	0		3	1.5%	0		1	2.2%
NICTITANS									
51.100	third eyelid cartilage anomaly	0		1	0.5%	0		0	
52.110	prolapsed gland of the third eyelid	0		0		1	0.4%	0	
CORNEA									
70.700	corneal dystrophy	0		0		1	0.4%	0	
UVEA									
93.120	iris cyst	0		0		3	1.2%	0	
93.710	persistent pupillary membranes, iris to iris	0		3	1.5%	10	3.8%	0	
93.720	persistent pupillary membranes, iris to lens	0		1	0.5%	0		0	
93.760	persistent pupillary membranes, endothelial opacity/no strands	0		0		0		1	2.2%
LENS									
100.210	cataract, significance unknown	0		8	3.9%	18	6.9%	2	4.3%
100.301	punctate cataract, anterior cortex	0		1	0.5%	2	0.8%	0	
100.302	punctate cataract, posterior cortex	0		3	1.5%	2	0.8%	0	
100.304	punctate cataract, anterior sutures	0		1	0.5%	0		0	
100.305	punctate cataract, posterior sutures	0		1	0.5%	1	0.4%	0	
100.312	incipient cataract, posterior cortex	0		4	2.0%	4	1.5%	1	2.2%
100.315	incipient cataract, posterior sutures	0		0		1	0.4%	0	
100.316	incipient cataract, nucleus	0		0		1	0.4%	0	
100.323	incomplete cataract, equatorial cortex	0		0		6	2.3%	0	
VITREOUS									
110.320	vitreal degeneration syneresis	0		0		1	0.4%	0	
OPTIC NERVE									
130.110	micropapilla	0		1	0.5%	0		0	
OTHER									
900.000	other, unspecified	0		3	1.5%	9	3.5%	0	
900.100	other, not inherited	0		8	3.9%	2	0.8%	1	2.2%
900.110	other, suspected as inherited	0		1	0.5%	1	0.4%	0	
NORMAL									
0.000	normal globe	3	100.0%	186	91.2%	228	87.7%	41	89.1%

OCULAR DISORDERS REPORT

BLOODHOUND - 1

BLOODHOUND

	DISORDER	INHERITANCE	REFERENCE	BREEDING ADVICE
A.	Ectropion	Not defined	1, 2	Breeder option
B.	Entropion	Not defined	1-3	Breeder option
C.	Macroblepharon	Not defined	1, 2	Breeder option
D.	Prolapsed gland of the third eyelid	Not defined	1, 2	Breeder option
E.	Persistent pupillary membranes			
	- iris to iris	Not defined	4, 5	Breeder option
	- iris to cornea	Not defined	5	NO
	- all other forms	Not defined	5	NO
F.	Cataract	Not defined	4	NO
G.	Retinal dysplasia - folds	Not defined	4, 5	Breeder option

Description and Comment

A. Ectropion

A conformational defect resulting in eversion of the eyelid(s), which may cause ocular irritation due to exposure. It is likely that ectropion is influenced by several genes (polygenic) defining the skin and other structures which make up the eyelids, the amount and weight of the skin covering the head and face, the orbital contents and the conformation of the skull.

B. Entropion

A conformational defect resulting in an "in-rolling" of one or both of the eyelids which may cause ocular irritation. It is likely that entropion is influenced by several genes (polygenic) defining the skin and other structures which make up the eyelids, the amount and weight of the skin covering the head and face, the orbital contents and the conformation of the skull.

OCULAR DISORDERS REPORT

BLOODHOUND - 2

C. Macroblepharon

Defined as an exceptionally large palpebral fissure, macroblepharon in conjunction with laxity of the lateral canthal structures may lead to lower lid ectropion and upper lid entropion. Either of these conditions may lead to severe ocular irritation.

D. Prolapsed gland of the third eyelid

Protrusion of the tear gland associated with the third eyelid. The mode of inheritance of this disorder is unknown. The exposed gland may become irritated. Commonly referred to as "cherry eye".

E. Persistent pupillary membranes (PPM)

Persistent blood vessel remnants in the anterior chamber of the eye which fail to regress normally by 3 months of age. These strands may bridge from iris to iris, iris to cornea, iris to lens, or form sheets of tissue in the anterior chamber. The last three forms pose the greatest threat to vision and when severe, vision impairment or blindness may occur.

F. Cataract

A partial or complete opacity of the lens and/or its capsule. In cases where cataracts are complete and affect both eyes, blindness results. The prudent approach is to assume cataracts to be hereditary except in cases known to be associated with trauma, other causes of ocular inflammation, specific metabolic diseases, persistent pupillary membrane, persistent hyaloid or nutritional deficiencies. Cataracts may involve the lens completely (diffuse) or in a localized region.

G. Retinal dysplasia - folds

Linear, triangular, curved or curvilinear foci of retinal folding that may be single or multiple. When seen in puppies, this condition may partially or completely resolve with maturity. Its significance to vision is unknown. There are two other forms of retinal dysplasia (geographic, detached) which are known to be inherited in other breeds and, in their most severe form, cause blindness. The genetic relationship between folds and more severe forms of retinal dysplasia is undetermined.

References

There are few references providing detailed descriptions of hereditary ocular conditions of the Bloodhound breed. The conditions listed above are generally recognized to exist in this breed, as evidenced by identification on breed eye screening examinations and/or clinical experience of veterinary ophthalmologists.

1. ACVO Genetics Committee, 1999 and/or Data from CERF All-Breeds Report, 1991-1998.
2. Barnett KC. Comparative aspects of canine hereditary eye disease. *Adv Vet Sci Comp Med.* 1976;20:39-67.

OCULAR DISORDERS REPORT

BLOODHOUND - 3

3. ACVO Genetics Committee, 2001 and/or Data from CERF All-Breeds Report, 2001.
4. ACVO Genetics Committee, 2000-2002 and/or Data from CERF All-Breeds Report, 2000-2002.
5. ACVO Genetics Committee, 2005 and/or Data from CERF All-Breeds Report 2003-2004.

OCULAR DISORDERS REPORT BLOODHOUND

Diagnostic Name	TOTAL DOGS EXAMINED	1991-1999		2000-2009		2010-2013		2014	
		#	%	#	%	#	%	#	%
GLOBE									
0.110 microphthalmia		0		0		1	1.4%	0	
EYELIDS									
20.160 macropalpebral fissure		36	17.9%	36	14.1%	3	4.1%	0	
21.000 entropion, unspecified		47	23.4%	62	24.2%	5	6.8%	1	10.0%
22.000 ectropion, unspecified		56	27.9%	73	28.5%	6	8.2%	1	10.0%
25.110 distichiasis		2	1.0%	4	1.6%	3	4.1%	0	
NASOLACRIMAL									
40.910 keratoconjunctivitis sicca		0		1	0.4%	0		0	
NICTITANS									
51.100 third eyelid cartilage anomaly		1	0.5%	0		0		0	
52.110 prolapsed gland of the third eyelid		1	0.5%	4	1.6%	1	1.4%	0	
CORNEA									
70.210 corneal pannus		2	1.0%	3	1.2%	0		0	
70.220 pigmentary keratitis		0		2	0.8%	0		0	
70.730 corneal endothelial degeneration		2	1.0%	0		0		0	
UVEA									
93.710 persistent pupillary membranes, iris to iris		13	6.5%	4	1.6%	0		0	
93.720 persistent pupillary membranes, iris to lens		2	1.0%	2	0.8%	0		0	
93.730 persistent pupillary membranes, iris to cornea		23	11.4%	13	5.1%	0		0	
93.750 persistent pupillary membranes, lens pigment foci/no strands		0		1	0.4%	0		0	
93.760 persistent pupillary membranes, endothelial opacity/no strands		0		0		1	1.4%	0	
95.120 ciliary body cyst		0		0		0		1	10.0%
LENS									
100.200 cataract, unspecified		1	0.5%	0		0		0	
100.210 cataract, significance unknown		3	1.5%	5	2.0%	5	6.8%	0	
100.301 punctate cataract, anterior cortex		6	3.0%	4	1.6%	0		0	
100.302 punctate cataract, posterior cortex		1	0.5%	0		0		0	
100.306 punctate cataract, nucleus		0		1	0.4%	2	2.7%	0	
100.307 punctate cataract, capsular		1	0.5%	1	0.4%	0		0	
100.311 incipient cataract, anterior cortex		4	2.0%	7	2.7%	4	5.5%	0	
100.312 incipient cataract, posterior cortex		3	1.5%	1	0.4%	2	2.7%	0	
100.314 incipient cataract, anterior sutures		2	1.0%	1	0.4%	0		0	
100.315 incipient cataract, posterior sutures		0		1	0.4%	0		0	
100.316 incipient cataract, nucleus		1	0.5%	2	0.8%	0		1	10.0%
100.317 incipient cataract, capsular		0		4	1.6%	0		0	
100.330 generalized/complete cataract		1	0.5%	0		0		0	
100.340 resorbing/hypermature cataract		0		0		1	1.4%	0	
VITREOUS									
110.120 persistent hyaloid artery/remnant		0		1	0.4%	0		0	
110.135 PHPV/PTVL		0		1	0.4%	0		0	
110.320 vitreous degeneration syneresis		1	0.5%	0		0		0	

OCULAR DISORDERS REPORT BLOODHOUND

	1991-1999	2000-2009	2010-2013	2014
RETINA				
120.170 retinal dysplasia, folds	12 6.0%	20 7.8%	0	0
120.310 generalized progressive retinal atrophy (PRA)	1 0.5%	0	0	0
120.910 retinal detachment without dialysis	1 0.5%	0	0	0
OPTIC NERVE				
130.150 optic disc coloboma	1 0.5%	0	0	0
OTHER				
900.000 other, unspecified	0	0	5 6.8%	0
900.100 other, not inherited	4 2.0%	8 3.1%	1 1.4%	0
900.110 other, suspected as inherited	3 1.5%	6 2.3%	0	0
NORMAL				
0.000 normal globe	73 36.3%	117 45.7%	55 75.3%	7 70.0%

OCULAR DISORDERS REPORT

BOERBOEL - 1

BOERBOEL

	DISORDER	INHERITANCE	REFERENCE	BREEDING ADVICE
A.	Multifocal retinopathy - cmr1 * a DNA test is available.	Autosomal recessive	1	Breeder option

Description and Comments

A. Multifocal retinopathy

Canine Multi-focal Retinopathy type 1 (cmr1) is characterized by numerous distinct (i.e. multi-focal), roughly circular patches of elevated retina (multifocal bullous retinal detachments). There may be a serous subretinal fluid, or accumulation of subretinal material that produces gray-tan-pink colored lesions. These lesions, looking somewhat like blisters, vary in location and size, although typically they are present in both eyes of the affected dog.

The disease generally develops in young dogs between 11-20 weeks of age and there is minimal progression after 1 year of age. The lesions may flatten, leaving areas of retinal thinning and RPE hypertrophy, hyperplasia, and pigmentation. Discrete areas of tapetal hyper-reflectivity may be seen in areas of previous retinal and RPE detachments. Most dogs exhibit no noticeable problem with vision or electroretinographic abnormalities despite their abnormal appearing retinas.

Canine Multi-focal Retinopathy type 1 is caused by a mutation in the Bestrophin 1 gene (BEST1) and is described to be recessively inherited in the Great Pyrenees, Dogue de Bordeaux, Bullmastiff, and Mastiff.

References

There are no references providing detailed descriptions of hereditary conditions of the Boerboel breed. The conditions listed above are generally recognized to exist in this breed, as evidenced by identification on breed eye screening examinations and/or clinical experience of veterinary ophthalmologists.

1. Zangerl B, Wickstrom K, Slavik J, et al. Assessment of canine BEST1 variations identifies new mutations and establishes an independent bestrophinopathy model (cmr3). *Mol Vis*. 2010;16:2791-2804.

OCULAR DISORDERS REPORT BOERBOEL

Diagnostic Name	TOTAL DOGS EXAMINED	1991-1999		2000-2009		2010-2013		2014		
		#	%	#	%	#	%	#	%	
EYELIDS										
20.160	macropalpebral fissure	0		0		1	7.1%	0		
22.000	ectropion, unspecified	0		0		1	7.1%	0		
25.110	distichiasis	0		0		2	14.3%	1	16.7%	
UVEA										
93.710	persistent pupillary membranes, iris to iris	0		0		1	7.1%	0		
93.760	persistent pupillary membranes, endothelial opacity/no strands	0		0		1	7.1%	0		
LENS										
100.210	cataract, significance unknown	0		0		1	7.1%	1	16.7%	
100.305	punctate cataract, posterior sutures	0		0		1	7.1%	0		
RETINA										
120.180	retinal dysplasia, geographic	0		0		1	7.1%	0		
NORMAL										
0.000	normal globe	0		2	100.0%	9	64.3%	5	83.3%	

OCULAR DISORDERS REPORT

BOLOGNESE - 1

BOLOGNESE

	DISORDER	INHERITANCE	REFERENCE	BREEDING ADVICE
A.	Distichiasis	Not defined	1	Breeder option
B.	Corneal dystrophy - epithelial/stromal	Not defined	2	Breeder option
C.	Persistent pupillary membranes - iris to iris	Not defined	1	Breeder option

Description and Comments

A. Distichiasis

Eyelashes abnormally located on the eyelid margin which may cause ocular irritation. Distichiasis may occur at any time in the life of a dog. It is difficult to make a strong recommendation with regard to breeding dogs with this entity. The hereditary basis has not been established although it seems probable due to the high incidence in some breeds. Reducing the incidence is a logical goal. When diagnosed, distichiasis should be recorded; breeding discretion is advised.

B. Corneal Dystrophy - epithelial/stromal

A non-inflammatory corneal opacity (white to gray) present in one or more of the corneal layers. Corneal dystrophy implies a probable inherited basis and is usually bilateral.

C. Persistent pupillary membranes (PPM)

Persistent blood vessel remnants in the anterior chamber of the eye which fail to regress normally by 3 months of age. These strands may bridge from iris to iris, iris to cornea, iris to lens, or form sheets of tissue in the anterior chamber. The last three forms pose the greatest threat to vision and when severe, vision impairment or blindness may occur

References

There are no references providing detailed descriptions of hereditary ocular conditions of the Bolognese breed. The conditions listed above are generally recognized to exist in the breed, as evidenced by identification on breed eye screening examinations and/or clinical experience of veterinary ophthalmologists.

1. ACVO Genetics Committee, 2005 and/or Data from CERF All-Breeds Report 2003-2004.

OCULAR DISORDERS REPORT

BOLOGNESE - 2

2. ACVO Genetics Committee, 2013-2014 and Data from OFA All-Breeds Report, 2013-2014.

OCULAR DISORDERS REPORT BOLOGNESE

Diagnostic Name	TOTAL DOGS EXAMINED		1991-1999		2000-2009		2010-2013		2014	
	#	%	#	%	#	%	#	%	#	%
EYELIDS										
21.000 entropion, unspecified	0		3	1.0%	0		0		0	
25.110 distichiasis	10	16.7%	55	18.6%	40	14.3%	0		0	
NASOLACRIMAL										
32.110 imperforate lower nasolacrimal punctum	0		0		1	0.4%	0		0	
40.910 keratoconjunctivitis sicca	0		0		2	0.7%	0		0	
NICTITANS										
52.110 prolapsed gland of the third eyelid	0		2	0.7%	0		0		0	
CORNEA										
70.700 corneal dystrophy	0		5	1.7%	6	2.2%	3	7.5%		
UVEA										
93.710 persistent pupillary membranes, iris to iris	12	20.0%	52	17.6%	27	9.7%	2	5.0%		
93.730 persistent pupillary membranes, iris to cornea	1	1.7%	3	1.0%	2	0.7%	0			
93.760 persistent pupillary membranes, endothelial opacity/no strands	0		2	0.7%	2	0.7%	0			
LENS										
100.210 cataract, significance unknown	1	1.7%	12	4.1%	5	1.8%	0			
100.305 punctate cataract, posterior sutures	0		0		1	0.4%	0			
100.311 incipient cataract, anterior cortex	1	1.7%	1	0.3%	0		0			
100.312 incipient cataract, posterior cortex	0		1	0.3%	2	0.7%	0			
100.313 incipient cataract, equatorial cortex	0		1	0.3%	2	0.7%	0			
100.315 incipient cataract, posterior sutures	1	1.7%	6	2.0%	0		0			
100.317 incipient cataract, capsular	0		1	0.3%	0		0			
100.330 generalized/complete cataract	2	3.3%	2	0.7%	0		0			
VITREOUS										
110.200 vitritis	0		0		1	0.4%	0			
110.320 vitreous degeneration syneresis	4	6.7%	0		4	1.4%	0			
110.330 vitreous degeneration anterior chamber	0		3	1.0%	0		0			
RETINA										
120.170 retinal dysplasia, folds	1	1.7%	5	1.7%	0		0			
120.190 retinal dysplasia, detached	0		0		1	0.4%	0			
120.310 generalized progressive retinal atrophy (PRA)	0		1	0.3%	0		0			
120.910 retinal detachment without dialysis	0		0		1	0.4%	0			
OPTIC NERVE										
130.110 micropapilla	0		1	0.3%	0		0			
OTHER										
900.000 other, unspecified	0		2	0.7%	17	6.1%	0			
900.100 other, not inherited	1	1.7%	19	6.4%	0		0			
900.110 other, suspected as inherited	1	1.7%	3	1.0%	0		0			

OCULAR DISORDERS REPORT BOLOGNESE

	1991-1999	2000-2009	2010-2013	2014
NORMAL 0.000 normal globe	36 60.0%	197 66.6%	230 82.4%	37 92.5%

OCULAR DISORDERS REPORT

BORDER COLLIE - 1

BORDER COLLIE

	DISORDER	INHERITANCE	REFERENCE	BREEDING ADVICE
A.	Distichiasis	Not defined	1	Breeder option
B.	Corneal dystrophy - epithelial/stromal	Not defined	1	Breeder option
F.	Persistent pupillary membranes			
	- iris to iris	Not defined	2, 3	Breeder option
	- all other forms	Not defined	3	NO
D.	Lens luxation	Not defined	4	NO
E.	Cataract	Not defined	2	NO
F.	Retinal atrophy - generalized	Suggested X Linked	2, 5, 6	NO
G.	Retinal dysplasia - folds	Not defined	2	Breeder option
H.	Central progressive retinal atrophy	Not defined	7	NO
I.	Choroidal hypoplasia * a DNA test is available	Autosomal recessive	8-10	NO
J.	Ceroid lipofuscinosis * a DNA test is available	Not defined	11, 12	NO

Description and Comments

A. Distichiasis

Eyelashes abnormally located on the eyelid margin which may cause ocular irritation. Distichiasis may occur at any time in the life of a dog. It is difficult to make a strong recommendation with regard to breeding dogs with this entity. The hereditary basis has not been established although it seems probable due to the high incidence in some breeds. Reducing the incidence is a logical goal. When diagnosed, distichiasis should be recorded; breeding discretion is advised.

©2014, American College of Veterinary Ophthalmologists

OCULAR DISORDERS REPORT

BORDER COLLIE - 2

B. Corneal Dystrophy - epithelial/stromal

A non-inflammatory corneal opacity (white to gray) present in one or more of the corneal layers. Corneal dystrophy implies a probable inherited basis and is usually bilateral.

C. Persistent pupillary membranes (PPM)

Persistent blood vessel remnants in the anterior chamber of the eye which fail to regress normally by 3 months of age. These strands may bridge from iris to iris, iris to cornea, iris to lens, or form sheets of tissue in the anterior chamber. The last three forms pose the greatest threat to vision and when severe, vision impairment or blindness may occur.

D. Lens luxation

Partial (subluxation) or complete displacement of the lens from the normal anatomic site behind the pupil. Lens luxation not associated with trauma or inflammation is presumed to be inherited. Lens luxation may result in elevated intraocular pressure (glaucoma), causing vision impairment or blindness.

E. Cataract

A partial or complete opacity of the lens and/or its capsule. In cases where cataracts are complete and affect both eyes, blindness results. The prudent approach is to assume cataracts to be hereditary except in cases known to be associated with trauma, other causes of ocular inflammation, specific metabolic diseases, persistent pupillary membrane, persistent hyaloid or nutritional deficiencies. Cataracts may involve the lens completely (diffuse) or in a localized region.

F. Retinal atrophy - generalized

A degenerative disease of the retinal visual cells which progresses to blindness. This abnormality, also known as progressive retinal atrophy or PRA, may be detected by electroretinogram (not part of a routine eye screening examination) before it is apparent clinically. Except for X-linked PRA in the Siberian Husky and Border Collie and a dominant form in the Mastiff and Bullmastiff, in all breeds studied to date, PRA is inherited as an autosomal recessive trait.

G. Retinal dysplasia - folds

Linear, triangular, curved or curvilinear foci of retinal folding that may be single or multiple. When seen in puppies, this condition may partially or completely resolve with maturity. Its significance to vision is unknown. There are two other forms of retinal dysplasia (geographic, detached) which are known to be inherited in other breeds and, in their most severe form, cause blindness. The genetic relationship between folds and more severe forms of retinal dysplasia is undetermined.

OCULAR DISORDERS REPORT

BORDER COLLIE - 3

H. Central progressive retinal atrophy (CPRA)

A progressive retinal degeneration in which photoreceptor degeneration occurs secondary to disease of the underlying pigment epithelium. Progression is slow and some animals may never lose vision. CPRA is a frequent occurrence in England, but is uncommon elsewhere.

A majority of Border Collies with CPRA are diagnosed by two years of age, and the ophthalmoscopic appearance is similar to that of CPRA reported in the Labrador Retriever. The most striking ophthalmoscopic feature is the appearance of multiple dark brown spots that vary considerably in size, shape and density. As with CPRA in other dog breeds, affected dogs will be visually impaired but may not lose vision completely.

I. Choroidal hypoplasia

Inadequate development of the choroid present at birth and non-progressive. This condition is more commonly identified in the Collie breed where it is a manifestation of "Collie Eye Anomaly". A DNA test is available.

J. Ceroid lipofuscinosis

An inherited disease of man and animals characterized by the accumulation of lipopigment in various tissues of the body including the eye. It results in progressive neurologic disease including blindness. (Also called Batten's disease.) A DNA test is available.

References

1. ACVO Genetics Committee, 2007 and/or Data from CERF All-Breeds Report 2002-2006.
2. ACVO Genetics Committee, 1999 and/or Data from CERF All-Breeds Report, 1991-1998.
3. ACVO Genetics Committee, 2005 and/or Data from CERF All-Breeds Report 2003-2004.
4. Foster SJ, Curtis R and Barnett KC. Primary lens luxation in the Border Collie. *J Small Anim Pract.* 1986;27:1.
5. Barnett KC. Canine retinopathies III. The other breeds. *J Small Anim Pract.* 1965;6:185.
6. Vilboux T, Chaudieu G, Jeannin P, et al. Progressive retinal atrophy in the Border Collie: a new XLPRA. *BMC veterinary research.* 2008;4:10.
7. McLellan GJ, Watson P, et al. Vitamin E deficiency in canine retinal pigment epithelial dystrophy (central progressive retinal atrophy). *Proc Am Coll Vet Ophthalmol.* 1997;27.
8. Bedford PG. Collie eye anomaly in the border collie. *Vet Rec.* 1982 Jul 10;111:34-35.
9. Lowe JK, Kukekova AV, Kirkness EF, et al. Linkage mapping of the primary disease locus for collie eye anomaly. *Genomics.* 2003;82:86-95.

OCULAR DISORDERS REPORT

BORDER COLLIE - 4

10. Parker HG, Kukekova AV, Akey DT, et al. Breed relationships facilitate fine-mapping studies: a 7.8-kb deletion cosegregates with Collie eye anomaly across multiple dog breeds. *Genome Res.* 2007 Nov;17:1562-1571.
11. Jolly RD, Palmer DN and Studdert VP. Canine ceroid-lipofuscinoses: A review and classification. *J Small Anim Pract.* 1994;35:299.
12. Melville SA, Wilson CL, Chiang CS, et al. A mutation in canine CLN5 causes neuronal ceroid lipofuscinosis in Border collie dogs. *Genomics.* 2005 Sep;86:287-294.

OCULAR DISORDERS REPORT BORDER COLLIE

Diagnostic Name	TOTAL DOGS EXAMINED		1991-1999 8438		2000-2009 12641		2010-2013 3460		2014 682	
	#	%	#	%	#	%	#	%	#	%
GLOBE										
0.110	microphthalmia	6	0.1%	5	0.0%	1	0.0%	1	0.1%	
10.000	glaucoma	0		0		0		1	0.1%	
EYELIDS										
21.000	entropion, unspecified	1	0.0%	0		1	0.0%	0		
25.110	distichiasis	35	0.4%	52	0.4%	22	0.6%	7	1.0%	
NICTITANS										
51.100	third eyelid cartilage anomaly	0		1	0.0%	1	0.0%	1	0.1%	
CORNEA										
70.210	corneal pannus	2	0.0%	7	0.1%	10	0.3%	0		
70.220	pigmentary keratitis	0		0		0		1	0.1%	
70.700	corneal dystrophy	57	0.7%	89	0.7%	38	1.1%	11	1.6%	
70.730	corneal endothelial degeneration	0		4	0.0%	0		0		
UVEA										
90.250	pigmentary uveitis	0		0		0		1	0.1%	
93.110	iris hypoplasia	0		0		1	0.0%	0		
93.120	iris cyst	1	0.0%	7	0.1%	0		0		
93.140	corneal endothelial pigment without PPM	0		2	0.0%	0		0		
93.150	iris coloboma	1	0.0%	7	0.1%	0		0		
93.170	anterior chamber cyst	0		0		1	0.0%	0		
93.710	persistent pupillary membranes, iris to iris	305	3.6%	872	6.9%	336	9.7%	56	8.2%	
93.720	persistent pupillary membranes, iris to lens	12	0.1%	17	0.1%	1	0.0%	1	0.1%	
93.730	persistent pupillary membranes, iris to cornea	13	0.2%	20	0.2%	0		1	0.1%	
93.740	persistent pupillary membranes, iris sheets	2	0.0%	12	0.1%	0		1	0.1%	
93.750	persistent pupillary membranes, lens pigment foci/no strands	0		3	0.0%	3	0.1%	0		
93.760	persistent pupillary membranes, endothelial opacity/no strands	0		2	0.0%	1	0.0%	0		
95.120	ciliary body cyst	0		0		0		1	0.1%	
97.150	chorioretinal coloboma, congenital	0		0		1	0.0%	1	0.1%	
LENS										
100.200	cataract, unspecified	57	0.7%	0		0		0		
100.210	cataract, significance unknown	275	3.3%	660	5.2%	179	5.2%	43	6.3%	
100.301	punctate cataract, anterior cortex	41	0.5%	45	0.4%	19	0.5%	3	0.4%	
100.302	punctate cataract, posterior cortex	23	0.3%	27	0.2%	9	0.3%	2	0.3%	
100.303	punctate cataract, equatorial cortex	17	0.2%	17	0.1%	12	0.3%	0		
100.304	punctate cataract, anterior sutures	4	0.0%	1	0.0%	1	0.0%	0		
100.305	punctate cataract, posterior sutures	38	0.5%	45	0.4%	33	1.0%	2	0.3%	
100.306	punctate cataract, nucleus	8	0.1%	9	0.1%	9	0.3%	0		
100.307	punctate cataract, capsular	4	0.0%	11	0.1%	11	0.3%	1	0.1%	
100.311	incipient cataract, anterior cortex	53	0.6%	57	0.5%	22	0.6%	3	0.4%	
100.312	incipient cataract, posterior cortex	36	0.4%	43	0.3%	15	0.4%	5	0.7%	
100.313	incipient cataract, equatorial cortex	32	0.4%	61	0.5%	14	0.4%	4	0.6%	
100.314	incipient cataract, anterior sutures	3	0.0%	8	0.1%	2	0.1%	0		
100.315	incipient cataract, posterior sutures	10	0.1%	33	0.3%	10	0.3%	0		
100.316	incipient cataract, nucleus	12	0.1%	9	0.1%	5	0.1%	0		
100.317	incipient cataract, capsular	4	0.0%	16	0.1%	3	0.1%	2	0.3%	

OCULAR DISORDERS REPORT BORDER COLLIE

LENS CONTINUED	1991-1999		2000-2009		2010-2013		2014	
100.321 incomplete cataract, anterior cortex	0		0		1	0.0%	0	
100.322 incomplete cataract, posterior cortex	0		0		1	0.0%	0	
100.323 incomplete cataract, equatorial cortex	0		0		1	0.0%	0	
100.330 generalized/complete cataract	12	0.1%	13	0.1%	4	0.1%	1	0.1%
100.375 subluxation/luxation, unspecified	6	0.1%	8	0.1%	0		0	
VITREOUS								
110.120 persistent hyaloid artery/remnant	25	0.3%	37	0.3%	1	0.0%	2	0.3%
110.135 PHPV/PTVL	5	0.1%	12	0.1%	1	0.0%	0	
110.200 vitritis	0		0		1	0.0%	1	0.1%
110.320 vitreous degeneration syneresis	26	0.3%	74	0.6%	43	1.2%	4	0.6%
110.330 vitreous degeneration anterior chamber	0		7	0.1%	3	0.1%	0	
FUNDUS								
97.110 choroidal hypoplasia	166	2.0%	224	1.8%	28	0.8%	8	1.2%
97.120 coloboma	11	0.1%	34	0.3%	4	0.1%	0	
RETINA								
120.170 retinal dysplasia, folds	58	0.7%	108	0.9%	21	0.6%	2	0.3%
120.180 retinal dysplasia, geographic	7	0.1%	8	0.1%	0		0	
120.200 retinitis	0		0		1	0.0%	9	1.3%
120.310 generalized progressive retinal atrophy (PRA)	97	1.1%	106	0.8%	17	0.5%	5	0.7%
120.400 retinal hemorrhage	4	0.0%	2	0.0%	0		0	
120.910 retinal detachment without dialysis	6	0.1%	11	0.1%	1	0.0%	0	
120.960 retinopathy	0		0		3	0.1%	0	
OPTIC NERVE								
130.110 micropapilla	0		12	0.1%	4	0.1%	1	0.1%
130.120 optic nerve hypoplasia	9	0.1%	8	0.1%	2	0.1%	0	
130.150 optic disc coloboma	45	0.5%	36	0.3%	9	0.3%	1	0.1%
OTHER								
900.000 other, unspecified	0		70	0.6%	144	4.2%	0	
900.100 other, not inherited	53	0.6%	552	4.4%	39	1.1%	30	4.4%
900.110 other, suspected as inherited	59	0.7%	32	0.3%	16	0.5%	1	0.1%
NORMAL								
0.000 normal globe	7190	85.2%	10629	84.1%	2921	84.4%	560	82.1%

OCULAR DISORDERS REPORT

BORDER TERRIER - 1

BORDER TERRIER

	DISORDER	INHERITANCE	REFERENCE	BREEDING ADVICE
A.	Distichiasis	Not defined	1	Breeder option
B.	Persistent pupillary membranes			
	- iris to iris	Not defined	2, 3	Breeder option
	- all other forms	Not defined	3	NO
C.	Cataract	Not defined	4	NO
D.	Vitreous degeneration	Not defined	4	Breeder option

Description and Comments

A. Distichiasis

Eyelashes abnormally located on the eyelid margin which may cause ocular irritation. Distichiasis may occur at any time in the life of a dog. It is difficult to make a strong recommendation with regard to breeding dogs with this entity. The hereditary basis has not been established, although it seems probable due to the high incidence in some breeds. Reducing the incidence is a logical goal. When diagnosed, distichiasis should be recorded; breeding discretion is advised.

B. Persistent pupillary membranes (PPM)

Persistent blood vessel remnants in the anterior chamber of the eye which fail to regress normally by 3 months of age. These strands may bridge from iris to iris, iris to cornea, iris to lens, or form sheets of tissue in the anterior chamber. The last three forms pose the greatest threat to vision and when severe, vision impairment or blindness may occur.

C. Cataract

A partial or complete opacity of the lens and/or its capsule. In cases where cataracts are complete and affect both eyes, blindness results. The prudent approach is to assume cataracts to be hereditary except in cases known to be associated with trauma, other causes of ocular inflammation, specific metabolic diseases, persistent pupillary membrane, persistent hyaloid or nutritional deficiencies. Cataracts may involve the lens completely (diffuse) or in a localized region.

OCULAR DISORDERS REPORT

BORDER TERRIER - 2

D. Vitreous degeneration

Liquefaction of the vitreous gel which may predispose to retinal detachment.

References

There are no references providing detailed descriptions of hereditary ocular conditions of the Border Terrier breed. The conditions listed above are generally recognized to exist in the breed, as evidenced by identification on breed eye screening examinations and/or clinical experience of veterinary ophthalmologists.

1. ACVO Genetics Committee, 2007 and/or Data from CERF All-Breeds Report 2002-2006.
2. ACVO Genetics Committee, 2002-2003 and/or Data from CERF All-Breeds Report, 2002-2003.
3. ACVO Genetics Committee, 2005 and/or Data from CERF All-Breeds Report 2003-2004.
4. ACVO Genetics Committee, 2000-2002 and/or Data from CERF All-Breeds Report, 2000-2002.

OCULAR DISORDERS REPORT BORDER TERRIER

Diagnostic Name	TOTAL DOGS EXAMINED		1991-1999		2000-2009		2010-2013		2014	
	#	%	#	%	#	%	#	%	#	%
EYELIDS										
21.000 entropion, unspecified	0		3	0.1%	0		0		0	
25.110 distichiasis	4	0.4%	22	0.7%	14	1.0%	4	1.3%		
NICTITANS										
52.110 prolapsed gland of the third eyelid	0		1	0.0%	0		0		0	
CORNEA										
70.700 corneal dystrophy	2	0.2%	7	0.2%	2	0.1%	0			
UVEA										
93.120 iris cyst	0		1	0.0%	0		0		0	
93.140 corneal endothelial pigment without PPM	0		1	0.0%	0		0		0	
93.710 persistent pupillary membranes, iris to iris	3	0.3%	64	2.1%	61	4.4%	8	2.5%		
93.720 persistent pupillary membranes, iris to lens	0		1	0.0%	0		0		0	
93.730 persistent pupillary membranes, iris to cornea	1	0.1%	2	0.1%	0		0		0	
93.740 persistent pupillary membranes, iris sheets	0		2	0.1%	0		0		0	
93.750 persistent pupillary membranes, lens pigment foci/no strands	0		0		1	0.1%	0		0	
93.760 persistent pupillary membranes, endothelial opacity/no strands	0		0		1	0.1%	0		0	
LENS										
100.200 cataract, unspecified	9	1.0%	0		0		0		0	
100.210 cataract, significance unknown	21	2.3%	184	6.1%	75	5.5%	39	12.3%		
100.301 punctate cataract, anterior cortex	6	0.6%	10	0.3%	15	1.1%	1	0.3%		
100.302 punctate cataract, posterior cortex	3	0.3%	11	0.4%	4	0.3%	0			
100.303 punctate cataract, equatorial cortex	1	0.1%	11	0.4%	5	0.4%	0			
100.304 punctate cataract, anterior sutures	1	0.1%	1	0.0%	0		0			
100.305 punctate cataract, posterior sutures	1	0.1%	7	0.2%	6	0.4%	2	0.6%		
100.306 punctate cataract, nucleus	0		4	0.1%	1	0.1%	0			
100.307 punctate cataract, capsular	0		3	0.1%	3	0.2%	0			
100.311 incipient cataract, anterior cortex	9	1.0%	33	1.1%	7	0.5%	3	0.9%		
100.312 incipient cataract, posterior cortex	6	0.6%	25	0.8%	12	0.9%	1	0.3%		
100.313 incipient cataract, equatorial cortex	14	1.5%	35	1.2%	8	0.6%	0			
100.314 incipient cataract, anterior sutures	0		2	0.1%	0		0			
100.315 incipient cataract, posterior sutures	1	0.1%	9	0.3%	2	0.1%	1	0.3%		
100.316 incipient cataract, nucleus	7	0.8%	4	0.1%	2	0.1%	0			
100.317 incipient cataract, capsular	0		4	0.1%	2	0.1%	3	0.9%		
100.321 incomplete cataract, anterior cortex	0		0		2	0.1%	2	0.6%		
100.322 incomplete cataract, posterior cortex	0		0		2	0.1%	2	0.6%		
100.323 incomplete cataract, equatorial cortex	0		0		0		2	0.6%		
100.326 incomplete cataract, nucleus	0		0		0		1	0.3%		
100.327 incomplete cataract, capsular	0		0		0		1	0.3%		
100.330 generalized/complete cataract	4	0.4%	12	0.4%	1	0.1%	1	0.3%		
100.340 resorbing/hypermature cataract	0		0		1	0.1%	0			
100.375 subluxation/luxation, unspecified	0		1	0.0%	0		0			
VITREOUS										
110.120 persistent hyaloid artery/remnant	2	0.2%	1	0.0%	2	0.1%	1	0.3%		
110.200 vitritis	0		0		1	0.1%	3	0.9%		
110.320 vitreous degeneration syneresis	11	1.2%	19	0.6%	11	0.8%	7	2.2%		

OCULAR DISORDERS REPORT BORDER TERRIER

VITREOUS CONTINUED	1991-1999	2000-2009	2010-2013	2014
110.330 vitreous degeneration anterior chamber	0	2 0.1%	5 0.4%	0
FUNDUS				
97.110 choroidal hypoplasia	0	1 0.0%	0	0
97.120 coloboma	0	1 0.0%	0	0
RETINA				
120.170 retinal dysplasia, folds	0	10 0.3%	1 0.1%	0
120.180 retinal dysplasia, geographic	2 0.2%	3 0.1%	2 0.1%	0
120.310 generalized progressive retinal atrophy (PRA)	4 0.4%	7 0.2%	0	0
120.910 retinal detachment without dialysis	0	1 0.0%	0	0
OPTIC NERVE				
130.120 optic nerve hypoplasia	0	0	0	1 0.3%
OTHER				
900.000 other, unspecified	0	11 0.4%	45 3.3%	0
900.100 other, not inherited	7 0.8%	117 3.9%	5 0.4%	17 5.4%
900.110 other, suspected as inherited	6 0.6%	5 0.2%	3 0.2%	0
NORMAL				
0.000 normal globe	843 90.4%	2747 90.9%	1264 92.2%	274 86.7%

OCULAR DISORDERS REPORT

BORZOI - 1

BORZOI

	DISORDER	INHERITANCE	REFERENCE	BREEDING ADVICE
A.	Corneal dystrophy - epithelial/stromal	Not defined	1	Breeder option
B.	Persistent pupillary membranes - iris to iris	Not defined	1	Breeder option
C.	Cataract	Not defined	2	NO
D.	Optic nerve hypoplasia	Not defined	1	NO
E.	Micropapilla	Not defined	1	Breeder option
F.	Retinal degeneration	Not defined	3	NO
G.	Retinopathy	Not defined	4	Breeder option

Description and Comments

A. Corneal Dystrophy- epithelial/stromal

A non-inflammatory corneal opacity (white to gray) present in one or more of the corneal layers. Corneal dystrophy implies a probable inherited basis and is usually bilateral.

B. Persistent pupillary membrane (PPM)

Persistent blood vessel remnants in the anterior chamber of the eye which fail to regress normally by 3 months of age. These strands may bridge from iris to iris, iris to cornea, iris to lens, or form sheets of tissue in the anterior chamber. The last three forms pose the greatest threat to vision and when severe, vision impairment or blindness may occur.

C. Cataract

A partial or complete opacity of the lens and/or its capsule. In cases where cataracts are complete and affect both eyes, blindness results. The prudent approach is to assume cataracts to be hereditary except in cases known to be associated with trauma, other causes of ocular inflammation, specific metabolic diseases, persistent pupillary membrane, persistent hyaloid or nutritional deficiencies. Cataracts may involve the lens completely (diffuse) or in a localized region.

OCULAR DISORDERS REPORT

BORZOI - 2

D. Optic nerve hypoplasia

A congenital defect of the optic nerve which causes blindness and abnormal pupil response in the affected eye. May be unable to differentiate from micropapilla on a routine (dilated) screening ophthalmoscopic exam.

E. Micropapilla

Micropapilla refers to a small optic disc which is not associated with vision impairment. Optic nerve hypoplasia refers to a congenital defect of the optic nerve which causes blindness and abnormal pupil response in the affected eye. It may be difficult to differentiate between micropapilla and optic nerve hypoplasia on a routine (dilated) screening ophthalmoscopic exam.

F. Retinal degeneration

A unilateral or bilateral retinal disease that affects young and adult Borzoi and which can be progressive. When bilateral, the ophthalmoscopic lesions are often asymmetrical, particularly in the early stages of the disease. Fundus examination shows initially single or multiple focal retinal lesions that appear active (local infiltrative inflammation or granulation) or inactive. The lesions can progress resulting in widespread retinal atrophy. The end-stage ophthalmoscopic lesions vary and may appear indistinguishable from PRA, or may be more characteristic of an inflammatory retinopathy. The asymmetry of the fundus abnormalities and the presence of inflammatory lesions in the retina and choroid help to differentiate this disorder from PRA. The mode of inheritance of this disease is not known; however, studies of different families suggest that it is possibly inherited. An intriguing aspect of the disease has been the preponderance of affected males compared to females. This has been confirmed in a recent unpublished survey.

G. Retinopathy

Patchy focal uni- or bilateral hyper reflective tapetal lesions most frequently peripheral but occasionally central around a pigmented spot, usually non progressive. Not usually present prior to 3 months of age but usually present by 18 months of age.

References

1. ACVO Genetics Committee, 2002-2003 and/or Data from CERF All-Breeds Report, 2002-2003.
2. ACVO Genetics Committee, 2005 and/or Data from CERF All-Breeds Report 2003-2004.
3. ACVO Genetics Committee, 1999 and/or Data from CERF All-Breeds Report, 1991-1998.
4. Storey ES, Grahn BH and Alcorn J. Multifocal chorioretinal lesions in Borzoi dogs. *Vet Ophthalmol.* 2005 Sep-Oct;8:337-347.

OCULAR DISORDERS REPORT BORZOI

Diagnostic Name	TOTAL DOGS EXAMINED		1991-1999		2000-2009		2010-2013		2014	
	#	%	#	%	#	%	#	%	#	%
GLOBE										
0.110 microphthalmia	2	0.3%	4	0.3%	0		1	0.5%		
EYELIDS										
20.160 macropalpebral fissure	1	0.1%	0		0		0		0	
25.110 distichiasis	4	0.5%	3	0.2%	2	0.3%	0		0	
NICTITANS										
51.100 third eyelid cartilage anomaly	0		0		0		1	0.5%		
CORNEA										
70.210 corneal pannus	7	0.9%	6	0.4%	3	0.4%	0		0	
70.700 corneal dystrophy	7	0.9%	6	0.4%	3	0.4%	0		0	
70.730 corneal endothelial degeneration	0		1	0.1%	0		0		0	
UVEA										
93.120 iris cyst	0		4	0.3%	0		0		0	
93.710 persistent pupillary membranes, iris to iris	20	2.5%	28	1.9%	18	2.5%	4	2.1%		
93.720 persistent pupillary membranes, iris to lens	4	0.5%	2	0.1%	0		0		0	
93.730 persistent pupillary membranes, iris to cornea	6	0.8%	5	0.3%	0		0		0	
93.740 persistent pupillary membranes, iris sheets	0		0		1	0.1%	0		0	
93.760 persistent pupillary membranes, endothelial opacity/no strands	0		0		1	0.1%	0		0	
95.120 ciliary body cyst	0		0		1	0.1%	0		0	
LENS										
100.200 cataract, unspecified	2	0.3%	0		0		0		0	
100.210 cataract, significance unknown	8	1.0%	64	4.3%	26	3.6%	2	1.1%		
100.301 punctate cataract, anterior cortex	0		4	0.3%	4	0.6%	0		0	
100.302 punctate cataract, posterior cortex	2	0.3%	2	0.1%	5	0.7%	0		0	
100.304 punctate cataract, anterior sutures	1	0.1%	1	0.1%	0		0		0	
100.305 punctate cataract, posterior sutures	3	0.4%	2	0.1%	2	0.3%	1	0.5%		
100.306 punctate cataract, nucleus	0		1	0.1%	0		0		0	
100.307 punctate cataract, capsular	2	0.3%	0		3	0.4%	0		0	
100.311 incipient cataract, anterior cortex	3	0.4%	5	0.3%	3	0.4%	1	0.5%		
100.312 incipient cataract, posterior cortex	6	0.8%	7	0.5%	1	0.1%	4	2.1%		
100.313 incipient cataract, equatorial cortex	0		2	0.1%	0		0		0	
100.314 incipient cataract, anterior sutures	1	0.1%	1	0.1%	0		0		0	
100.315 incipient cataract, posterior sutures	0		0		1	0.1%	0		0	
100.316 incipient cataract, nucleus	1	0.1%	0		1	0.1%	0		0	
100.317 incipient cataract, capsular	0		4	0.3%	0		0		0	
100.324 incomplete cataract, anterior sutures	0		0		0		1	0.5%		
100.330 generalized/complete cataract	3	0.4%	4	0.3%	0		0		0	
100.375 subluxation/luxation, unspecified	4	0.5%	0		0		0		0	
VITREOUS										
110.120 persistent hyaloid artery/remnant	3	0.4%	5	0.3%	2	0.3%	2	1.1%		
110.135 PHPV/PTVL	4	0.5%	2	0.1%	4	0.6%	0		0	
110.320 vitreous degeneration syneresis	0		5	0.3%	2	0.3%	0		0	
110.330 vitreous degeneration anterior chamber	0		2	0.1%	0		0		0	

OCULAR DISORDERS REPORT BORZOI

	1991-1999	2000-2009	2010-2013	2014
RETINA				
120.170 retinal dysplasia, folds	4 0.5%	3 0.2%	0	0
120.180 retinal dysplasia, geographic	3 0.4%	4 0.3%	1 0.1%	0
120.190 retinal dysplasia, detached	0	0	1 0.1%	0
120.200 retinitis	0	0	0	7 3.7%
120.310 generalized progressive retinal atrophy (PRA)	6 0.8%	14 0.9%	5 0.7%	0
120.400 retinal hemorrhage	2 0.3%	0	0	0
120.910 retinal detachment without dialysis	2 0.3%	0	3 0.4%	0
120.920 retinal detachment with dialysis	0	0	1 0.1%	0
120.960 retinopathy	0	0	6 0.8%	0
OPTIC NERVE				
130.110 micropapilla	0	8 0.5%	3 0.4%	0
130.120 optic nerve hypoplasia	10 1.3%	3 0.2%	1 0.1%	0
130.150 optic disc coloboma	2 0.3%	0	1 0.1%	0
OTHER				
900.000 other, unspecified	0	17 1.1%	27 3.8%	0
900.100 other, not inherited	10 1.3%	99 6.6%	11 1.5%	12 6.3%
900.110 other, suspected as inherited	19 2.4%	9 0.6%	6 0.8%	0
NORMAL				
0.000 normal globe	681 86.0%	1310 87.1%	676 94.5%	179 94.7%

OCULAR DISORDERS REPORT

BOSTON TERRIER - 1

BOSTON TERRIER

	DISORDER	INHERITANCE	REFERENCE	BREEDING ADVICE
A.	Distichiasis	Not defined	1	Breeder option
B.	Imperforate lacrimal punctum	Not defined	2	Breeder option
C.	Corneal dystrophy - epithelial/stromal	Not defined	1	Breeder option
D.	Corneal dystrophy - endothelial	Not defined	1, 3	NO
E.	Glaucoma	Not defined	1, 4, 5	NO
F.	Persistent pupillary membranes			
	- iris to iris	Not defined	1	Breeder option
	- all other forms	Not defined	7	NO
G.	Cataract * a DNA test is available	Autosomal recessive	1, 6-10	NO
H.	Vitreous degeneration	Not defined	11,12	Breeder option

Description and Comments

A. Distichiasis

Eyelashes abnormally located on the eyelid margin which may cause ocular irritation. Distichiasis may occur at any time in the life of a dog. It is difficult to make a strong recommendation with regard to breeding dogs with this entity. The hereditary basis has not been established although it seems probable due to the high incidence in some breeds. Reducing the incidence is a logical goal. When diagnosed, distichiasis should be recorded; breeding discretion is advised.

B. Imperforate lacrimal punctum

©2014, American College of Veterinary Ophthalmologists

OCULAR DISORDERS REPORT

BOSTON TERRIER - 2

A developmental anomaly resulting in failure of opening of the lacrimal duct located at the medial lid margins. The lower punctum is more frequently affected. This defect usually results in epiphora, an overflow of tears onto the face.

C. Corneal dystrophy - epithelial/stromal

A non-inflammatory corneal opacity (white to gray) present in one or more of the corneal layers; usually inherited and bilateral

D. Corneal dystrophy – endothelial

Corneal endothelial dystrophy is an abnormal loss of the inner lining of the cornea that causes progressive fluid retention (edema). With time the edema results in keratitis and decreased vision. This usually does not occur until the animal is older.

In the Boston Terrier, this is a primary degenerative endothelial disease leading to progressive and permanent corneal edema. It is not known if this disease is an inherited disorder. There is no sex predilection. The condition is observed in older dogs, 6 to 13 years of age with a mean of 9.5 years. The corneal edema starts asymptotically in the dorsal temporal corneal quadrant of one eye and slowly progresses medially, eventually involving the entire cornea. Typically, it becomes bilateral. In the later stages, discomfort, intracorneal bullae with subsequent ulceration and keratoconus may develop.

E. Glaucoma

Glaucoma is characterized by an elevation of intraocular pressure (IOP) which, when sustained, causes intraocular damage resulting in blindness. The elevated intraocular pressure occurs because the fluid cannot leave through the iridocorneal angle. Diagnosis and classification of glaucoma requires measurement of the IOP (tonometry) and examination of the iridocorneal angle (gonioscopy). Neither of these tests is part of a routine screening exam for certification.

F. Persistent pupillary membranes (PPM)

Persistent blood vessel remnants in the anterior chamber of the eye which fail to regress normally during the first three months of life. These strands may bridge from iris to iris, iris to cornea, iris to lens, or form sheets of tissue in the anterior chamber. The last three forms pose the greatest threat to vision and when severe, vision impairment or blindness may occur.

G. Cataract

A partial or complete opacity of the lens and/or its capsule. In cases where cataracts are complete and affect both eyes, blindness results. The prudent approach is to assume cataracts to be hereditary except in cases known to be associated with trauma, other causes of ocular inflammation, specific metabolic diseases, persistent pupillary membrane, persistent hyaloid or nutritional deficiencies. Cataracts may involve the lens

©2014, American College of Veterinary Ophthalmologists

OCULAR DISORDERS REPORT

BOSTON TERRIER - 3

completely (diffuse) or in a localized region.

The Boston Terrier has at least two distinct forms of inherited cataract. One type has an onset before 6 months of age with rapid progression to complete opacity prior to 2 years old. A mutation in HSF4 appears to be responsible for early this type of cataract. A second type of cataract occurs after 4-5 years of age with variable progression.

H. Vitreous degeneration

Liquefaction of the vitreous gel which may predispose to retinal detachment.

References

1. ACVO Genetics Committee, 1999 and/or Data from CERF All-Breeds Report, 1991-1998.
2. ACVO Genetics Committee, 2013-2014 and Data from OFA All-Breeds Report, 2013-2014.
3. Martin CL and Dice PF. Corneal endothelial dystrophy in the dog. *J Am Anim Hosp Assoc.* 1982;18:327.
4. Slater MR and Erb HN. Effects of risk factors and prophylactic treatment on primary glaucoma in the dog. *J Am Vet Med Assoc.* 1986 May 1;188:1028-1030.
5. Gelatt KN and MacKay EO. Prevalence of the breed-related glaucomas in pure-bred dogs in North America. *Vet Ophthalmol.* 2004 Mar-Apr;7:97-111.
6. Curtis R. Late-onset cataract in the Boston terrier. *Vet Rec.* 1984 Dec 1;115:577-578.
7. Barnett KC. The diagnosis and differential diagnosis of cataract in the dog. *J Small Anim Pract.* 1985;26:305.
8. Barnett KC. Hereditary cataract in the dog. *J Small Anim Pract.* 1978 Feb;19:109-120.
9. Mellersh CS, Graves KT, McLaughlin B, et al. Mutation in HSF4 associated with early but not late-onset hereditary cataract in the Boston Terrier. *J Hered.* 2007;98:531-533.
10. Mellersh CS, Pettitt L, Forman OP, et al. Identification of mutations in HSF4 in dogs of three different breeds with hereditary cataracts. *Vet Ophthalmol.* 2006 Sep-Oct;9:369-378.
11. ACVO Genetics Committee, 2005 and/or Data from CERF All-Breeds Report 2003-2004.
12. ACVO Genetics Committee, 2011 and/or Data from CERF All-Breeds Report, 2009.

OCULAR DISORDERS REPORT BOSTON TERRIER

Diagnostic Name	TOTAL DOGS EXAMINED		1991-1999 2723		2000-2009 6803		2010-2013 2816		2014 627	
	#	%	#	%	#	%	#	%	#	%
GLOBE										
0.110	microphthalmia	1	0.0%	1	0.0%	0		0		0
10.000	glaucoma	0		0		1	0.0%	1	0.0%	0
EYELIDS										
20.140	ectopic cilia	3	0.1%	0		2	0.1%	2	0.1%	0
20.160	macropalpebral fissure	3	0.1%	9	0.1%	0		0		0
21.000	entropion, unspecified	2	0.1%	22	0.3%	5	0.2%	5	0.2%	0
22.000	ectropion, unspecified	2	0.1%	0		0		0		0
25.110	distichiasis	80	2.9%	237	3.5%	94	3.3%	94	3.3%	33
NASOLACRIMAL										
32.110	imperforate lower nasolacrimal punctum	7	0.3%	0		15	0.5%	15	0.5%	3
40.910	keratoconjunctivitis sicca	0		1	0.0%	6	0.2%	6	0.2%	0
NICTITANS										
51.100	third eyelid cartilage anomaly	0		1	0.0%	0		0		0
52.110	prolapsed gland of the third eyelid	3	0.1%	5	0.1%	0		0		1
CORNEA										
70.210	corneal pannus	0		0		0		0		1
70.220	pigmentary keratitis	11	0.4%	4	0.1%	0		0		1
70.700	corneal dystrophy	61	2.2%	169	2.5%	60	2.1%	60	2.1%	17
70.730	corneal endothelial degeneration	5	0.2%	14	0.2%	5	0.2%	5	0.2%	2
UVEA										
93.110	iris hypoplasia	0		1	0.0%	4	0.1%	4	0.1%	0
93.120	iris cyst	1	0.0%	15	0.2%	8	0.3%	8	0.3%	0
93.150	iris coloboma	2	0.1%	4	0.1%	1	0.0%	1	0.0%	0
93.170	anterior chamber cyst	0		0		1	0.0%	1	0.0%	2
93.710	persistent pupillary membranes, iris to iris	27	1.0%	271	4.0%	132	4.7%	132	4.7%	39
93.720	persistent pupillary membranes, iris to lens	1	0.0%	8	0.1%	2	0.1%	2	0.1%	1
93.730	persistent pupillary membranes, iris to cornea	4	0.1%	2	0.0%	0		0		0
93.740	persistent pupillary membranes, iris sheets	3	0.1%	5	0.1%	0		0		0
93.750	persistent pupillary membranes, lens pigment foci/no strands	0		0		0		0		1
93.810	uveal melanoma	0		1	0.0%	0		0		0
LENS										
100.200	cataract, unspecified	81	3.0%	0		0		0		0
100.210	cataract, significance unknown	42	1.5%	167	2.5%	68	2.4%	68	2.4%	22
100.301	punctate cataract, anterior cortex	23	0.8%	78	1.1%	42	1.5%	42	1.5%	10
100.302	punctate cataract, posterior cortex	11	0.4%	18	0.3%	13	0.5%	13	0.5%	3
100.303	punctate cataract, equatorial cortex	9	0.3%	37	0.5%	13	0.5%	13	0.5%	6
100.304	punctate cataract, anterior sutures	5	0.2%	11	0.2%	9	0.3%	9	0.3%	5
100.305	punctate cataract, posterior sutures	8	0.3%	6	0.1%	3	0.1%	3	0.1%	5
100.306	punctate cataract, nucleus	3	0.1%	1	0.0%	3	0.1%	3	0.1%	1
100.307	punctate cataract, capsular	1	0.0%	7	0.1%	4	0.1%	4	0.1%	5
100.311	incipient cataract, anterior cortex	113	4.1%	353	5.2%	113	4.0%	113	4.0%	22
100.312	incipient cataract, posterior cortex	34	1.2%	87	1.3%	30	1.1%	30	1.1%	1
100.313	incipient cataract, equatorial cortex	52	1.9%	170	2.5%	55	2.0%	55	2.0%	7
100.314	incipient cataract, anterior sutures	14	0.5%	42	0.6%	15	0.5%	15	0.5%	4

OCULAR DISORDERS REPORT BOSTON TERRIER

LENS CONTINUED	1991-1999		2000-2009		2010-2013		2014	
100.315 incipient cataract, posterior sutures	13	0.5%	15	0.2%	5	0.2%	1	0.2%
100.316 incipient cataract, nucleus	4	0.1%	9	0.1%	3	0.1%	0	
100.317 incipient cataract, capsular	1	0.0%	12	0.2%	0		1	0.2%
100.321 incomplete cataract, anterior cortex	0		0		5	0.2%	9	1.4%
100.322 incomplete cataract, posterior cortex	0		0		4	0.1%	3	0.5%
100.323 incomplete cataract, equatorial cortex	0		0		5	0.2%	4	0.6%
100.324 incomplete cataract, anterior sutures	0		0		1	0.0%	0	
100.330 generalized/complete cataract	31	1.1%	50	0.7%	8	0.3%	1	0.2%
100.375 subluxation/luxation, unspecified	5	0.2%	6	0.1%	1	0.0%	0	
VITREOUS								
110.120 persistant hyaloid artery/remnant	11	0.4%	29	0.4%	1	0.0%	0	
110.135 PHPV/PTVL	1	0.0%	3	0.0%	3	0.1%	1	0.2%
110.200 vitritis	0		0		1	0.0%	2	0.3%
110.320 vitreous degeneration syneresis	16	0.6%	93	1.4%	25	0.9%	3	0.5%
110.330 vitreous degeneration anterior chamber	0		26	0.4%	9	0.3%	0	
FUNDUS								
97.110 choroidal hypoplasia	0		1	0.0%	1	0.0%	0	
RETINA								
120.170 retinal dysplasia, folds	5	0.2%	19	0.3%	10	0.4%	0	
120.180 retinal dysplasia, geographic	3	0.1%	6	0.1%	3	0.1%	0	
120.190 retinal dysplasia, detached	2	0.1%	0		2	0.1%	0	
120.200 retinitis	0		0		1	0.0%	1	0.2%
120.310 generalized progressive retinal atrophy (PRA)	3	0.1%	7	0.1%	1	0.0%	0	
120.400 retinal hemorrhage	2	0.1%	0		1	0.0%	0	
120.910 retinal detachment without dialysis	1	0.0%	0		0		0	
120.920 retinal detachment with dialysis	0		0		2	0.1%	0	
120.960 retinopathy	0		0		1	0.0%	0	
OPTIC NERVE								
130.110 micropapilla	0		0		1	0.0%	0	
130.120 optic nerve hypoplasia	0		2	0.0%	0		0	
OTHER								
900.000 other, unspecified	0		52	0.8%	113	4.0%	0	
900.100 other, not inherited	13	0.5%	359	5.3%	18	0.6%	34	5.4%
900.110 other, suspected as inherited	27	1.0%	35	0.5%	6	0.2%	0	
NORMAL								
0.000 normal globe	2185	80.2%	5637	82.9%	2440	86.6%	504	80.4%

OCULAR DISORDERS REPORT

BOUVIER DES FLANDRES - 1

BOUVIER DES FLANDRES

	DISORDER	INHERITANCE	REFERENCE	BREEDING ADVICE
A.	Glaucoma	Not defined	4, 5	NO
B.	Entropion	Not defined	1	Breeder option
C.	Distichiasis	Not defined	2	Breeder option
D.	Corneal dystrophy - epithelial/stromal	Not defined	3	Breeder option
E.	Persistent pupillary membranes - iris to iris - all other forms	Not defined Not defined	1, 4 1	Breeder option NO
F.	Cataract	Not defined	4	NO
G.	Vitreous degeneration	Not defined	3	Breeder option
H.	Persistent hyperplastic primary vitreous/Persistent hyperplastic tunica vasculosa lentis (PHPV/PHTVL)	Not defined	4, 6	NO
I.	Retinal dysplasia - folds	Not defined	2	Breeder option

Description and Comments

A. Glaucoma

Glaucoma is characterized by an elevation of intraocular pressure (IOP) which, when sustained, causes intraocular damage resulting in blindness. The elevated intraocular pressure occurs because the fluid cannot leave through the iridocorneal angle. Diagnosis and classification of glaucoma requires measurement of the IOP (tonometry) and examination of the iridocorneal angle (gonioscopy). Neither of these tests is part of a routine screening exam for certification.

©2014, American College of Veterinary Ophthalmologists

OCULAR DISORDERS REPORT

BOUVIER DES FLANDRES - 2

In this breed, primary glaucoma is associated with narrowed iridocorneal angles and various degrees of congenital angle malformations varying from mild to severe. Dysplastic pectinate ligaments and subsequent narrowed angles are similar to those described in the Basset Hound and American and English Cocker Spaniels. The occurrence of glaucoma is related to the most severe abnormalities of the pectinate ligaments. The relationship between glaucoma development and the anomaly of the pectinate ligament is not clear.

B. Entropion

A conformational defect resulting in an "in-rolling" of one or both of the eyelids which may cause ocular irritation. It is likely that entropion is influenced by several genes (polygenic), defining the skin and other structures which make up the eyelids, the amount and weight of the skin covering the head and face, the orbital contents, and the conformation of the skull.

C. Distichiasis

Eyelashes abnormally located on the eyelid margin which may cause ocular irritation. Distichiasis may occur at any time in the life of a dog. It is difficult to make a strong recommendation with regard to breeding dogs with this entity. The hereditary basis has not been established although it seems probable due to the high incidence in some breeds. Reducing the incidence is a logical goal. When diagnosed, distichiasis should be recorded; breeding discretion is advised.

D. Corneal Dystrophy - epithelial/stromal

A non-inflammatory corneal opacity (white to gray) present in one or more of the corneal layers. Corneal dystrophy implies a probable inherited basis and is usually bilateral.

E. Persistent pupillary membranes (PPM)

Persistent blood vessel remnants in the anterior chamber of the eye which fail to regress normally by 3 months of age. These strands may bridge from iris to iris, iris to cornea, iris to lens, or form sheets of tissue in the anterior chamber. The last three forms pose the greatest threat to vision and when severe, vision impairment or blindness may occur.

F. Cataract

A partial or complete opacity of the lens and/or its capsule. In cases where cataracts are complete and affect both eyes, blindness results. The prudent approach is to assume cataracts to be hereditary except in cases known to be associated with trauma, other causes of ocular inflammation, specific metabolic diseases, persistent pupillary membrane, persistent hyaloid or nutritional deficiencies. Cataracts may involve the lens completely (diffuse) or in a localized region.

G. Vitreous degeneration

Liquefaction of the vitreous gel which may predispose to retinal detachment.

OCULAR DISORDERS REPORT

BOUVIER DES FLANDRES - 3

- H. Persistent hyperplastic primary vitreous (PHPV)/Persistent hyperplastic tunica vasculosa lentis (PHTVL)

Persistent hyperplastic primary vitreous is a congenital defect resulting from abnormalities in the development and regression of the hyaloid artery (the primary vitreous) and the interaction of this blood vessel with the posterior lens capsule/cortex during embryogenesis. This condition is often associated with persistent hyperplastic tunica vasculosa lentis which results from failure of regression of the embryologic vascular network which surrounds the developing lens.

In the Bouvier des Flandres, the condition is associated with retinal dysplasia and detachment, optic nerve hypoplasia, lenticonus, cataract and congenital blindness.

- I. Retinal dysplasia - folds

Linear, triangular, curved or curvilinear foci of retinal folding that may be single or multiple. When seen in puppies, this condition may partially or completely resolve with maturity. Its significance to vision is unknown. There are two other forms of retinal dysplasia (geographic, detached) which are known to be inherited in other breeds and, in their most severe form, cause blindness. The genetic relationship between folds and more severe forms of retinal dysplasia is undetermined.

References

1. ACVO Genetics Committee, 2005 and/or Data from CERF All-Breeds Report 2003-2004.
2. ACVO Genetics Committee, 2000-2002 and/or Data from CERF All-Breeds Report, 2000-2002.
3. ACVO Genetics Committee, 2007 and/or Data from CERF All-Breeds Report 2002-2006.
4. ACVO Genetics Committee, 1999 and/or Data from CERF All-Breeds Report, 1991-1998.
5. van der Linde-Sipman JS. Dysplasia of the pectinate ligament and primary glaucoma in the Bouvier des Flandres dog. *Vet Pathol.* 1987 May;24:201-206.
6. Van Rensburg IBJ, Petrick S, van der Lagt J, et al. Multiple inherited eye anomalies including persistent hyperplastic tunica vasculosa lentis in the bouvier des Flanders. *Prog Vet Comp Ophthalmol.* 1992;2:143.

OCULAR DISORDERS REPORT BOUVIER DES FLANDRES

Diagnostic Name	TOTAL DOGS EXAMINED	1991-1999 1365		2000-2009 2541		2010-2013 796		2014 168		
		#	%	#	%	#	%	#	%	
GLOBE										
10.000	glaucoma	0		1	0.0%	0		0		
EYELIDS										
20.160	macropalpebral fissure	1	0.1%	0		0		0		
21.000	entropion, unspecified	7	0.5%	15	0.6%	5	0.6%	0		
22.000	ectropion, unspecified	0		4	0.2%	2	0.3%	0		
25.110	distichiasis	20	1.5%	14	0.6%	6	0.8%	0		
CORNEA										
70.210	corneal pannus	0		1	0.0%	0		0		
70.220	pigmentary keratitis	0		0		1	0.1%	0		
70.700	corneal dystrophy	9	0.7%	12	0.5%	6	0.8%	1	0.6%	
70.730	corneal endothelial degeneration	2	0.1%	2	0.1%	0		0		
UVEA										
93.120	iris cyst	2	0.1%	6	0.2%	4	0.5%	1	0.6%	
93.710	persistent pupillary membranes, iris to iris	85	6.2%	236	9.3%	68	8.5%	10	6.0%	
93.720	persistent pupillary membranes, iris to lens	1	0.1%	10	0.4%	0		0		
93.730	persistent pupillary membranes, iris to cornea	1	0.1%	5	0.2%	0		0		
93.740	persistent pupillary membranes, iris sheets	5	0.4%	1	0.0%	0		1	0.6%	
93.750	persistent pupillary membranes, lens pigment foci/no strands	0		1	0.0%	7	0.9%	5	3.0%	
93.760	persistent pupillary membranes, endothelial opacity/no strands	0		0		2	0.3%	0		
93.810	uveal melanoma	0		0		1	0.1%	0		
95.120	ciliary body cyst	0		0		1	0.1%	0		
LENS										
100.200	cataract, unspecified	5	0.4%	0		0		0		
100.210	cataract, significance unknown	84	6.2%	212	8.3%	78	9.8%	25	14.9%	
100.301	punctate cataract, anterior cortex	6	0.4%	20	0.8%	3	0.4%	1	0.6%	
100.302	punctate cataract, posterior cortex	14	1.0%	16	0.6%	10	1.3%	2	1.2%	
100.303	punctate cataract, equatorial cortex	0		4	0.2%	0		0		
100.304	punctate cataract, anterior sutures	1	0.1%	1	0.0%	4	0.5%	0		
100.305	punctate cataract, posterior sutures	5	0.4%	15	0.6%	12	1.5%	4	2.4%	
100.306	punctate cataract, nucleus	3	0.2%	5	0.2%	3	0.4%	0		
100.307	punctate cataract, capsular	0		18	0.7%	1	0.1%	0		
100.311	incipient cataract, anterior cortex	4	0.3%	9	0.4%	1	0.1%	1	0.6%	
100.312	incipient cataract, posterior cortex	33	2.4%	54	2.1%	7	0.9%	1	0.6%	
100.313	incipient cataract, equatorial cortex	8	0.6%	11	0.4%	2	0.3%	0		
100.315	incipient cataract, posterior sutures	7	0.5%	11	0.4%	5	0.6%	0		
100.316	incipient cataract, nucleus	21	1.5%	8	0.3%	2	0.3%	1	0.6%	
100.317	incipient cataract, capsular	2	0.1%	6	0.2%	1	0.1%	1	0.6%	
100.321	incomplete cataract, anterior cortex	0		0		1	0.1%	1	0.6%	
100.322	incomplete cataract, posterior cortex	0		0		2	0.3%	1	0.6%	
100.326	incomplete cataract, nucleus	0		0		0		1	0.6%	
100.330	generalized/complete cataract	18	1.3%	11	0.4%	2	0.3%	0		
100.375	subluxation/luxation, unspecified	1	0.1%	1	0.0%	0		0		

OCULAR DISORDERS REPORT BOUVIER DES FLANDRES

	1991-1999	2000-2009	2010-2013	2014
VITREOUS				
110.120 persistant hyaloid artery/remnant	2 0.1%	4 0.2%	2 0.3%	0
110.135 PHPV/PTVL	1 0.1%	5 0.2%	0	0
110.320 vitreous degeneration syneresis	1 0.1%	8 0.3%	0	1 0.6%
110.330 vitreous degeneration anterior chamber	0	0	1 0.1%	0
RETINA				
120.170 retinal dysplasia, folds	12 0.9%	19 0.7%	1 0.1%	1 0.6%
120.180 retinal dysplasia, geographic	0	1 0.0%	1 0.1%	1 0.6%
120.310 generalized progressive retinal atrophy (PRA)	0	9 0.4%	4 0.5%	1 0.6%
OPTIC NERVE				
130.110 micropapilla	0	1 0.0%	0	0
130.120 optic nerve hypoplasia	1 0.1%	0	0	0
130.150 optic disc coloboma	1 0.1%	2 0.1%	0	0
OTHER				
900.000 other, unspecified	0	21 0.8%	43 5.4%	0
900.100 other, not inherited	10 0.7%	120 4.7%	22 2.8%	13 7.7%
900.110 other, suspected as inherited	36 2.6%	64 2.5%	10 1.3%	0
NORMAL				
0.000 normal globe	1055 77.3%	2020 79.5%	659 82.8%	135 80.4%

OCULAR DISORDERS REPORT

BOXER - 1

BOXER

	DISORDER	INHERITANCE	REFERENCE	BREEDING ADVICE
A.	Distichiasis	Not defined	1	Breeder option
B.	Ectopic cilia	Not defined	2	Breeder option
C.	Ectropion	Not defined	1	Breeder option
D.	Eury/Macroblepharon	Not defined	3, 4	Breeder option
E.	Corneal dystrophy - epithelial/stromal	Not defined	1	Breeder option
F.	Corneal dystrophy - epithelial erosion	Not defined	1, 5-7	Breeder option
G.	Persistent pupillary membranes - iris to iris	Not defined	2	Breeder option
H.	Cataract	Not defined	1	NO
I.	Vitreous degeneration	Not defined	8	Breeder option

Description and Comments

A. Distichiasis

Eyelashes abnormally located on the eyelid margin which may cause ocular irritation. Distichiasis may occur at any time in the life of a dog. It is difficult to make a strong recommendation with regard to breeding dogs with this entity. The hereditary basis has not been established although it seems probable due to the high incidence in some breeds. Reducing the incidence is a logical goal. When diagnosed, distichiasis should be recorded; breeding discretion is advised.

In the Boxer, because there is significant clinical disease associated with the abnormal hairs, breeding of affected animal should be discouraged.

OCULAR DISORDERS REPORT

BOXER - 2

B. Ectopic cilia

Hair emerging through the eyelid conjunctiva. Ectopic cilia occur more frequently in younger dogs and cause discomfort and corneal disease.

C. Ectropion

A conformational defect resulting in eversion of the eyelid(s), which may cause ocular irritation due to exposure. It is likely that ectropion is influenced by several genes (polygenic) defining the skin and other structures which make up the eyelids, the amount and weight of the skin covering the head and face, the orbital contents and the conformation of the skull.

D. Eury/Macrolepharon

Defined as an exceptionally large palpebral fissure, macrolepharon in conjunction with laxity of the lateral canthal structures may lead to lower lid ectropion and upper lid entropion. Either of these conditions may lead to severe ocular irritation.

E. Corneal dystrophy - epithelial/stromal

A non-inflammatory corneal opacity (white to gray) present in one or more of the corneal layers; usually inherited and bilateral.

F. Corneal dystrophy - epithelial erosion

A general group of corneal ulcerative conditions (e.g. erosions, indolent or persistent ulcers, epithelial bonding defects) is recognized as a common problem in older boxers (as well as other older animals). It has been commonly referred to as Boxer corneal ulceration. Animals that are affected are usually 7-8 years of age or older. The ulceration can be a very difficult lesion to heal, and it is often recurrent. The chronic form stimulates eventual scarring, with vascularization, fibrosis and pigmentation of the lesion site. The lesion can cause vision impairment.

G. Persistent pupillary membranes (PPM)

Persistent blood vessel remnants in the anterior chamber of the eye which fail to regress normally by 3 months of age. These strands may bridge from iris to iris, iris to cornea, iris to lens, or form sheets of tissue in the anterior chamber. The last three forms pose the greatest threat to vision and when severe, vision impairment or blindness may occur

H. Cataract

A partial or complete opacity of the lens and/or its capsule. In cases where cataracts are complete and affect both eyes, blindness results. The prudent approach is to assume cataracts to be hereditary except in cases known to be associated with trauma, other causes of ocular inflammation, specific metabolic diseases, persistent pupillary membrane, persistent hyaloid or nutritional deficiencies. Cataracts may involve the lens completely (diffuse) or in a localized region.

OCULAR DISORDERS REPORT

BOXER - 3

I. Vitreous degeneration

Liquefaction of the vitreous gel which may predispose to retinal detachment.

References

1. ACVO Genetics Committee, 1999 and/or Data from CERF All-Breeds Report, 1991-1998.
2. ACVO Genetics Committee, 2006 and/or Data from CERF All-Breeds Report, 2001-2005.
3. ACVO Genetics Committee, 2000-2002 and/or Data from CERF All-Breeds Report, 2000-2002.
4. ACVO Genetics Committee, 2005 and/or Data from CERF All-Breeds Report 2003-2004.
5. Roberts SR. Superficial indolent ulcer in the cornea of Boxer dogs. *J Small Anim Pract.* 1965;6:111.
6. Gelatt KN and Samuelson DA. Recurrent corneal erosions and epithelial dystrophy in the Boxer dog. *J Am Anim Hosp Assoc.* 1982;18:453.
7. Kirschner SE, Niyo Y and Betts DM. Idiopathic persistent corneal erosions: clinical and pathological findings in 18 dogs. *J Am Anim Hosp Assoc.* 1989;25:84.
8. ACVO Genetics Committee, 2013-2014 and Data from OFA All-Breeds Report, 2013-2014.

OCULAR DISORDERS REPORT BOXER

Diagnostic Name	TOTAL DOGS EXAMINED	1991-1999		2000-2009		2010-2013		2014	
		#	%	#	%	#	%	#	%
GLOBE									
0.110 microphthalmia		4	0.6%	1	0.1%	0		0	
EYELIDS									
20.140 ectopic cilia		0		3	0.4%	0		0	
20.160 macropalpebral fissure		6	0.9%	2	0.3%	1	0.5%	0	
21.000 entropion, unspecified		0		1	0.1%	1	0.5%	0	
22.000 ectropion, unspecified		24	3.5%	30	4.3%	6	2.7%	0	
25.110 distichiasis		60	8.7%	97	13.8%	24	10.8%	8	25.0%
CORNEA									
70.210 corneal pannus		0		1	0.1%	0		0	
70.220 pigmentary keratitis		1	0.1%	0		0		0	
70.700 corneal dystrophy		54	7.8%	62	8.8%	19	8.6%	4	12.5%
70.730 corneal endothelial degeneration		2	0.3%	0		0		0	
UVEA									
93.120 iris cyst		1	0.1%	0		0		0	
93.150 iris coloboma		1	0.1%	0		0		0	
93.710 persistent pupillary membranes, iris to iris		0		3	0.4%	2	0.9%	0	
93.720 persistent pupillary membranes, iris to lens		2	0.3%	1	0.1%	0		0	
93.730 persistent pupillary membranes, iris to cornea		4	0.6%	2	0.3%	1	0.5%	1	3.1%
93.740 persistent pupillary membranes, iris sheets		1	0.1%	0		0		0	
93.750 persistent pupillary membranes, lens pigment foci/no strands		0		0		1	0.5%	0	
93.760 persistent pupillary membranes, endothelial opacity/no strands		0		0		1	0.5%	0	
LENS									
100.200 cataract, unspecified		4	0.6%	0		0		0	
100.210 cataract, significance unknown		15	2.2%	21	3.0%	1	0.5%	1	3.1%
100.301 punctate cataract, anterior cortex		1	0.1%	1	0.1%	0		0	
100.303 punctate cataract, equatorial cortex		1	0.1%	1	0.1%	0		0	
100.304 punctate cataract, anterior sutures		1	0.1%	2	0.3%	0		0	
100.305 punctate cataract, posterior sutures		0		0		2	0.9%	0	
100.306 punctate cataract, nucleus		1	0.1%	0		0		0	
100.307 punctate cataract, capsular		0		2	0.3%	0		0	
100.311 incipient cataract, anterior cortex		5	0.7%	8	1.1%	1	0.5%	1	3.1%
100.312 incipient cataract, posterior cortex		1	0.1%	1	0.1%	0		0	
100.313 incipient cataract, equatorial cortex		3	0.4%	4	0.6%	0		0	
100.314 incipient cataract, anterior sutures		1	0.1%	1	0.1%	0		0	
100.315 incipient cataract, posterior sutures		2	0.3%	0		0		0	
100.316 incipient cataract, nucleus		1	0.1%	0		1	0.5%	0	
100.330 generalized/complete cataract		3	0.4%	4	0.6%	0		0	
100.375 subluxation/luxation, unspecified		1	0.1%	1	0.1%	0		0	
VITREOUS									
110.120 persistent hyaloid artery/remnant		1	0.1%	1	0.1%	0		0	
110.135 PHPV/PTVL		0		1	0.1%	0		0	
110.320 vitreous degeneration syneresis		1	0.1%	5	0.7%	7	3.2%	0	

OCULAR DISORDERS REPORT BOXER

	1991-1999	2000-2009	2010-2013	2014
RETINA				
120.170 retinal dysplasia, folds	2 0.3%	2 0.3%	1 0.5%	0
120.310 generalized progressive retinal atrophy (PRA)	1 0.1%	2 0.3%	0	0
120.400 retinal hemorrhage	1 0.1%	0	0	0
120.910 retinal detachment without dialysis	1 0.1%	0	0	0
OPTIC NERVE				
130.110 micropapilla	0	1 0.1%	0	0
130.120 optic nerve hypoplasia	1 0.1%	0	0	0
130.150 optic disc coloboma	2 0.3%	0	0	0
OTHER				
900.000 other, unspecified	0	2 0.3%	11 5.0%	0
900.100 other, not inherited	4 0.6%	39 5.6%	1 0.5%	3 9.4%
900.110 other, suspected as inherited	6 0.9%	4 0.6%	0	1 3.1%
NORMAL				
0.000 normal globe	522 75.8%	506 72.1%	176 79.3%	22 68.8%

OCULAR DISORDERS REPORT

BOYKIN SPANIEL - 1

BOYKIN SPANIEL

	DISORDER	INHERITANCE	REFERENCE	BREEDING ADVICE
A.	Distichiasis	Not defined	1	Breeder option
B.	Corneal dystrophy - epithelial/stromal	Not defined	1	Breeder option
C.	Persistent pupillary membranes - iris to iris	Not defined	2	Breeder option
D.	Cataract	Not defined	1	NO
E.	Persistent hyaloid artery	Not defined	2	Breeder option
F.	Retinal dysplasia - folds	Not defined	1	Breeder option
G.	Retinal atrophy - generalized	Not defined	1	NO
H.	Choroidal hypoplasia (Collie Eye Anomaly) - staphyloma/coloboma - retinal detachment - retinal hemorrhage - optic nerve coloboma * a genetic test is available	Autosomal recessive	3-5	NO

Description and Comments

A. Distichiasis

Eyelashes abnormally located on the eyelid margin which may cause ocular irritation. Distichiasis may occur at any time in the life of a dog. It is difficult to make a strong recommendation with regard to breeding dogs with this entity. The hereditary basis has not been established, although it seems probable due to the high incidence in some breeds. Reducing the incidence is a logical goal. When diagnosed, distichiasis should be recorded; breeding discretion is advised.

B. Corneal dystrophy - epithelial/stromal

©2014, American College of Veterinary Ophthalmologists

OCULAR DISORDERS REPORT

BOYKIN SPANIEL - 2

A non-inflammatory corneal opacity (white to gray) present in one or more of the corneal layers. Corneal dystrophy implies a probable inherited basis and is usually bilateral.

C. Persistent pupillary membranes (PPM)

Persistent blood vessel remnants in the anterior chamber of the eye which fail to regress normally by 3 months of age. These strands may bridge from iris to iris, iris to cornea, iris to lens, or form sheets of tissue in the anterior chamber. The last three forms pose the greatest threat to vision and when severe, vision impairment or blindness may occur.

D. Cataract

A partial or complete opacity of the lens and/or its capsule. In cases where cataracts are complete and affect both eyes, blindness results. The prudent approach is to assume cataracts to be hereditary except in cases known to be associated with trauma, other causes of ocular inflammation, specific metabolic diseases, persistent pupillary membrane, persistent hyaloid or nutritional deficiencies. Cataracts may involve the lens completely (diffuse) or in a localized region.

E. Persistent hyaloid artery (PHA)

Congenital defect resulting from abnormalities in the development and regression of the hyaloid artery. The blood vessel remnant can be present in the vitreous as a small patent vascular strand (PHA) or as a non-vascular strand that appears gray-white (persistent hyaloid remnant).

F. Retinal dysplasia - folds

Linear, triangular, curved or curvilinear foci of retinal folding that may be single or multiple. When seen in puppies, this condition may partially or completely resolve with maturity. Its significance to vision is unknown. There are two other forms of retinal dysplasia (geographic, detached) which are known to be inherited in other breeds and, in their most severe form, cause blindness. The genetic relationship between folds and more severe forms of retinal dysplasia is undetermined.

G. Retinal atrophy - generalized

A degenerative disease of the retinal visual cells which progresses to blindness. This abnormality, also known as progressive retinal atrophy or PRA, may be detected by electroretinogram before it is apparent clinically. In most breeds studied to date, retinal atrophy is recessively inherited.

H. Choroidal hypoplasia (Collie Eye Anomaly)

- staphyloma/coloboma
- retinal detachment
- retinal hemorrhage
- optic nerve coloboma

OCULAR DISORDERS REPORT

BOYKIN SPANIEL - 3

A spectrum of malformations present at birth and ranging from inadequate development of the choroid (choroidal hypoplasia) to defects of the choroid, retina, or optic nerve (coloboma/staphyloma) to complete retinal detachment (with or without hemorrhage). Mildly affected animals will have no detectable vision deficit. This disorder is collectively referred to as "Collie Eye Anomaly". A DNA test is available.

References

There are few references providing detailed descriptions of hereditary ocular conditions of the Boykin Spaniel breed. The conditions listed above are generally recognized to exist in the breed, as evidenced by identification on breed eye screening examinations and/or clinical experience of veterinary ophthalmologists.

1. ACVO Genetics Committee, 1999 and/or Data from CERF All-Breeds Report, 1991-1998.
2. ACVO Genetics Committee, 2005 and/or Data from CERF All-Breeds Report 2003-2004.
3. ACVO Genetics Committee, 2007 and/or Data from CERF All-Breeds Report 2002-2006.
4. ACVO Genetics Committee, 2008 and/or Data from CERF All Breeds Report, 2003-2007.
5. Parker HG, Kukekova AV, Akey DT, et al. Breed relationships facilitate fine-mapping studies: a 7.8-kb deletion cosegregates with Collie eye anomaly across multiple dog breeds. *Genome Res.* 2007 Nov;17:1562-1571.

OCULAR DISORDERS REPORT BOYKIN SPANIEL

Diagnostic Name	TOTAL DOGS EXAMINED	1991-1999		2000-2009		2010-2013		2014	
		#	%	#	%	#	%	#	%
GLOBE									
0.110 microphthalmia		0		1	0.1%	0		0	
EYELIDS									
20.160 macropalpebral fissure		1	0.3%	1	0.1%	0		0	
21.000 entropion, unspecified		0		1	0.1%	0		0	
25.110 distichiasis		51	13.1%	203	12.8%	123	12.8%	34	12.2%
NICTITANS									
51.100 third eyelid cartilage anomaly		1	0.3%	0		0		0	
52.110 prolapsed gland of the third eyelid		1	0.3%	0		0		0	
CORNEA									
70.210 corneal pannus		1	0.3%	0		0		0	
70.220 pigmentary keratitis		1	0.3%	0		0		0	
70.700 corneal dystrophy		13	3.4%	31	2.0%	6	0.6%	1	0.4%
70.730 corneal endothelial degeneration		1	0.3%	0		0		0	
UVEA									
93.110 iris hypoplasia		0		0		0		2	0.7%
93.120 iris cyst		1	0.3%	0		0		0	
93.150 iris coloboma		1	0.3%	0		0		0	
93.710 persistent pupillary membranes, iris to iris		5	1.3%	21	1.3%	34	3.5%	23	8.2%
93.720 persistent pupillary membranes, iris to lens		1	0.3%	0		1	0.1%	0	
93.730 persistent pupillary membranes, iris to cornea		1	0.3%	3	0.2%	1	0.1%	0	
93.740 persistent pupillary membranes, iris sheets		2	0.5%	0		0		0	
93.750 persistent pupillary membranes, lens pigment foci/no strands		0		0		7	0.7%	2	0.7%
97.150 chorioretinal coloboma, congenital		0		0		0		1	0.4%
LENS									
100.200 cataract, unspecified		7	1.8%	0		0		0	
100.210 cataract, significance unknown		17	4.4%	99	6.3%	49	5.1%	18	6.5%
100.301 punctate cataract, anterior cortex		5	1.3%	5	0.3%	4	0.4%	1	0.4%
100.302 punctate cataract, posterior cortex		11	2.8%	16	1.0%	13	1.4%	4	1.4%
100.303 punctate cataract, equatorial cortex		3	0.8%	1	0.1%	3	0.3%	0	
100.304 punctate cataract, anterior sutures		0		3	0.2%	0		0	
100.305 punctate cataract, posterior sutures		4	1.0%	7	0.4%	4	0.4%	0	
100.306 punctate cataract, nucleus		5	1.3%	3	0.2%	1	0.1%	0	
100.307 punctate cataract, capsular		0		3	0.2%	5	0.5%	0	
100.311 incipient cataract, anterior cortex		3	0.8%	8	0.5%	5	0.5%	0	
100.312 incipient cataract, posterior cortex		4	1.0%	22	1.4%	8	0.8%	2	0.7%
100.313 incipient cataract, equatorial cortex		2	0.5%	2	0.1%	2	0.2%	0	
100.315 incipient cataract, posterior sutures		1	0.3%	2	0.1%	1	0.1%	1	0.4%
100.316 incipient cataract, nucleus		1	0.3%	7	0.4%	1	0.1%	0	
100.317 incipient cataract, capsular		0		2	0.1%	3	0.3%	1	0.4%
100.323 incomplete cataract, equatorial cortex		0		0		0		1	0.4%
100.330 generalized/complete cataract		3	0.8%	7	0.4%	0		0	
VITREOUS									
110.120 persistent hyaloid artery/remnant		1	0.3%	8	0.5%	10	1.0%	3	1.1%
110.135 PHPV/PTVL		0		3	0.2%	0		0	

OCULAR DISORDERS REPORT BOYKIN SPANIEL

VITREOUS CONTINUED	1991-1999	2000-2009	2010-2013	2014
110.320 vitreous degeneration syneresis	0	2 0.1%	3 0.3%	0
FUNDUS				
97.110 choroidal hypoplasia	0	24 1.5%	9 0.9%	11 3.9%
97.120 coloboma	0	0	1 0.1%	0
RETINA				
120.170 retinal dysplasia, folds	16 4.1%	30 1.9%	15 1.6%	0
120.180 retinal dysplasia, geographic	0	7 0.4%	2 0.2%	0
120.190 retinal dysplasia, detached	0	1 0.1%	0	0
120.200 retinitis	0	0	0	8 2.9%
120.310 generalized progressive retinal atrophy (PRA)	5 1.3%	18 1.1%	7 0.7%	0
120.400 retinal hemorrhage	1 0.3%	1 0.1%	0	0
120.910 retinal detachment without dialysis	1 0.3%	1 0.1%	0	0
120.920 retinal detachment with dialysis	0	0	0	1 0.4%
120.960 retinopathy	0	0	4 0.4%	0
OPTIC NERVE				
130.110 micropapilla	1 0.3%	0	0	0
130.120 optic nerve hypoplasia	3 0.8%	1 0.1%	0	0
130.150 optic disc coloboma	5 1.3%	4 0.3%	6 0.6%	2 0.7%
OTHER				
900.000 other, unspecified	0	26 1.6%	47 4.9%	0
900.100 other, not inherited	4 1.0%	75 4.7%	15 1.6%	12 4.3%
900.110 other, suspected as inherited	2 0.5%	6 0.4%	2 0.2%	0
NORMAL				
0.000 normal globe	271 69.8%	1250 79.1%	801 83.6%	218 78.1%

OCULAR DISORDERS REPORT

BRACCO ITALIANO - 1

BRACCO ITALIANO

	DISORDER	INHERITANCE	REFERENCE	BREEDING ADVICE
A.	Distichiasis	Not defined	1	Breeder option
B.	Cataract	Not defined	2	No
C.	Retinal dysplasia - folds	Not defined	3	Breeder option

Description and Comments

A. Distichiasis

Eyelashes abnormally located on the eyelid margin which may cause ocular irritation. Distichiasis may occur at any time in the life of a dog. It is difficult to make a strong recommendation with regard to breeding dogs with this entity. The hereditary basis has not been established although it seems probable due to the high incidence in some breeds. Reducing the incidence is a logical goal. When diagnosed, distichiasis should be recorded; breeding discretion is advised.

B. Cataract

A partial or complete opacity of the lens and/or its capsule. In cases where cataracts are complete and affect both eyes, blindness results. The prudent approach is to assume cataracts to be hereditary except in cases known to be associated with trauma, other causes of ocular inflammation, specific metabolic diseases, persistent pupillary membrane, persistent hyaloid or nutritional deficiencies. Cataracts may involve the lens completely (diffuse) or in a localized region.

C. Retinal dysplasia - folds

Linear, triangular, curved or curvilinear foci of retinal folding that may be single or multiple. When seen in puppies, this condition may partially or completely resolve with maturity. Its significance to vision is unknown. There are two other forms of retinal dysplasia (geographic, detached) which are known to be inherited in other breeds and, in their most severe form, cause blindness. The genetic relationship between folds and more severe forms of retinal dysplasia is undetermined.

OCULAR DISORDERS REPORT

BRACCO ITALIANO - 2

References

There are no references providing detailed descriptions of hereditary conditions of the Bracco Italiano breed. The conditions listed above are generally recognized to exist in this breed, as evidenced by identification on breed eye screening examinations and/or clinical experience of veterinary ophthalmologists.

1. ACVO Genetics Committee, 2013-2014 and Data from OFA All-Breeds Report, 2013-2014.
2. ACVO Genetics Committee, 2009 and/or Data from CERF All-Breeds Report, 2008.
3. ACVO Genetics Committee, 2006 and/or Data from CERF All-Breeds Report, 2001-2005.

OCULAR DISORDERS REPORT BRACCO ITALIANO

Diagnostic Name	TOTAL DOGS EXAMINED		1991-1999		2000-2009		2010-2013		2014	
	#	%	#	%	#	%	#	%	#	%
EYELIDS										
20.160 macropalpebral fissure	0		1	2.1%	0		0		0	
21.000 entropion, unspecified	0		2	4.2%	2	5.9%	2	5.9%	0	
25.110 distichiasis	0		2	4.2%	5	14.7%	5	14.7%	1	4.3%
NICTITANS										
51.100 third eyelid cartilage anomaly	0		0		1	2.9%	1	2.9%	0	
52.110 prolapsed gland of the third eyelid	0		1	2.1%	0		0		0	
UVEA										
93.710 persistent pupillary membranes, iris to iris	0		0		2	5.9%	2	5.9%	0	
LENS										
100.210 cataract, significance unknown	0		3	6.2%	6	17.6%	6	17.6%	1	4.3%
100.301 punctate cataract, anterior cortex	0		2	4.2%	0		0		0	
100.302 punctate cataract, posterior cortex	0		2	4.2%	1	2.9%	1	2.9%	1	4.3%
100.305 punctate cataract, posterior sutures	0		0		1	2.9%	1	2.9%	0	
100.311 incipient cataract, anterior cortex	0		1	2.1%	0		0		0	
100.312 incipient cataract, posterior cortex	0		2	4.2%	3	8.8%	3	8.8%	3	13.0%
100.313 incipient cataract, equatorial cortex	0		1	2.1%	0		0		0	
100.316 incipient cataract, nucleus	0		2	4.2%	0		0		0	
100.317 incipient cataract, capsular	0		0		0		0		1	4.3%
RETINA										
120.170 retinal dysplasia, folds	0		5	10.4%	2	5.9%	2	5.9%	0	
120.200 retinitis	0		0		0		0		1	4.3%
OTHER										
900.000 other, unspecified	0		1	2.1%	1	2.9%	1	2.9%	0	
900.100 other, not inherited	0		3	6.2%	0		0		0	
NORMAL										
0.000 normal globe	0		32	66.7%	21	61.8%	21	61.8%	17	73.9%

OCULAR DISORDERS REPORT

BRIARD - 1

BRIARD

	DISORDER	INHERITANCE	REFERENCE	BREEDING ADVICE
A.	Corneal dystrophy - epithelial/stromal	Not defined	1	Breeder option
B.	Persistent pupillary membranes - iris to iris	Not defined	2	Breeder option
C.	Cataract	Not defined	3	NO
D.	Central progressive retinal atrophy	Autosomal recessive	1, 4, 5	NO
E.	Retinal dystrophy formerly called Congenital stationary night blindness (<i>CSNB</i>) * a DNA test is available	Autosomal recessive	1, 6-12	NO
F.	Retinal atrophy - generalized	Not defined	1	NO

Description and Comments

A. Corneal dystrophy- epithelial/stromal

A non-inflammatory corneal opacity (white to gray) present in one or more of the corneal layers. Corneal dystrophy implies a probable inherited basis and is usually bilateral.

B. Persistent pupillary membranes (PPM)

Persistent blood vessel remnants in the anterior chamber of the eye which fail to regress normally by 3 months of age. These strands may bridge from iris to iris, iris to cornea, iris to lens, or form sheets of tissue in the anterior chamber. The last three forms pose the greatest threat to vision and when severe, vision impairment or blindness may occur.

OCULAR DISORDERS REPORT

BRIARD - 2

C. Cataract

A partial or complete opacity of the lens and/or its capsule. In cases where cataracts are complete and affect both eyes, blindness results. The prudent approach is to assume cataracts to be hereditary except in cases known to be associated with trauma, other causes of ocular inflammation, specific metabolic diseases, persistent pupillary membrane, persistent hyaloid or nutritional deficiencies. Cataracts may involve the lens completely (diffuse) or in a localized region.

D. Central progressive retinal atrophy (CPRA)

A progressive retinal degeneration in which photoreceptor death occurs secondary to disease of the underlying pigment epithelium. Progression is slow and some animals never lose vision. CPRA occurs in England, but is uncommon elsewhere.

CPRA is characterized by the appearance of brown spots and patches primarily in the tapetal fundus and retinal degeneration. These areas are created by an accumulation of autofluorescent lipopigment within the retinal pigment epithelium cells. These changes are consistent with retinal changes observed in Vitamin E deficiency. Neurologic signs including ataxia and proprioceptive deficits have also been identified in affected dogs.

In the Briard, the early lesions are seen first in the temporal tapetal fundus and progress to affect the posterior pole region at a later time; the eye lesions may initially be asymmetrical. The age of onset varies from young adults (> 17 months) to older animals. Many dogs have been found to be normal on repeated examinations before 5 years of age, only to develop clinical signs at a later age. The disease is inherited as a simple recessive trait. The ERG has not been reported to be a useful test for the early diagnosis of the disease.

In the Briard, retinal lesions of CPRA have been related to an underlying abnormal metabolism of Vitamin E resulting in a systemic deficiency.

E. Retinal dystrophy formerly Congenital stationary night blindness (*CSNB*)

A non-progressive retinal function defect characterized primarily by night blindness; day vision is normal to severely compromised. CSNB is an autosomal recessive trait caused by a mutation in the RPE65 gene. The condition is detected by 5-6 weeks of age, after the postnatal maturation of the retina is completed. Nystagmus is present in some dogs, particularly in those having night blindness and severely compromised day vision. Ophthalmoscopic examination shows no abnormalities. Abnormalities in serum lipids (mild hypercholesterolemia) and elevated arachidonic acid have been noted in some animals. The ERG results are specific and diagnostic for the disorder. ERG testing is essential to distinguish this disorder from more central visual pathway defects which may appear clinically similar.

The gene mutation RPE65 has been identified. This is the same mutation as causes Leber's congenital amaurosis, also sometimes called juvenile retinitis pigmentosa (RP), in humans. A DNA test is available.

OCULAR DISORDERS REPORT

BRIARD - 3

F. Retinal atrophy - generalized

A degenerative disease of the retinal visual cells which progresses to blindness. This abnormality, also known as progressive retinal atrophy or PRA, may be detected by electroretinogram (not part of a routine eye screening examination) before it is apparent clinically. Except for X-linked PRA in the Siberian Husky, in all breeds studied to date, PRA is inherited as an autosomal recessive trait.

In the Briard, early fundus abnormalities usually appear after 4 years of age. The electroretinogram (ERG) shows marked functional abnormalities indicative of a progressive rod-cone degeneration. The age for early diagnosis by ERG has not been established but should be possible in dogs over 2 years of age.

References

1. ACVO Genetics Committee, 1999 and/or Data from CERF All-Breeds Report, 1991-1998.
2. ACVO Genetics Committee, 2006 and/or Data from CERF All-Breeds Report, 2001-2005.
3. ACVO Genetics Committee, 2005 and/or Data from CERF All-Breeds Report 2003-2004.
4. Bedford P. Retinal pigment epithelial dystrophy (CPRA): A study of the disease in the Briard. *J Small Anim Pract.* 1984;25:129.
5. McLellan GJ, Elks R, Lybaert P, et al. Vitamin E deficiency in dogs with retinal pigment epithelial dystrophy. *Vet Rec.* 2002 Nov 30;151:663-667.
6. Narfstrom K. Retinal dystrophy or 'congenital stationary night blindness' in the Briard dog. *Vet Ophthalmol.* 1999;2:75-76.
7. Narfstrom K, Wrigstad A and Nilsson SE. The Briard dog: a new animal model of congenital stationary night blindness. *Br J Ophthalmol.* 1989 Sep;73:750-756.
8. Veske A, Nilsson SE, Narfstrom K, et al. Retinal dystrophy of Swedish briard/briard-beagle dogs is due to a 4-bp deletion in RPE65. *Genomics.* 1999 Apr 1;57:57-61.
9. Wrigstad A, Narfstrom K and Nilsson SE. Slowly progressive changes of the retina and retinal pigment epithelium in Briard dogs with hereditary retinal dystrophy. A morphological study. *Doc Ophthalmol.* 1994;87:337-354.
10. Lightfoot RM, Cabral L, Gooch L, et al. Retinal pigment epithelial dystrophy in Briard dogs. *Research in veterinary science.* 1996 Jan;60:17-23.
11. Aguirre GD and Acland GM. Use and misuse of electroretinography in the diagnosis of inherited retinal diseases in dogs. *Proc Am Coll Vet Ophthalmol.* 1997;27:37.
12. Aguirre GD, Baldwin V, Pearce-Kelling S, et al. Congenital stationary night blindness in the dog: common mutation in the RPE65 gene indicates founder effect. *Mol Vis.* 1998 Oct

OCULAR DISORDERS REPORT

BRIARD - 4

30;4:23.

OCULAR DISORDERS REPORT BRIARD

Diagnostic Name	TOTAL DOGS EXAMINED	1991-1999		2000-2009		2010-2013		2014	
		#	%	#	%	#	%	#	%
GLOBE									
10.000 glaucoma		1	0.1%	0		0		0	
EYELIDS									
20.140 ectopic cilia		1	0.1%	0		0		0	
21.000 entropion, unspecified		1	0.1%	0		0		0	
25.110 distichiasis		0		7	0.8%	3	0.8%	0	
NASOLACRIMAL									
32.110 imperforate lower nasolacrimal punctum		2	0.2%	0		0		0	
NICTITANS									
51.100 third eyelid cartilage anomaly		0		1	0.1%	0		0	
52.110 prolapsed gland of the third eyelid		1	0.1%	0		1	0.3%	0	
CORNEA									
70.210 corneal pannus		1	0.1%	0		0		0	
70.700 corneal dystrophy		7	0.8%	14	1.5%	5	1.4%	3	3.7%
UVEA									
93.120 iris cyst		2	0.2%	4	0.4%	4	1.1%	0	
93.710 persistent pupillary membranes, iris to iris		6	0.7%	11	1.2%	0		3	3.7%
93.720 persistent pupillary membranes, iris to lens		0		1	0.1%	1	0.3%	0	
93.730 persistent pupillary membranes, iris to cornea		0		2	0.2%	0		0	
93.740 persistent pupillary membranes, iris sheets		0		2	0.2%	0		0	
93.750 persistent pupillary membranes, lens pigment foci/no strands		0		0		5	1.4%	1	1.2%
LENS									
100.200 cataract, unspecified		9	1.1%	0		0		0	
100.210 cataract, significance unknown		16	1.9%	29	3.1%	22	6.0%	5	6.1%
100.301 punctate cataract, anterior cortex		1	0.1%	4	0.4%	1	0.3%	0	
100.302 punctate cataract, posterior cortex		0		1	0.1%	1	0.3%	0	
100.305 punctate cataract, posterior sutures		0		2	0.2%	0		0	
100.306 punctate cataract, nucleus		1	0.1%	4	0.4%	1	0.3%	0	
100.307 punctate cataract, capsular		0		3	0.3%	0		0	
100.311 incipient cataract, anterior cortex		2	0.2%	3	0.3%	1	0.3%	0	
100.312 incipient cataract, posterior cortex		1	0.1%	7	0.8%	1	0.3%	0	
100.313 incipient cataract, equatorial cortex		0		1	0.1%	1	0.3%	0	
100.315 incipient cataract, posterior sutures		0		1	0.1%	0		0	
100.316 incipient cataract, nucleus		0		2	0.2%	1	0.3%	0	
100.317 incipient cataract, capsular		0		2	0.2%	0		0	
100.323 incomplete cataract, equatorial cortex		0		0		1	0.3%	0	
100.330 generalized/complete cataract		2	0.2%	1	0.1%	0		0	
VITREOUS									
110.120 persistent hyaloid artery/remnant		0		1	0.1%	0		0	
110.135 PHPV/PTVL		0		3	0.3%	0		0	
110.320 vitreous degeneration syneresis		1	0.1%	1	0.1%	0		0	

OCULAR DISORDERS REPORT BRIARD

	1991-1999	2000-2009	2010-2013	2014
FUNDUS				
97.120 coloboma	1 0.1%	0	0	0
RETINA				
120.170 retinal dysplasia, folds	3 0.4%	2 0.2%	2 0.5%	0
120.180 retinal dysplasia, geographic	0	1 0.1%	0	0
120.310 generalized progressive retinal atrophy (PRA)	1 0.1%	0	0	0
120.400 retinal hemorrhage	1 0.1%	0	0	0
120.910 retinal detachment without dialysis	0	0	2 0.5%	0
OPTIC NERVE				
130.120 optic nerve hypoplasia	1 0.1%	0	0	0
130.150 optic disc coloboma	2 0.2%	1 0.1%	0	0
OTHER				
900.000 other, unspecified	0	12 1.3%	25 6.8%	0
900.100 other, not inherited	6 0.7%	52 5.6%	7 1.9%	5 6.1%
900.110 other, suspected as inherited	14 1.7%	2 0.2%	2 0.5%	0
NORMAL				
0.000 normal globe	764 92.2%	869 93.1%	336 91.3%	75 91.5%

OCULAR DISORDERS REPORT

BRITTANY - 1

BRITTANY

	DISORDER	INHERITANCE	REFERENCE	BREEDING ADVICE
A.	Distichiasis	Not defined	1	Breeder option
B.	Persistent pupillary membrane - iris to iris	Not defined	2	Breeder option
C.	Lens luxation	Not defined	3	NO
D.	Cataract	Not defined	3	NO
E.	Vitreous degeneration	Not defined	4	Breeder option
F.	Retinal dysplasia - folds	Not defined	4	Breeder option
G.	Retinal dysplasia - geographic	Not defined	5	NO

Description and Comments

A. Distichiasis

Eyelashes abnormally located on the eyelid margin which may cause ocular irritation. Distichiasis may occur at any time in the life of a dog. It is difficult to make a strong recommendation with regard to breeding dogs with this entity. The hereditary basis has not been established although it seems probable due to the high incidence in some breeds. Reducing the incidence is a logical goal. When diagnosed, distichiasis should be recorded; breeding discretion is advised.

B. Persistent pupillary membrane (PPM)

Persistent blood vessel remnants in the anterior chamber of the eye which fail to regress normally by 3 months of age. These strands may bridge from iris to iris, iris to cornea, iris to lens, or form sheets of tissue in the anterior chamber. The last three forms pose the greatest threat to vision and when severe, vision impairment or blindness may occur.

OCULAR DISORDERS REPORT

BRITTANY - 2

C. Lens luxation

Partial (subluxated) or complete displacement of the lens from the normal anatomic site behind the pupil. Lens luxation not associated with trauma or inflammation is presumed to be inherited. Lens luxation may result in elevated intraocular pressure (glaucoma) causing vision impairment or blindness.

D. Cataract

A partial or complete opacity of the lens and/or its capsule. In cases where cataracts are complete and affect both eyes, blindness results. The prudent approach is to assume cataracts to be hereditary except in cases known to be associated with trauma, other causes of ocular inflammation, specific metabolic diseases, persistent pupillary membrane, persistent hyaloid or nutritional deficiencies. Cataracts may involve the lens completely (diffuse) or in a localized region.

The exact frequency and significance of cataracts in the breed is not known, although it is probably low.

E. Vitreous degeneration

Liquefaction of the vitreous gel which may predispose to retinal detachment.

F. Retinal dysplasia - folds

Linear, triangular, curved or curvilinear foci of retinal folding that may be single or multiple. When seen in puppies, this condition may partially or completely resolve with maturity. Its significance to vision is unknown. There are two other forms of retinal dysplasia (geographic, detached) which are known to be inherited in other breeds and, in their most severe form, cause blindness. The genetic relationship between folds and more severe forms of retinal dysplasia is undetermined.

G. Retinal dysplasia - geographic

Abnormal development of the retina present at birth. Any irregularly shaped area of abnormal retinal development containing both areas of thinning and areas of elevation representing folds and retinal disorganization.

References

There are no references providing detailed descriptions of hereditary conditions of the Brittany breed. The conditions listed above are generally recognized to exist in this breed, as evidenced by identification on breed eye screening examinations and/or clinical experience of veterinary ophthalmologists.

1. ACVO Genetics Committee, 2002-2003 and/or Data from CERF All-Breeds Report, 2002-2003.

OCULAR DISORDERS REPORT

BRITTANY - 3

2. ACVO Genetics Committee, 2005 and/or Data from CERF All-Breeds Report 2003-2004.
3. ACVO Genetics Committee, 1999 and/or Data from CERF All-Breeds Report, 1991-1998.
4. ACVO Genetics Committee, 2006 and/or Data from CERF All-Breeds Report, 2001-2005.
5. ACVO Genetics Committee, 2008 and/or Data from CERF All-Breeds Report, 2003-2007.

OCULAR DISORDERS REPORT BRITTANY

Diagnostic Name	TOTAL DOGS EXAMINED	1991-1999		2000-2009		2010-2013		2014	
		#	%	#	%	#	%	#	%
EYELIDS									
25.110	distichiasis	22	3.3%	22	2.2%	5	1.5%	2	1.7%
NASOLACRIMAL									
40.910	keratoconjunctivitis sicca	0		1	0.1%	0		0	
NICTITANS									
52.110	prolapsed gland of the third eyelid	0		0		2	0.6%	0	
CORNEA									
70.700	corneal dystrophy	1	0.1%	3	0.3%	1	0.3%	0	
70.730	corneal endothelial degeneration	2	0.3%	1	0.1%	0		0	
UVEA									
93.120	iris cyst	0		1	0.1%	0		0	
93.710	persistent pupillary membranes, iris to iris	4	0.6%	21	2.1%	7	2.2%	1	0.8%
93.720	persistent pupillary membranes, iris to lens	0		2	0.2%	0		0	
93.750	persistent pupillary membranes, lens pigment foci/no strands	0		0		4	1.2%	2	1.7%
LENS									
100.200	cataract, unspecified	10	1.5%	0		0		0	
100.210	cataract, significance unknown	17	2.5%	57	5.7%	9	2.8%	3	2.5%
100.301	punctate cataract, anterior cortex	5	0.7%	3	0.3%	2	0.6%	2	1.7%
100.302	punctate cataract, posterior cortex	3	0.4%	16	1.6%	6	1.8%	1	0.8%
100.303	punctate cataract, equatorial cortex	1	0.1%	0		1	0.3%	0	
100.304	punctate cataract, anterior sutures	1	0.1%	0		0		0	
100.305	punctate cataract, posterior sutures	1	0.1%	3	0.3%	1	0.3%	0	
100.306	punctate cataract, nucleus	1	0.1%	0		0		0	
100.307	punctate cataract, capsular	0		8	0.8%	0		1	0.8%
100.311	incipient cataract, anterior cortex	4	0.6%	5	0.5%	0		0	
100.312	incipient cataract, posterior cortex	9	1.3%	18	1.8%	4	1.2%	1	0.8%
100.313	incipient cataract, equatorial cortex	4	0.6%	3	0.3%	5	1.5%	0	
100.314	incipient cataract, anterior sutures	0		1	0.1%	1	0.3%	0	
100.315	incipient cataract, posterior sutures	2	0.3%	6	0.6%	0		1	0.8%
100.316	incipient cataract, nucleus	1	0.1%	5	0.5%	0		0	
100.317	incipient cataract, capsular	0		4	0.4%	0		0	
100.322	incomplete cataract, posterior cortex	0		0		2	0.6%	0	
100.323	incomplete cataract, equatorial cortex	0		0		2	0.6%	0	
100.327	incomplete cataract, capsular	0		0		2	0.6%	0	
100.330	generalized/complete cataract	4	0.6%	0		0		0	
100.375	subluxation/luxation, unspecified	0		3	0.3%	0		0	
VITREOUS									
110.120	persistant hyaloid artery/remnant	1	0.1%	0		0		0	
110.135	PHPV/PTVL	0		1	0.1%	0		0	
110.320	vitreous degeneration syneresis	0		8	0.8%	4	1.2%	0	
RETINA									
120.170	retinal dysplasia, folds	1	0.1%	5	0.5%	1	0.3%	0	
120.180	retinal dysplasia, geographic	0		6	0.6%	0		0	
120.200	retinitis	0		0		1	0.3%	0	

OCULAR DISORDERS REPORT BRITTANY

RETINA CONTINUED	1991-1999	2000-2009	2010-2013	2014
120.310 generalized progressive retinal atrophy (PRA)	6 0.9%	12 1.2%	2 0.6%	0
120.910 retinal detachment without dialysis	1 0.1%	0	0	0
120.920 retinal detachment with dialysis	0	0	1 0.3%	0
120.960 retinopathy	0	0	1 0.3%	0
OPTIC NERVE				
130.110 micropapilla	0	1 0.1%	0	0
130.120 optic nerve hypoplasia	0	1 0.1%	0	0
130.150 optic disc coloboma	0	1 0.1%	0	0
OTHER				
900.000 other, unspecified	0	4 0.4%	13 4.0%	0
900.100 other, not inherited	4 0.6%	57 5.7%	2 0.6%	1 0.8%
900.110 other, suspected as inherited	5 0.7%	3 0.3%	1 0.3%	0
NORMAL				
0.000 normal globe	592 87.6%	871 86.9%	296 91.1%	111 93.3%

OCULAR DISORDERS REPORT

BRUSSELS GRIFFON - 1

BRUSSELS GRIFFON

	DISORDER	INHERITANCE	REFERENCES	BREEDING ADVICE
A.	Exposure keratopathy syndrome/ macroblepharon	Not defined	1	Breeder option
B.	Distichiasis	Not defined	2, 3	Breeder option
C.	Persistent pupillary membranes - iris to iris - all other forms	Not defined Not defined	1, 3 3	Breeder option NO
D.	Cataract	Not defined	1	NO
E.	Lens luxation	Not defined	2, 3	NO
F.	Persistent hyaloid artery	Not defined	3	Breeder option
G.	Vitreous degeneration	Not defined	1, 4, 5	Breeder option
H.	Retinal atrophy - generalized	Not defined	2, 3	NO
I.	Retinal dysplasia - geographic	Not defined	5	NO
J.	Optic nerve coloboma	Not defined	1	NO

Description and Comments

A. Exposure keratopathy syndrome/macroblepharon

A corneal disease involving all or part of the cornea, resulting from inadequate blinking. This results from a combination of anatomic features including shallow orbits, exophthalmos, macroblepharon and lagophthalmos.

B. Distichiasis

©2014, American College of Veterinary Ophthalmologists

OCULAR DISORDERS REPORT

BRUSSELS GRIFFON - 2

Eyelashes abnormally located on the eyelid margin which may cause ocular irritation. Distichiasis may occur at any time in the life of a dog. It is difficult to make a strong recommendation with regard to breeding dogs with this entity. The hereditary basis has not been established although it seems probable due to the high incidence in some breeds. Reducing the incidence is a logical goal. When diagnosed, distichiasis should be recorded; breeding discretion is advised.

C. Persistent pupillary membranes (PPM)

Persistent blood vessel remnants in the anterior chamber of the eye which fail to regress normally by 3 months of age. These strands may bridge from iris to iris, iris to cornea, iris to lens, or form sheets of tissue in the anterior chamber. The last three forms pose the greatest threat to vision and when severe, vision impairment or blindness may occur.

D. Cataract

A partial or complete opacity of the lens and/or its capsule. In cases where cataracts are complete and affect both eyes, blindness results. The prudent approach is to assume cataracts to be hereditary except in cases known to be associated with trauma, other causes of ocular inflammation, specific metabolic diseases, persistent pupillary membrane, persistent hyaloid or nutritional deficiencies. Cataracts may involve the lens completely (diffuse) or in a localized region.

E. Lens luxation

Partial (subluxation) or complete displacement of the lens from the normal anatomic site behind the pupil. Lens luxation not associated with trauma or inflammation is presumed to be inherited. Lens luxation may result in elevated intraocular pressure (glaucoma) causing vision impairment or blindness.

F. Persistent hyaloid artery (PHA)

Congenital defect resulting from abnormalities in the development and regression of the hyaloid artery. The blood vessel remnant can be present in the vitreous as a small patent vascular strand (PHA) or as a non-vascular strand that appears gray-white (persistent hyaloid remnant).

G. Vitreous degeneration

Liquefaction of the vitreous gel which may predispose to retinal detachment.

OCULAR DISORDERS REPORT

BRUSSELS GRIFFON - 3

H. Retinal atrophy - generalized

A degenerative disease of the retinal visual cells which progresses to blindness. This abnormality, also known as Progressive Retinal Atrophy or PRA, may be detected by electroretinogram (not part of a routine eye screening examination) before it is apparent clinically. Except for X-linked PRA in the Siberian Husky, in all breeds studied to date, PRA is inherited as an autosomal recessive trait.

I. Retinal dysplasia - geographic

Abnormal development of the retina present at birth. Any irregularly shaped area of abnormal retinal development containing both areas of thinning and areas of elevation representing folds and retinal disorganization.

J. Optic nerve coloboma

A congenital cavity in the optic nerve which, if large, may cause blindness or vision impairment.

References

There are no references providing detailed descriptions of hereditary ocular conditions of the Brussels Griffon breed. The conditions listed above are generally recognized to exist in this breed, as evidenced by identification on breed eye screening examinations and/or clinical experience of veterinary ophthalmologists.

1. ACVO Genetics Committee, 1999 and/or Data from CERF All-Breeds Report, 1991-1998.
2. ACVO Genetics Committee, 2002-2003 and/or Data from CERF All-Breeds Report, 2002-2003.
3. ACVO Genetics Committee, 2005 and/or Data from CERF All-Breeds Report 2003-2004.
4. ACVO Genetics Committee, 2007 and/or Data from CERF All-Breeds Report 2002-2006.
5. ACVO Genetics Committee, 2008 and/or Data from CERF All-Breeds Report, 2003-2007.

OCULAR DISORDERS REPORT BRUSSELS GRIFFON

Diagnostic Name	TOTAL DOGS EXAMINED		1991-1999		2000-2009		2010-2013		2014	
	#	%	#	%	#	%	#	%	#	%
EYELIDS										
20.140	ectopic cilia	1	0.3%	6	1.0%	1	0.3%	0		
21.000	entropion, unspecified	2	0.6%	1	0.2%	0		0		
25.110	distichiasis	6	1.7%	16	2.7%	6	2.0%	2	2.6%	
NASOLACRIMAL										
40.910	keratoconjunctivitis sicca	0		1	0.2%	1	0.3%	1	1.3%	
CORNEA										
70.210	corneal pannus	0		1	0.2%	0		0		
70.220	pigmentary keratitis	8	2.2%	7	1.2%	2	0.7%	5	6.6%	
70.700	corneal dystrophy	1	0.3%	7	1.2%	2	0.7%	0		
UVEA										
93.110	iris hypoplasia	0		0		2	0.7%	0		
93.120	iris cyst	0		0		2	0.7%	0		
93.710	persistent pupillary membranes, iris to iris	10	2.8%	48	8.0%	38	12.8%	10	13.2%	
93.720	persistent pupillary membranes, iris to lens	0		1	0.2%	0		0		
93.730	persistent pupillary membranes, iris to cornea	0		2	0.3%	0		0		
93.740	persistent pupillary membranes, iris sheets	0		1	0.2%	0		0		
93.750	persistent pupillary membranes, lens pigment foci/no strands	0		0		5	1.7%	3	3.9%	
93.760	persistent pupillary membranes, endothelial opacity/no strands	0		0		3	1.0%	0		
LENS										
100.200	cataract, unspecified	8	2.2%	0		0		0		
100.210	cataract, significance unknown	18	5.0%	19	3.2%	12	4.0%	5	6.6%	
100.301	punctate cataract, anterior cortex	5	1.4%	12	2.0%	7	2.3%	1	1.3%	
100.302	punctate cataract, posterior cortex	6	1.7%	2	0.3%	2	0.7%	1	1.3%	
100.303	punctate cataract, equatorial cortex	1	0.3%	2	0.3%	1	0.3%	1	1.3%	
100.304	punctate cataract, anterior sutures	0		2	0.3%	2	0.7%	0		
100.305	punctate cataract, posterior sutures	0		0		1	0.3%	0		
100.307	punctate cataract, capsular	0		4	0.7%	0		0		
100.311	incipient cataract, anterior cortex	27	7.5%	39	6.5%	9	3.0%	2	2.6%	
100.312	incipient cataract, posterior cortex	7	1.9%	16	2.7%	9	3.0%	2	2.6%	
100.313	incipient cataract, equatorial cortex	10	2.8%	31	5.2%	1	0.3%	1	1.3%	
100.314	incipient cataract, anterior sutures	1	0.3%	6	1.0%	0		0		
100.315	incipient cataract, posterior sutures	0		3	0.5%	2	0.7%	0		
100.316	incipient cataract, nucleus	0		3	0.5%	2	0.7%	0		
100.317	incipient cataract, capsular	0		2	0.3%	0		0		
100.321	incomplete cataract, anterior cortex	0		0		0		1	1.3%	
100.330	generalized/complete cataract	16	4.4%	10	1.7%	3	1.0%	0		
100.375	subluxation/luxation, unspecified	3	0.8%	4	0.7%	2	0.7%	0		
VITREOUS										
110.120	persistant hyaloid artery/remnant	0		8	1.3%	0		1	1.3%	
110.135	PHPV/PTVL	0		0		2	0.7%	0		
110.200	vitritis	0		0		6	2.0%	6	7.9%	
110.320	vitreous degeneration syneresis	53	14.6%	109	18.3%	76	25.5%	11	14.5%	
110.330	vitreous degeneration anterior chamber	0		62	10.4%	9	3.0%	0		

OCULAR DISORDERS REPORT BRUSSELS GRIFFON

	1991-1999	2000-2009	2010-2013	2014
FUNDUS				
97.110 choroidal hypoplasia	0	0	2 0.7%	0
97.120 coloboma	0	2 0.3%	1 0.3%	0
RETINA				
120.170 retinal dysplasia, folds	2 0.6%	3 0.5%	8 2.7%	3 3.9%
120.180 retinal dysplasia, geographic	3 0.8%	5 0.8%	5 1.7%	0
120.190 retinal dysplasia, detached	0	0	1 0.3%	0
120.310 generalized progressive retinal atrophy (PRA)	6 1.7%	16 2.7%	1 0.3%	0
120.400 retinal hemorrhage	0	0	2 0.7%	0
120.910 retinal detachment without dialysis	1 0.3%	1 0.2%	0	0
OPTIC NERVE				
130.120 optic nerve hypoplasia	0	0	2 0.7%	1 1.3%
130.150 optic disc coloboma	9 2.5%	6 1.0%	3 1.0%	0
OTHER				
900.000 other, unspecified	0	6 1.0%	20 6.7%	0
900.100 other, not inherited	1 0.3%	24 4.0%	3 1.0%	3 3.9%
900.110 other, suspected as inherited	7 1.9%	5 0.8%	1 0.3%	1 1.3%
NORMAL				
0.000 normal globe	229 63.3%	370 62.0%	176 59.1%	47 61.8%

OCULAR DISORDERS REPORT

BULL TERRIER - 1

BULL TERRIER

	DISORDER	INHERITANCE	REFERENCE	BREEDING ADVICE
A.	Persistent pupillary membranes			
	- iris to iris	Not defined	1, 2	Breeder option
	- iris to cornea	Not defined	2	NO
	- all other forms	Not defined	2	NO
B.	Lens luxation	Not defined	3	NO
C.	Cataract	Not defined	1	NO

Description and Comments

A. Persistent pupillary membranes (PPM)

Persistent blood vessel remnants in the anterior chamber of the eye which fail to regress normally by 3 months of age. These strands may bridge from iris to iris, iris to cornea, iris to lens, or form sheets of tissue in the anterior chamber. The last three forms pose the greatest threat to vision and when severe, vision impairment or blindness may occur.

B. Lens luxation

Partial (subluxated) or complete displacement of the lens from the normal anatomic site behind the pupil. Lens luxation not associated with trauma or inflammation is presumed to be inherited. Lens luxation may result in elevated intraocular pressure (glaucoma) causing vision impairment or blindness.

C. Cataract

A partial or complete opacity of the lens and/or its capsule. In cases where cataracts are complete and affect both eyes, blindness results. The prudent approach is to assume cataracts to be hereditary except in cases known to be associated with trauma, other causes of ocular inflammation, specific metabolic diseases, persistent pupillary membrane, persistent hyaloid or nutritional deficiencies. Cataracts may involve the lens completely (diffuse) or in a localized region.

OCULAR DISORDERS REPORT

BULL TERRIER - 2

References

There are no references providing detailed descriptions of hereditary conditions of the Bull Terrier breed. The conditions listed above are generally recognized to exist in this breed, as evidenced by identification on breed eye screening examinations and/or clinical experience of veterinary ophthalmologists.

1. ACVO Genetics Committee, 2000-2002 and/or Data from CERF All-Breeds Report, 2000-2002.
2. ACVO Genetics Committee, 2005 and/or Data from CERF All-Breeds Report 2003-2004.
3. ACVO Genetics Committee, 2006 and/or Data from CERF All-Breeds Report, 2001-2005.

OCULAR DISORDERS REPORT BULL TERRIER

Diagnostic Name	TOTAL DOGS EXAMINED	1991-1999		2000-2009		2010-2013		2014	
		#	%	#	%	#	%	#	%
GLOBE									
0.110 microphthalmia		1	1.1%	2	2.1%	0		0	
EYELIDS									
21.000 entropion, unspecified		0		2	2.1%	0		0	
22.000 ectropion, unspecified		0		0		1	2.0%	0	
25.110 distichiasis		1	1.1%	0		4	7.8%	0	
CORNEA									
70.700 corneal dystrophy		0		1	1.1%	0		0	
70.730 corneal endothelial degeneration		5	5.3%	0		0		0	
UVEA									
93.710 persistent pupillary membranes, iris to iris		5	5.3%	3	3.2%	0		0	
93.720 persistent pupillary membranes, iris to lens		2	2.1%	2	2.1%	0		0	
93.730 persistent pupillary membranes, iris to cornea		6	6.4%	4	4.2%	1	2.0%	0	
93.740 persistent pupillary membranes, iris sheets		1	1.1%	0		0		0	
93.760 persistent pupillary membranes, endothelial opacity/no strands		0		0		1	2.0%	0	
LENS									
100.210 cataract, significance unknown		0		4	4.2%	2	3.9%	0	
100.301 punctate cataract, anterior cortex		2	2.1%	0		0		0	
100.302 punctate cataract, posterior cortex		1	1.1%	0		1	2.0%	0	
100.303 punctate cataract, equatorial cortex		2	2.1%	0		0		0	
100.304 punctate cataract, anterior sutures		0		1	1.1%	0		0	
100.306 punctate cataract, nucleus		1	1.1%	0		0		0	
100.307 punctate cataract, capsular		0		1	1.1%	0		0	
100.311 incipient cataract, anterior cortex		0		1	1.1%	0		0	
100.312 incipient cataract, posterior cortex		1	1.1%	0		0		0	
100.313 incipient cataract, equatorial cortex		1	1.1%	1	1.1%	0		0	
100.314 incipient cataract, anterior sutures		1	1.1%	0		0		0	
100.315 incipient cataract, posterior sutures		1	1.1%	0		0		0	
100.330 generalized/complete cataract		0		2	2.1%	1	2.0%	0	
100.375 subluxation/luxation, unspecified		3	3.2%	4	4.2%	0		0	
VITREOUS									
110.320 vitreous degeneration syneresis		1	1.1%	2	2.1%	0		0	
110.330 vitreous degeneration anterior chamber		0		0		1	2.0%	0	
RETINA									
120.170 retinal dysplasia, folds		0		1	1.1%	0		0	
120.310 generalized progressive retinal atrophy (PRA)		0		1	1.1%	0		0	
120.910 retinal detachment without dialysis		1	1.1%	1	1.1%	0		0	
OPTIC NERVE									
130.110 micropapilla		1	1.1%	1	1.1%	0		0	
130.120 optic nerve hypoplasia		3	3.2%	0		0		0	

OCULAR DISORDERS REPORT BULL TERRIER

	1991-1999	2000-2009	2010-2013	2014
OTHER				
900.000 other, unspecified	0	0	5 9.8%	0
900.100 other, not inherited	0	8 8.4%	0	0
900.110 other, suspected as inherited	3 3.2%	0	0	0
NORMAL				
0.000 normal globe	73 77.7%	76 80.0%	41 80.4%	5 100.0%

OCULAR DISORDERS REPORT

BULLDOG - 1

BULLDOG

	DISORDER	INHERITANCE	REFERENCE	BREEDING ADVICE
A.	Distichiasis	Not defined	1	Breeder option
B.	Ectopic cilia	Not defined	1	Breeder option
C.	Ectropion	Not defined	1	Breeder option
D.	Entropion	Not defined	1,2	Breeder option
E.	Eury/Macroblepharon	Not defined	1	Breeder option
F.	Prolapsed gland of third eyelid	Not defined	1,3-5	Breeder option
G.	Keratoconjunctivitis sicca/dry eye	Not defined	1,6,7	NO
H.	Cataract	Not defined	1	NO
I.	Retinal dysplasia - folds	Not defined	1	Breeder option

Description and Comments

A. Distichiasis

Eyelashes abnormally located on the eyelid margin which may cause ocular irritation. Distichiasis may occur at any time in the life of a dog. It is difficult to make a strong recommendation with regard to breeding dogs with this entity. The hereditary basis has not been established although it seems probable due to the high incidence in some breeds. Reducing the incidence is a logical goal. When diagnosed, distichiasis should be recorded; breeding discretion is advised.

In the Bulldog, these abnormal eyelashes may be associated with significant clinical disease and breeding of affected animals should be discouraged.

OCULAR DISORDERS REPORT

BULLDOG - 2

B. Ectopic cilia

Hair emerging through the eyelid conjunctiva. Ectopic cilia occur more frequently in younger dogs and cause discomfort and corneal disease.

C. Ectropion

A conformational defect resulting in eversion of the eyelids which may cause ocular irritation due to exposure. It is likely that ectropion is influenced by several genes (polygenic) defining the skin and other structures which make up the eyelids, the amount and weight of the skin covering the head and face, the orbital contents and the conformation of the skull.

In the Bulldog, ectropion is associated with an exceptionally large palpebral fissure and laxity of the canthal structures. Central lower lid ectropion is often associated with entropion of the adjacent lid. This causes severe ocular irritation.

D. Entropion

A conformational defect resulting in an "in-rolling" of one or both of the eyelids which may cause ocular irritation. It is likely that entropion is influenced by several genes (polygenic), defining the skin and other structures which make up the eyelids, the amount and weight of the skin covering the head and face, the orbital contents, and the conformation of the skull.

E. Eury/Macroblepharon

Macroblepharon is defined as an exceptionally large palpebral fissure, macroblepharon in conjunction with laxity of the lateral canthal structures may lead to lower lid ectropion and upper lid entropion.

F. Prolapse of the gland of the third eyelid

Protrusion of the tear gland associated with the third eyelid. The mode of inheritance of this disorder is unknown. The exposed gland may become irritated and severe chronic inflammation or keratoconjunctivitis sicca/dry eye syndrome may ensue. Commonly referred to as "cherry eye".

Bulldogs were overrepresented in a study of prolapsed gland of the third eyelid. In the study, 100% of the prolapsed glands in Bulldogs occurred before 1 year of age. Bulldogs were also more likely to develop bilateral prolapsed glands that occurred either simultaneously with the first prolapse or with a short time interval between prolapses.

G. Keratoconjunctivitis sicca/ dry eye

An abnormality of the tear film, most commonly a deficiency of the aqueous portion, although the mucin and/or lipid layers may be affected; results in ocular irritation and/or vision impairment.

OCULAR DISORDERS REPORT

BULLDOG - 3

H. Cataract

A partial or complete opacity of the lens and/or its capsule. In cases where cataracts are complete and affect both eyes, blindness results. The prudent approach is to assume cataracts to be hereditary except in cases known to be associated with trauma, other causes of ocular inflammation, specific metabolic diseases, persistent pupillary membrane, persistent hyaloid or nutritional deficiencies. Cataracts may involve the lens completely (diffuse) or in a localized region.

I. Retinal dysplasia - folds

Linear, triangular, curved or curvilinear foci of retinal folding that may be single or multiple. When seen in puppies, this condition may partially or completely resolve with maturity. Its significance to vision is unknown. There are two other forms of retinal dysplasia (geographic, detached) which are known to be inherited in other breeds and, in their most severe form, cause blindness. The genetic relationship between folds and more severe forms of retinal dysplasia is undetermined.

References

1. ACVO Genetics Committee, 1999 and/or Data from CERF All-Breeds Report, 1991-1998.
2. ACVO Genetics Committee, 2001 and/or Data from CERF All-Breeds Report, 2001.
3. Barnett KC. Comparative aspects of canine hereditary eye disease. *Adv Vet Sci Comp Med.* 1976;20:39-67.
4. Morgan RV, Duddy JM, McClurg K. Prolapse of the gland of the third eyelid in the dog: A retrospective study of 89 cases (1980-1990). *J Am Anim Hosp Assoc.* 1993;29:56.
5. Mazzucchelli S, Vaillant MD, Weverberg F, et al. Retrospective study of 155 cases of prolapse of the nictitating membrane gland in dogs. *Vet Rec.* 2012;170:443.
6. Kaswan RL, Martin CL, Chapman WL, Jr. Keratoconjunctivitis sicca: histopathologic study of nictitating membrane and lacrimal glands from 28 dogs. *Am J Vet Res.* 1984;45:112-118.
7. Sansom J, Barnett KC, Long RD. Keratoconjunctivitis sicca in the dog associated with the administration of salicylazosulphapyridine (sulphasalazine). *Vet Rec.* 1985;116:391-393.

OCULAR DISORDERS REPORT BULLDOG

Diagnostic Name	TOTAL DOGS EXAMINED	1991-1999		2000-2009		2010-2013		2014	
		#	%	#	%	#	%	#	%
GLOBE									
0.110 microphthalmia		1	0.5%	0		0		0	
EYELIDS									
20.140 ectopic cilia		3	1.4%	3	0.6%	0		0	
20.160 macropalpebral fissure		3	1.4%	12	2.3%	1	0.5%	0	
21.000 entropion, unspecified		36	17.2%	74	13.9%	27	13.8%	17	14.8%
22.000 ectropion, unspecified		11	5.3%	31	5.8%	8	4.1%	7	6.1%
25.110 distichiasis		47	22.5%	96	18.1%	61	31.3%	32	27.8%
NASOLACRIMAL									
32.110 imperforate lower nasolacrimal punctum		1	0.5%	0		0		1	0.9%
40.910 keratoconjunctivitis sicca		1	0.5%	0		1	0.5%	0	
NICTITANS									
52.110 prolapsed gland of the third eyelid		3	1.4%	9	1.7%	4	2.1%	0	
CORNEA									
70.210 corneal pannus		3	1.4%	6	1.1%	0		0	
70.220 pigmentary keratitis		4	1.9%	13	2.4%	4	2.1%	3	2.6%
70.700 corneal dystrophy		3	1.4%	3	0.6%	1	0.5%	1	0.9%
UVEA									
93.120 iris cyst		0		2	0.4%	5	2.6%	1	0.9%
93.170 anterior chamber cyst		0		0		0		1	0.9%
93.710 persistent pupillary membranes, iris to iris		1	0.5%	4	0.8%	1	0.5%	0	
93.730 persistent pupillary membranes, iris to cornea		0		1	0.2%	0		0	
93.740 persistent pupillary membranes, iris sheets		0		2	0.4%	0		0	
93.760 persistent pupillary membranes, endothelial opacity/no strands		0		0		1	0.5%	0	
95.120 ciliary body cyst		0		0		0		1	0.9%
LENS									
100.200 cataract, unspecified		1	0.5%	0		0		0	
100.210 cataract, significance unknown		6	2.9%	10	1.9%	11	5.6%	6	5.2%
100.301 punctate cataract, anterior cortex		1	0.5%	1	0.2%	1	0.5%	1	0.9%
100.302 punctate cataract, posterior cortex		1	0.5%	1	0.2%	0		0	
100.305 punctate cataract, posterior sutures		0		0		3	1.5%	0	
100.311 incipient cataract, anterior cortex		0		4	0.8%	0		0	
100.312 incipient cataract, posterior cortex		1	0.5%	1	0.2%	0		0	
100.313 incipient cataract, equatorial cortex		1	0.5%	2	0.4%	0		0	
100.314 incipient cataract, anterior sutures		1	0.5%	0		0		0	
100.316 incipient cataract, nucleus		1	0.5%	1	0.2%	0		0	
100.317 incipient cataract, capsular		0		1	0.2%	0		0	
100.330 generalized/complete cataract		4	1.9%	1	0.2%	0		0	
100.375 subluxation/luxation, unspecified		0		1	0.2%	1	0.5%	0	
VITREOUS									
110.120 persistent hyaloid artery/remnant		0		1	0.2%	0		0	
110.320 vitreous degeneration syneresis		0		2	0.4%	0		0	

OCULAR DISORDERS REPORT BULLDOG

	1991-1999	2000-2009	2010-2013	2014
RETINA				
120.170 retinal dysplasia, folds	15 7.2%	38 7.2%	7 3.6%	4 3.5%
120.180 retinal dysplasia, geographic	1 0.5%	2 0.4%	0	0
120.190 retinal dysplasia, detached	0	2 0.4%	0	0
120.960 retinopathy	0	0	1 0.5%	0
OTHER				
900.000 other, unspecified	0	3 0.6%	4 2.1%	0
900.100 other, not inherited	3 1.4%	33 6.2%	5 2.6%	12 10.4%
900.110 other, suspected as inherited	7 3.3%	3 0.6%	2 1.0%	1 0.9%
NORMAL				
0.000 normal globe	108 51.7%	347 65.3%	123 63.1%	70 60.9%

OCULAR DISORDERS REPORT

BULLMASTIFF - 1

BULLMASTIFF

	DISORDER	INHERITANCE	REFERENCE	BREEDING ADVICE
A.	Glaucoma	Not defined	1	NO
B.	Entropion	Not defined	1	Breeder option
C.	Ectropion	Not defined	2	Breeder option
D.	Eury/Macroblepharon	Not defined	2	Breeder option
E.	Distichiasis	Not defined	1	Breeder option
F.	Persistent pupillary membranes			
	- iris to iris	Not defined	1	Breeder option
	- all other forms	Not defined	3	NO
G.	Cataract	Not defined	1	NO
H.	Retinal atrophy	Autosomal dominant	4	NO
	- generalized			
	* a DNA test is available			
I.	Retinal dysplasia	Not defined	1	Breeder option
	- folds			
J.	Multifocal retinopathy	Autosomal recessive	5	Breeder option
	- cmr1			
	* a DNA test is available			
K.	Optic nerve hypoplasia	Not defined	2	NO
L.	Micropapilla	Not defined	2	Breeder option

Description and Comments

A. Glaucoma

Glaucoma is characterized by an elevation of intraocular pressure (IOP) which, when sustained, causes intraocular damage resulting in blindness. The elevated intraocular

OCULAR DISORDERS REPORT

BULLMASTIFF - 2

pressure occurs because the fluid cannot leave through the iridocorneal angle. Diagnosis and classification of glaucoma requires measurement of the IOP (tonometry) and examination of the iridocorneal angle (gonioscopy). Neither of these tests is part of a routine screening exam for certification.

B. Entropion

A conformational defect resulting in an "in-rolling" of one or both of the eyelids which may cause ocular irritation. It is likely that entropion is influenced by several genes (polygenic) defining the skin and other structures which make up the eyelids, the amount and weight of the skin covering the head and face, the orbital contents and the conformation of the skull.

In this breed, the palpebral fissures may become vertical and/or shaped like a "pagoda". Entropion in the Bullmastiff is severe and may require multiple surgical corrections.

C. Ectropion

A conformational defect resulting in eversion (rolling-out) of the eyelids, which may cause ocular irritation due to exposure. It is likely that ectropion is influenced by several genes (polygenic), defining the skin and other structures which make up the eyelids, the amount and weight of the skin covering the head and face, the orbital contents and the conformation of the skull.

D. Eury/Macrolepharon

Defined as an exceptionally large palpebral fissure, macrolepharon in conjunction with laxity of the lateral canthal structures may lead to lower lid ectropion and upper lid entropion. Either of these conditions may lead to severe ocular irritation.

E. Distichiasis

Eyelashes abnormally located on the eyelid margin which may cause ocular irritation. Distichiasis may occur at any time in the life of a dog. It is difficult to make a strong recommendation with regard to breeding dogs with this entity. The hereditary basis has not been established although it seems probable due to the high incidence in some breeds. Reducing the incidence is a logical goal. When diagnosed, distichiasis should be recorded; breeding discretion is advised.

F. Persistent pupillary membranes (PPM)

Persistent blood vessel remnants in the anterior chamber of the eye which fail to regress normally by 3 months of age. These strands may bridge from iris to iris, iris to cornea, iris to lens, or form sheets of tissue in the anterior chamber. The last three forms pose the greatest threat to vision and when severe, vision impairment or blindness may occur.

G. Cataract

OCULAR DISORDERS REPORT

BULLMASTIFF - 3

A partial or complete opacity of the lens and/or its capsule. In cases where cataracts are complete and affect both eyes, blindness results. The prudent approach is to assume cataracts to be hereditary except in cases known to be associated with trauma, other causes of ocular inflammation, specific metabolic diseases, persistent pupillary membrane, persistent hyaloid or nutritional deficiencies. Cataracts may involve the lens completely (diffuse) or in a localized region.

H Retinal atrophy - generalized

A degenerative disease of the retinal visual cells which progresses to blindness. This abnormality, also known as progressive retinal atrophy or PRA, may be detected by electroretinogram (not part of a routine eye screening examination) before it is apparent clinically. PRA in the Bullmastiff is inherited as an autosomal dominant trait. A DNA test is available.

I. Retinal dysplasia - folds

Linear, triangular, curved or curvilinear foci of retinal folding that may be single or multiple. When seen in puppies, this condition may partially or completely resolve with maturity. Its significance to vision is unknown. There are two other forms of retinal dysplasia (geographic, detached) which are known to be inherited in other breeds and, in their most severe form, cause blindness. The genetic relationship between folds and more severe forms of retinal dysplasia is undetermined.

J. Multifocal retinopathy

Canine Multi-focal Retinopathy type 1 (cmr1) is characterized by numerous distinct (i.e. multi-focal), roughly circular patches of elevated retina (multifocal bullous retinal detachments). There may be a serous subretinal fluid, or accumulation of subretinal material that produces gray-tan-pink colored lesions. These lesions, looking somewhat like blisters, vary in location and size, although typically they are present in both eyes of the affected dog.

The disease generally develops in young dogs between 11-20 weeks of age and there is minimal progression after 1 year of age. The lesions may flatten, leaving areas of retinal thinning and RPE hypertrophy, hyperplasia, and pigmentation. Discrete areas of tapetal hyper-reflectivity may be seen in areas of previous retinal and RPE detachments. Most dogs exhibit no noticeable problem with vision or electroretinographic abnormalities despite their abnormal appearing retinas.

Canine Multi-focal Retinopathy type 1 is caused by a mutation in the Bestrophin 1 gene (BEST1) and is described to be recessively inherited in the Great Pyrenees, Dogue de Bordeaux, Bullmastiff, and Mastiff.

OCULAR DISORDERS REPORT

BULLMASTIFF - 4

K. Optic nerve hypoplasia

A congenital defect of the optic nerve which causes blindness and abnormal pupil response in the affected eye. May be unable to differentiate from micropapilla on a routine (dilated) screening ophthalmoscopic exam.

L. Micropapilla

Micropapilla refers to a small optic disc, which is not associated with vision impairment. Optic nerve hypoplasia refers to a congenital defect of the optic nerve, which causes blindness and abnormal pupil response in the affected eye. It may be difficult to differentiate between micropapilla and optic nerve hypoplasia on a routine (dilated) screening ophthalmoscopic exam.

References

There are few references providing detailed descriptions of hereditary ocular conditions of the Bullmastiff breed. The conditions listed above are generally recognized to exist in this breed, as evidenced by identification on breed eye screening examinations and/or clinical experience of veterinary ophthalmologists.

1. ACVO Genetics Committee, 1999 and/or Data from CERF All-Breeds Report, 1991-1998.
2. ACVO Genetics Committee, 2000-2002 and/or Data from CERF All-Breeds Report, 2000-2002.
3. ACVO Genetics Committee, 2005 and/or Data from CERF All-Breeds Report 2003-2004.
4. Kijas JW, Cideciyan AV, Aleman TS, et al. Naturally occurring rhodopsin mutation in the dog causes retinal dysfunction and degeneration mimicking human dominant retinitis pigmentosa. *Proc Natl Acad Sci U S A*. 2002 Apr 30;99:6328-6333.
5. Guziewicz KE, Zangerl B, Lindauer SJ, et al. Bestrophin gene mutations cause canine multifocal retinopathy: a novel animal model for best disease. *Invest Ophthalmol Vis Sci*. 2007 May;48:1959-1967.

OCULAR DISORDERS REPORT BULLMASTIFF

Diagnostic Name	TOTAL DOGS EXAMINED		1991-1999		2000-2009		2010-2013		2014	
	#	%	#	%	#	%	#	%	#	%
GLOBE										
0.110 microphthalmia	2	0.5%	2	0.3%	0		1	0.9%		
EYELIDS										
20.160 macropalpebral fissure	0		13	2.0%	3	0.8%	0			
21.000 entropion, unspecified	28	7.1%	46	7.1%	14	3.7%	6	5.5%		
22.000 ectropion, unspecified	3	0.8%	15	2.3%	6	1.6%	1	0.9%		
25.110 distichiasis	11	2.8%	19	3.0%	5	1.3%	3	2.8%		
NICTITANS										
51.100 third eyelid cartilage anomaly	0		1	0.2%	0		0			
52.110 prolapsed gland of the third eyelid	1	0.3%	0		0		0			
CORNEA										
70.210 corneal pannus	0		2	0.3%	0		0			
70.220 pigmentary keratitis	0		1	0.2%	1	0.3%	1	0.9%		
70.700 corneal dystrophy	1	0.3%	0		1	0.3%	0			
70.730 corneal endothelial degeneration	1	0.3%	0		0		0			
UVEA										
93.120 iris cyst	1	0.3%	3	0.5%	3	0.8%	0			
93.140 corneal endothelial pigment without PPM	0		0		1	0.3%	0			
93.150 iris coloboma	0		2	0.3%	0		1	0.9%		
93.710 persistent pupillary membranes, iris to iris	17	4.3%	11	1.7%	6	1.6%	6	5.5%		
93.720 persistent pupillary membranes, iris to lens	7	1.8%	2	0.3%	0		0			
93.730 persistent pupillary membranes, iris to cornea	12	3.0%	6	0.9%	2	0.5%	1	0.9%		
93.740 persistent pupillary membranes, iris sheets	0		1	0.2%	0		0			
93.750 persistent pupillary membranes, lens pigment foci/no strands	0		0		3	0.8%	3	2.8%		
93.760 persistent pupillary membranes, endothelial opacity/no strands	0		1	0.2%	0		1	0.9%		
95.120 ciliary body cyst	0		0		0		1	0.9%		
97.150 chorioretinal coloboma, congenital	0		0		0		1	0.9%		
LENS										
100.200 cataract, unspecified	1	0.3%	0		0		0			
100.210 cataract, significance unknown	8	2.0%	24	3.7%	14	3.7%	1	0.9%		
100.301 punctate cataract, anterior cortex	2	0.5%	3	0.5%	1	0.3%	0			
100.302 punctate cataract, posterior cortex	0		2	0.3%	2	0.5%	0			
100.303 punctate cataract, equatorial cortex	0		1	0.2%	1	0.3%	0			
100.307 punctate cataract, capsular	0		2	0.3%	0		0			
100.311 incipient cataract, anterior cortex	3	0.8%	5	0.8%	0		2	1.8%		
100.312 incipient cataract, posterior cortex	4	1.0%	7	1.1%	0		0			
100.313 incipient cataract, equatorial cortex	3	0.8%	3	0.5%	1	0.3%	1	0.9%		
100.315 incipient cataract, posterior sutures	0		1	0.2%	0		0			
100.316 incipient cataract, nucleus	1	0.3%	3	0.5%	0		0			
100.317 incipient cataract, capsular	0		0		1	0.3%	0			
100.321 incomplete cataract, anterior cortex	0		0		2	0.5%	0			
100.322 incomplete cataract, posterior cortex	0		0		2	0.5%	1	0.9%		
100.323 incomplete cataract, equatorial cortex	0		0		2	0.5%	0			
100.330 generalized/complete cataract	3	0.8%	4	0.6%	0		0			

OCULAR DISORDERS REPORT BULLMASTIFF

	1991-1999	2000-2009	2010-2013	2014
VITREOUS				
110.135 PHPV/PTVL	0	0	0	1 0.9%
110.320 vitreous degeneration syneresis	1 0.3%	0	1 0.3%	0
110.330 vitreous degeneration anterior chamber	0	1 0.2%	0	0
RETINA				
120.170 retinal dysplasia, folds	27 6.8%	27 4.2%	17 4.5%	2 1.8%
120.180 retinal dysplasia, geographic	1 0.3%	2 0.3%	0	0
120.310 generalized progressive retinal atrophy (PRA)	0	2 0.3%	1 0.3%	0
120.960 retinopathy	0	0	2 0.5%	0
OPTIC NERVE				
130.110 micropapilla	0	2 0.3%	1 0.3%	0
130.120 optic nerve hypoplasia	6 1.5%	0	0	0
130.150 optic disc coloboma	1 0.3%	0	0	1 0.9%
OTHER				
900.000 other, unspecified	0	10 1.6%	15 3.9%	0
900.100 other, not inherited	2 0.5%	40 6.2%	2 0.5%	1 0.9%
900.110 other, suspected as inherited	4 1.0%	9 1.4%	0	0
NORMAL				
0.000 normal globe	288 72.5%	502 78.0%	325 85.5%	96 88.1%

OCULAR DISORDERS REPORT

CAIRN TERRIER - 1

CAIRN TERRIER

	DISORDER	INHERITANCE	REFERENCE	BREEDING ADVICE
A.	Ocular melanosis with and without glaucoma	Presumed autosomal dominant	1-3	NO
B.	Persistent pupillary membranes - iris to iris	Not defined	4, 5	Breeder option
C.	Cataract	Not defined	1	NO
D.	Persistent hyaloid artery	Not defined	5	Breeder option

Description and Comments

- A. Ocular melanosis with and without glaucoma
(previously Ocular melanosis with secondary glaucoma, previously Pigmentary glaucoma)

A proliferation of melanocytes within the uveal tract associated with an elevation in intraocular pressure. Obstruction of the aqueous outflow pathways occurs resulting in glaucoma. This condition has been identified most commonly in the Cairn Terrier. The condition is familial but the exact mode of inheritance is unknown (pedigree analysis has ruled out a sex-linked disorder). In the Cairn Terrier, the disease is very slowly progressive and blindness ultimately results. Some dogs develop episodes of anterior uveitis associated with the shedding of large amounts of pigment from the iris surface. There is a long pre-glaucomatous phase of the disease in which diagnosis of the condition is possible. Age of onset varies from 2-14 years.

- B. Persistent pupillary membranes (PPM)

Persistent blood vessel remnants in the anterior chamber of the eye which fail to regress normally by 3 months of age. These strands may bridge from iris to iris, iris to cornea, iris to lens, or form sheets of tissue in the anterior chamber. The last three forms pose the greatest threat to vision and when severe, vision impairment or blindness may occur.

- C. Cataract

A partial or complete opacity of the lens and/or its capsule. In cases where cataracts are complete and affect both eyes, blindness results. The prudent approach is to assume

OCULAR DISORDERS REPORT

CAIRN TERRIER - 2

cataracts to be hereditary except in cases known to be associated with trauma, other causes of ocular inflammation, specific metabolic diseases, persistent pupillary membrane, persistent hyaloid or nutritional deficiencies. Cataracts may involve the lens completely (diffuse) or in a localized region.

D. Persistent hyaloid artery (PHA)

Congenital defect resulting from abnormalities in the development and regression of the hyaloid artery. The blood vessel remnant can be present in the vitreous as a small patent vascular strand (PHA) or as a non-vascular strand that appears gray-white (persistent hyaloid remnant).

References

1. ACVO Genetics Committee, 1999 and/or Data from CERF All-Breeds Report, 1991-1998.
2. Petersen-Jones SM, Forcier J and Mentzer AL. Ocular melanosis in the Cairn Terrier: clinical description and investigation of mode of inheritance. *Vet Ophthalmol.* 2007 Nov-Dec;10 Suppl 1:63-69.
3. ACVO Genetics Committee, 2000-2002 and/or Data from CERF All-Breeds Report, 2000-2002.
4. ACVO Genetics Committee, 2002-2003 and/or Data from CERF All-Breeds Report, 2002-2003.
5. ACVO Genetics Committee, 2005 and/or Data from CERF All-Breeds Report 2003-2004.

OCULAR DISORDERS REPORT

CAIRN TERRIER

Diagnostic Name	TOTAL DOGS EXAMINED	1991-1999		2000-2009		2010-2013		2014	
		#	%	#	%	#	%	#	%
GLOBE									
0.110	microphthalmia	0		0		1	0.1%	0	
10.000	glaucoma	2	0.3%	0		1	0.1%	0	
EYELIDS									
25.110	distichiasis	3	0.5%	5	0.2%	9	1.2%	0	
NASOLACRIMAL									
40.910	keratoconjunctivitis sicca	0		1	0.0%	3	0.4%	1	0.8%
NICTITANS									
51.100	third eyelid cartilage anomaly	0		1	0.0%	0		0	
52.110	prolapsed gland of the third eyelid	0		0		1	0.1%	0	
CORNEA									
70.210	corneal pannus	0		1	0.0%	0		0	
70.220	pigmentary keratitis	1	0.2%	5	0.2%	1	0.1%	0	
70.700	corneal dystrophy	2	0.3%	15	0.7%	6	0.8%	0	
70.730	corneal endothelial degeneration	3	0.5%	0		0		0	
UVEA									
93.120	iris cyst	0		0		1	0.1%	0	
93.140	corneal endothelial pigment without PPM	0		0		1	0.1%	0	
93.150	iris coloboma	0		0		1	0.1%	0	
93.170	anterior chamber cyst	0		0		1	0.1%	0	
93.710	persistent pupillary membranes, iris to iris	12	1.9%	174	8.2%	83	10.7%	18	14.8%
93.720	persistent pupillary membranes, iris to lens	0		5	0.2%	3	0.4%	0	
93.730	persistent pupillary membranes, iris to cornea	3	0.5%	2	0.1%	0		0	
93.740	persistent pupillary membranes, iris sheets	1	0.2%	1	0.0%	0		0	
93.750	persistent pupillary membranes, lens pigment foci/no strands	0		2	0.1%	9	1.2%	0	
93.760	persistent pupillary membranes, endothelial opacity/no strands	0		3	0.1%	1	0.1%	0	
93.930	ocular melanocytosis	0		9	0.4%	0		0	
LENS									
100.200	cataract, unspecified	10	1.6%	0		1	0.1%	0	
100.210	cataract, significance unknown	11	1.7%	102	4.8%	65	8.4%	15	12.3%
100.301	punctate cataract, anterior cortex	2	0.3%	14	0.7%	7	0.9%	0	
100.302	punctate cataract, posterior cortex	2	0.3%	13	0.6%	8	1.0%	0	
100.303	punctate cataract, equatorial cortex	2	0.3%	7	0.3%	5	0.6%	0	
100.305	punctate cataract, posterior sutures	1	0.2%	3	0.1%	1	0.1%	0	
100.306	punctate cataract, nucleus	1	0.2%	0		0		0	
100.307	punctate cataract, capsular	0		4	0.2%	2	0.3%	0	
100.311	incipient cataract, anterior cortex	3	0.5%	18	0.8%	9	1.2%	0	
100.312	incipient cataract, posterior cortex	9	1.4%	34	1.6%	15	1.9%	1	0.8%
100.313	incipient cataract, equatorial cortex	2	0.3%	18	0.8%	5	0.6%	1	0.8%
100.315	incipient cataract, posterior sutures	5	0.8%	2	0.1%	3	0.4%	0	
100.316	incipient cataract, nucleus	0		2	0.1%	0		0	
100.317	incipient cataract, capsular	0		4	0.2%	1	0.1%	0	
100.321	incomplete cataract, anterior cortex	0		0		3	0.4%	2	1.6%
100.322	incomplete cataract, posterior cortex	0		0		4	0.5%	1	0.8%

OCULAR DISORDERS REPORT CAIRN TERRIER

LENS CONTINUED	1991-1999	2000-2009	2010-2013	2014
100.326 incomplete cataract, nucleus	0	0	0	1 0.8%
100.330 generalized/complete cataract	8 1.3%	17 0.8%	3 0.4%	4 3.3%
100.340 resorbing/hypermature cataract	0	0	1 0.1%	0
100.375 subluxation/luxation, unspecified	0	1 0.0%	0	0
VITREOUS				
110.120 persistent hyaloid artery/remnant	5 0.8%	17 0.8%	6 0.8%	2 1.6%
110.135 PHPV/PTVL	2 0.3%	4 0.2%	0	0
110.320 vitreous degeneration syneresis	2 0.3%	20 0.9%	14 1.8%	0
110.330 vitreous degeneration anterior chamber	0	4 0.2%	0	0
FUNDUS				
97.110 choroidal hypoplasia	2 0.3%	0	0	0
97.120 coloboma	0	0	1 0.1%	0
RETINA				
120.170 retinal dysplasia, folds	1 0.2%	13 0.6%	5 0.6%	0
120.180 retinal dysplasia, geographic	2 0.3%	3 0.1%	1 0.1%	0
120.200 retinitis	0	0	0	1 0.8%
120.310 generalized progressive retinal atrophy (PRA)	9 1.4%	11 0.5%	2 0.3%	0
OPTIC NERVE				
130.110 micropapilla	0	1 0.0%	2 0.3%	0
130.120 optic nerve hypoplasia	1 0.2%	6 0.3%	1 0.1%	0
130.150 optic disc coloboma	6 1.0%	5 0.2%	0	0
OTHER				
900.000 other, unspecified	0	29 1.4%	47 6.0%	0
900.100 other, not inherited	3 0.5%	110 5.2%	11 1.4%	5 4.1%
900.110 other, suspected as inherited	39 6.2%	44 2.1%	8 1.0%	1 0.8%
NORMAL				
0.000 normal globe	502 79.8%	1726 81.1%	643 82.8%	91 74.6%

OCULAR DISORDERS REPORT

CANAAN DOG - 1

CANAAN DOG

	DISORDER	INHERITANCE	REFERENCE	BREEDING ADVICE
A.	Distichiasis	Not defined	1	Breeder option
B.	Persistent pupillary membranes - iris to iris	Not defined	2	Breeder option
C.	Cataract	Not defined	2, 3	NO

Description and Comments

A. Distichiasis

Eyelashes abnormally located on the eyelid margin which may cause ocular irritation. Distichiasis may occur at any time in the life of a dog. It is difficult to make a strong recommendation with regard to breeding dogs with this entity. The hereditary basis has not been established although it seems probable due to the high incidence in some breeds. Reducing the incidence is a logical goal. When diagnosed, distichiasis should be recorded; breeding discretion is advised.

B. Persistent pupillary membranes (PPM)

Persistent blood vessel remnants in the anterior chamber of the eye which fail to regress normally by 3 months of age. These strands may bridge from iris to iris, iris to cornea, iris to lens, or form sheets of tissue in the anterior chamber. The last three forms pose the greatest threat to vision and when severe, vision impairment or blindness may occur.

C. Cataract

A partial or complete opacity of the lens and/or its capsule. In cases where cataracts are complete and affect both eyes, blindness results. The prudent approach is to assume cataracts to be hereditary except in cases known to be associated with trauma, other causes of ocular inflammation, specific metabolic diseases, persistent pupillary membrane, persistent hyaloid or nutritional deficiencies. Cataracts may involve the lens completely (diffuse) or in a localized region.

OCULAR DISORDERS REPORT

CANAAN DOG - 2

References

There are no references providing detailed descriptions of hereditary conditions of the Canaan Dog. The conditions listed above are generally recognized to exist in this breed, as evidenced by identification on breed eye screening examinations and/or clinical experience of veterinary ophthalmologists.

1. ACVO Genetics Committee, 2006 and/or Data from CERF All-Breeds Report, 2001-2005.
2. ACVO Genetics Committee, 2005 and/or Data from CERF All-Breeds Report 2003-2004.
3. ACVO Genetics Committee, 2000-2002 and/or Data from CERF All-Breeds Report, 2000-2002.

OCULAR DISORDERS REPORT CANAAN

Diagnostic Name	TOTAL DOGS EXAMINED	1991-1999		2000-2009		2010-2013		2014	
		#	%	#	%	#	%	#	%
EYELIDS									
25.110	distichiasis	2	4.0%	7	2.1%	5	6.8%	1	4.3%
CORNEA									
70.700	corneal dystrophy	1	2.0%	1	0.3%	1	1.4%	0	
UVEA									
93.120	iris cyst	0		0		2	2.7%	0	
93.170	anterior chamber cyst	0		0		1	1.4%	0	
93.710	persistent pupillary membranes, iris to iris	3	6.0%	13	3.9%	1	1.4%	2	8.7%
93.740	persistent pupillary membranes, iris sheets	0		1	0.3%	0		0	
LENS									
100.210	cataract, significance unknown	3	6.0%	12	3.6%	2	2.7%	0	
100.302	punctate cataract, posterior cortex	0		2	0.6%	0		0	
100.303	punctate cataract, equatorial cortex	0		1	0.3%	0		0	
100.304	punctate cataract, anterior sutures	0		1	0.3%	0		0	
100.306	punctate cataract, nucleus	1	2.0%	2	0.6%	0		0	
100.311	incipient cataract, anterior cortex	0		0		2	2.7%	0	
100.312	incipient cataract, posterior cortex	0		4	1.2%	3	4.1%	0	
100.314	incipient cataract, anterior sutures	1	2.0%	0		0		0	
100.315	incipient cataract, posterior sutures	1	2.0%	0		0		0	
100.316	incipient cataract, nucleus	3	6.0%	9	2.7%	0		0	
100.322	incomplete cataract, posterior cortex	0		0		0		1	4.3%
100.323	incomplete cataract, equatorial cortex	0		0		0		1	4.3%
100.330	generalized/complete cataract	12	24.0%	1	0.3%	0		0	
VITREOUS									
110.120	persistant hyaloid artery/remnant	0		0		0		1	4.3%
FUNDUS									
97.110	choroidal hypoplasia	0		1	0.3%	0		0	
RETINA									
120.170	retinal dysplasia, folds	0		2	0.6%	0		0	
120.310	generalized progressive retinal atrophy (PRA)	0		9	2.7%	0		0	
OTHER									
900.000	other, unspecified	0		3	0.9%	3	4.1%	0	
900.100	other, not inherited	0		18	5.4%	1	1.4%	0	
900.110	other, suspected as inherited	0		0		1	1.4%	0	
NORMAL									
0.000	normal globe	38	76.0%	274	81.8%	66	90.4%	20	87.0%

OCULAR DISORDERS REPORT

CARDIGAN WELSH CORGI - 1

CARDIGAN WELSH CORGI

	DISORDER	INHERITANCE	REFERENCE	BREEDING ADVICE
A.	Distichiasis	Not defined	1	Breeder option
B.	Persistent pupillary membranes - iris to iris	Not defined	2, 3	Breeder option
C.	Cataract	Not defined	1	NO
D.	Retinal atrophy - rod-cone dysplasia type 3 (<i>rcd3</i>) * a DNA test is available	Presumed autosomal recessive	1, 4-6	NO
E.	Central progressive retinal atrophy	Not defined	1, 7	NO

Description and Comments

A. Distichiasis

Eyelashes abnormally located on the eyelid margin that may cause ocular irritation. Distichiasis may occur any time in the life of the dog. It is difficult to make a strong recommendation about breeding dogs with this entity. The hereditary basis is not known although it seems probable due to the high incidence in some breeds. Reducing the incidence is a logical goal. When diagnosed, distichiasis should be recorded; breeding discretion is advised.

B. Persistent pupillary membranes (PPM)

Persistent blood vessel remnants in the anterior chamber of the eye which fail to regress normally by 3 months of age. These strands may bridge from iris to iris, iris to cornea, iris to lens, or form sheets of tissue in the anterior chamber. The last three forms pose the greatest threat to vision and when severe, vision impairment or blindness may occur.

C. Cataract

Lens opacity which may affect one or both eyes and may involve the lens partially or completely. In cases where cataracts are complete and affect both eyes, blindness results. The prudent approach is to assume cataracts to be hereditary except in cases known to be associated with trauma, other causes of ocular inflammation, specific metabolic diseases,

OCULAR DISORDERS REPORT

CARDIGAN WELSH CORGI - 2

persistent pupillary membranes, persistent hyaloid or nutritional deficiencies.

D. Retinal atrophy - rod-cone dysplasia type 3 (*rcd3*)

PRA in the Cardigan Welsh Corgi is an autosomal recessive trait caused by a one-base-pair deletion in the gene encoding the alpha subunit of cyclic GMP phosphodiesterase (*rcd3*) PRA begins early in life with clinical signs of night blindness and lack rod ERG responses seen at 6-8 weeks of age. Dogs are completely blind by 2-3 years of age when ophthalmoscopic signs are first visible. A DNA test is available. Current carrier rate from samples submitted is approx. 8.5%.

E. Central Progressive Retinal Atrophy (CPRA)

A progressive retinal degeneration in which photoreceptor death occurs secondary to disease of the underlying pigment epithelium. Progression is slow and some animals never lose vision. CPRA occurs in the United Kingdom, but is uncommon elsewhere.

References

1. ACVO Genetics Committee, 1999 and/or Data from CERF All Breeds Report, 1991-1998.
2. ACVO Genetics Committee, 2002-2003 and/or Data from CERF All-Breeds Report, 2002-2003.
3. ACVO Genetics Committee, 2005 and/or Data from CERF All-Breeds Report 2003-2004.
4. Petersen-Jones SM, Entz DD and Sargan DR. cGMP phosphodiesterase-alpha mutation causes progressive retinal atrophy in the Cardigan Welsh corgi dog. *Invest Ophthalmol Vis Sci.* 1999 Jul;40:1637-1644.
5. Petersen-Jones SM and Entz DD. An improved DNA-based test for detection of the codon 616 mutation in the alpha cyclic GMP phosphodiesterase gene that causes progressive retinal atrophy in the Cardigan Welsh Corgi. *Vet Ophthalmol.* 2002 Jun;5:103-106.
6. Keep JM. Clinical aspects of progressive retinal atrophy in the Cardigan Welsh Corgi. *Aust Vet J.* 1972 Apr;48:197-199.
7. Barnett KC. Comparative aspects of canine hereditary eye disease. *Adv Vet Sci Comp Med.* 1976;20:39-67.

OCULAR DISORDERS REPORT CARDIGAN WELSH CORGI

Diagnostic Name	TOTAL DOGS EXAMINED	1991-1999		2000-2009		2010-2013		2014	
		#	%	#	%	#	%	#	%
GLOBE									
0.110 microphthalmia		1	0.1%	1	0.1%	0		0	
EYELIDS									
25.110 distichiasis		51	3.2%	60	4.4%	18	3.3%	3	2.5%
CORNEA									
70.700 corneal dystrophy		8	0.5%	5	0.4%	1	0.2%	1	0.8%
70.730 corneal endothelial degeneration		0		1	0.1%	1	0.2%	0	
UVEA									
93.110 iris hypoplasia		0		0		0		1	0.8%
93.150 iris coloboma		0		1	0.1%	0		0	
93.710 persistent pupillary membranes, iris to iris		38	2.4%	49	3.6%	15	2.7%	4	3.3%
93.720 persistent pupillary membranes, iris to lens		1	0.1%	2	0.1%	0		0	
93.730 persistent pupillary membranes, iris to cornea		3	0.2%	5	0.4%	1	0.2%	0	
93.740 persistent pupillary membranes, iris sheets		0		1	0.1%	0		0	
LENS									
100.200 cataract, unspecified		15	1.0%	0		0		0	
100.210 cataract, significance unknown		47	3.0%	45	3.3%	8	1.5%	5	4.1%
100.301 punctate cataract, anterior cortex		5	0.3%	4	0.3%	1	0.2%	0	
100.302 punctate cataract, posterior cortex		7	0.4%	2	0.1%	2	0.4%	0	
100.303 punctate cataract, equatorial cortex		4	0.3%	4	0.3%	3	0.5%	0	
100.304 punctate cataract, anterior sutures		2	0.1%	0		0		0	
100.305 punctate cataract, posterior sutures		0		1	0.1%	1	0.2%	0	
100.306 punctate cataract, nucleus		1	0.1%	1	0.1%	0		0	
100.311 incipient cataract, anterior cortex		19	1.2%	10	0.7%	3	0.5%	1	0.8%
100.312 incipient cataract, posterior cortex		8	0.5%	8	0.6%	1	0.2%	0	
100.313 incipient cataract, equatorial cortex		7	0.4%	5	0.4%	2	0.4%	1	0.8%
100.314 incipient cataract, anterior sutures		1	0.1%	1	0.1%	1	0.2%	0	
100.315 incipient cataract, posterior sutures		1	0.1%	0		1	0.2%	0	
100.316 incipient cataract, nucleus		3	0.2%	4	0.3%	0		0	
100.317 incipient cataract, capsular		0		2	0.1%	0		0	
100.330 generalized/complete cataract		6	0.4%	1	0.1%	1	0.2%	0	
VITREOUS									
110.120 persistent hyaloid artery/remnant		4	0.3%	0		0		0	
110.320 vitreous degeneration syneresis		3	0.2%	0		1	0.2%	0	
110.330 vitreous degeneration anterior chamber		0		2	0.1%	1	0.2%	0	
FUNDUS									
97.110 choroidal hypoplasia		0		2	0.1%	1	0.2%	0	
97.120 coloboma		0		2	0.1%	0		0	
RETINA									
120.170 retinal dysplasia, folds		13	0.8%	10	0.7%	1	0.2%	0	
120.180 retinal dysplasia, geographic		4	0.3%	1	0.1%	1	0.2%	0	
120.310 generalized progressive retinal atrophy (PRA)		8	0.5%	1	0.1%	0		0	
120.400 retinal hemorrhage		1	0.1%	0		0		0	
120.910 retinal detachment without dialysis		2	0.1%	0		0		0	

OCULAR DISORDERS REPORT CARDIGAN WELSH CORGI

	1991-1999	2000-2009	2010-2013	2014
OPTIC NERVE				
130.120 optic nerve hypoplasia	3 0.2%	0	0	0
OTHER				
900.000 other, unspecified	0	8 0.6%	8 1.5%	0
900.100 other, not inherited	3 0.2%	35 2.6%	3 0.5%	3 2.5%
900.110 other, suspected as inherited	4 0.3%	4 0.3%	3 0.5%	0
NORMAL				
0.000 normal globe	1357 86.4%	1236 90.2%	509 93.1%	115 94.3%

OCULAR DISORDERS REPORT

CAVALIER KING CHARLES SPANIEL - 1

CAVALIER KING CHARLES SPANIEL

	DISORDER	INHERITANCE	REFERENCE	BREEDING ADVICE
A.	Microphthalmia with multiple ocular defects	Not defined	1,2	NO
B.	Keratoconjunctivitis Sicca (dry eye)	Not defined	3	NO
C.	Congenital KCS and ichthyosiform dermatosis	Autosomal recessive	4,10	NO
D.	Entropion	Not defined	5	Breeder option
E.	Distichiasis	Not defined	1	Breeder option
F.	Corneal dystrophy - epithelial/stromal	Not defined	1,6,7	Breeder option
G.	Exposure keratopathy syndrome/ macroblepharon	Not defined	1	Breeder option
H.	Persistent pupillary membranes - iris to iris	Not defined	8	Breeder option
I.	Cataract	Not defined	1,9	NO
J.	Vitreous degeneration	Not defined	5	Breeder option
K.	Retinal dysplasia - folds	Not defined	1	Breeder option
L.	Retinal dysplasia - geographic/detached	Not defined	1	NO

©2014, American College of Veterinary Ophthalmologists

OCULAR DISORDERS REPORT

CAVALIER KING CHARLES SPANIEL - 2

Description and Comments

A. Microphthalmia with multiple ocular defects

Microphthalmia is a congenital defect characterized by a small eye often associated with other ocular malformations, including defects of the cornea, anterior chamber, lens and/or retina

B. Keratoconjunctivitis sicca (KCS)/dry eye

An abnormality of the tear film, most commonly a deficiency of the aqueous portion, although the mucin and/or lipid layers may be affected; results in ocular irritation and/or vision impairment.

C. Congenital KCS and ichthyosiform dermatosis

A syndrome in which dogs are born with severe to absolute keratoconjunctivitis sicca which is poorly responsive to lacrimostimulant treatment. Co-morbid congenital dermatopathy affecting haircoat, skin and footpads is severe and requires intensive life-long care. Clinical signs are so devastating that affected dogs are often euthanized.

D. Entropion

A conformational defect resulting in an "in-rolling" of one or both of the eyelids which may cause ocular irritation. It is likely that entropion is influenced by several genes (polygenic), defining the skin and other structures which make up the eyelids, the amount and weight of the skin covering the head and face, the orbital contents, and the conformation of the skull.

E. Distichiasis

Eyelashes abnormally located on the eyelid margin which may cause ocular irritation. Distichiasis may occur at any time in the life of a dog. It is difficult to make a strong recommendation with regard to breeding dogs with this entity. The hereditary basis has not been established although it seems probable due to the high incidence in some breeds. Reducing the incidence is a logical goal. When diagnosed, distichiasis should be recorded; breeding discretion is advised.

F. Corneal dystrophy - epithelial/stromal

A non-inflammatory corneal opacity (white to gray) present in one or more of the corneal layers; usually inherited and bilateral. In these dogs, lesions are circular or semicircular central crystalline deposits in the anterior corneal stroma that appear between 2 and 5 years of age. It may be associated with exophthalmos and lagophthalmos common in these dogs.

G. Exposure keratopathy syndrome/macroblepharon

A corneal disease involving all or part of the cornea, resulting from inadequate blinking. This

OCULAR DISORDERS REPORT

CAVALIER KING CHARLES SPANIEL - 3

results from a combination of anatomic features including shallow orbits, exophthalmos, a large eyelid opening (macroblepharon) and lagophthalmos.

H. Persistent pupillary membranes (PPM)

Persistent blood vessel remnants in the anterior chamber of the eye which fail to regress normally by 3 months of age. These strands may bridge from iris to iris, iris to cornea, iris to lens, or form sheets of tissue in the anterior chamber. The last three forms pose the greatest threat to vision and when severe, vision impairment or blindness may occur.

I. Cataract

A partial or complete opacity of the lens and/or its capsule. In cases where cataracts are complete and affect both eyes, blindness results. The prudent approach is to assume cataracts to be hereditary except in cases known to be associated with trauma, other causes of ocular inflammation, specific metabolic diseases, persistent pupillary membrane, persistent hyaloid or nutritional deficiencies. Cataracts may involve the lens completely (diffuse) or in a localized region.

In the Cavalier King Charles Spaniel, onset is at an early age (less than 6 months), affecting the cortex and nucleus with rapid progression to complete cataract, resulting in blindness.

J. Vitreous degeneration

Liquefaction of the vitreous gel which may predispose to retinal detachment.

K. Retinal dysplasia - folds

Linear, triangular, curved or curvilinear foci of retinal folding that may be single or multiple. When seen in puppies, this condition may partially or completely resolve with maturity. Its significance to vision is unknown. There are two other forms of retinal dysplasia (geographic, detached) which are known to be inherited in other breeds and, in their most severe form, cause blindness. The genetic relationship between folds and more severe forms of retinal dysplasia is undetermined.

L. Retinal dysplasia – geographic / detached

Abnormal development of the retina present at birth.

Retinal dysplasia - geographic: Any irregularly shaped area of abnormal retinal development containing both areas of thinning and areas of elevation representing folds and retinal disorganization.

Retinal dysplasia - detached: Severe retinal disorganization associated with separation (detachment) of the retina.

These two forms are associated with vision impairment or blindness. Retinal dysplasia is known to be inherited in many breeds. The genetic relationship between the three forms of

OCULAR DISORDERS REPORT

CAVALIER KING CHARLES SPANIEL - 4

retinal dysplasia is not known for all breeds.

References

1. ACVO Genetics Committee, 1999 and/or Data from CERF All-Breeds Report, 1991-1998.
2. Narfstrom K, Dubielzig R. Posterior lenticonus, cataracts and microphthalmia: Congenital defects in the Cavalier King Charles Spaniel. *J Small Anim Pract.* 1984;25:11 669-677.
3. Sanchez RF, Innocent G, Mould J, et al. Canine keratoconjunctivitis sicca: disease trends in a review of 229 cases. *J Small Anim Pract.* 2007;48:211-217.
4. Hartley C, Donaldson D, Smith KC, et al. Congenital keratoconjunctivitis sicca and ichthyosiform dermatosis in 25 Cavalier King Charles Spaniel dogs – part I: clinical signs, histopathology, and inheritance. *Vet Ophthalmol.* 2012;15:315-326.
5. ACVO Genetics Committee, 2006 and/or Data from CERF All-Breeds Report, 2001-2005.
6. Crispin SM. Crystalline stromal dystrophy in the Cavalier King Charles Spaniel. *Proc Am Coll Vet Ophthalmol.* 1986;17:18.
7. Crispin SM, Barnett KC. Dystrophy, degeneration and infiltration of the canine cornea. *J Small Anim Pract.* 1983;24:63.
8. ACVO Genetics Committee, 2005 and/or Data from CERF All-Breeds Report 2003-2004.
9. Barnett KC. The diagnosis and differential diagnosis of cataract in the dog. *J Small Anim Pract.* 1985;26:305.
10. Barnett KC. Congenital keratoconjunctivitis sicca and ichthyosiform dermatosis in the Cavalier King Charles Spaniel. *J Small Anim Pract.* 2006 Sep;47(9):524-8.

OCULAR DISORDERS REPORT CAVALIER KING CHARLES SPANIEL

Diagnostic Name	TOTAL DOGS EXAMINED		1991-1999 6383		2000-2009 26222		2010-2013 12133		2014 2941	
	#	%	#	%	#	%	#	%	#	%
GLOBE										
0.110	microphthalmia	8	0.1%	38	0.1%	17	0.1%	4	0.1%	
10.000	glaucoma	2	0.0%	1	0.0%	0		0		
EYELIDS										
20.140	ectopic cilia	0		3	0.0%	0		0		
20.160	macropalpebral fissure	14	0.2%	96	0.4%	16	0.1%	0		
21.000	entropion, unspecified	21	0.3%	120	0.5%	46	0.4%	9	0.3%	
22.000	ectropion, unspecified	1	0.0%	6	0.0%	1	0.0%	2	0.1%	
25.110	distichiasis	498	7.8%	2465	9.4%	1094	9.0%	272	9.2%	
NASOLACRIMAL										
32.110	imperforate lower nasolacrimal punctum	3	0.0%	0		3	0.0%	5	0.2%	
40.910	keratoconjunctivitis sicca	2	0.0%	29	0.1%	30	0.2%	11	0.4%	
NICTITANS										
50.210	pannus of third eyelid	0		0		2	0.0%	0		
51.100	third eyelid cartilage anomaly	0		5	0.0%	1	0.0%	0		
52.110	prolapsed gland of the third eyelid	4	0.1%	7	0.0%	7	0.1%	0		
CORNEA										
70.210	corneal pannus	2	0.0%	9	0.0%	3	0.0%	0		
70.220	pigmentary keratitis	11	0.2%	92	0.4%	98	0.8%	27	0.9%	
70.700	corneal dystrophy	494	7.7%	2313	8.8%	1107	9.1%	291	9.9%	
70.730	corneal endothelial degeneration	6	0.1%	33	0.1%	5	0.0%	3	0.1%	
UVEA										
93.110	iris hypoplasia	0		0		1	0.0%	3	0.1%	
93.120	iris cyst	2	0.0%	11	0.0%	4	0.0%	0		
93.140	corneal endothelial pigment without PPM	0		7	0.0%	0		0		
93.150	iris coloboma	2	0.0%	2	0.0%	0		0		
93.170	anterior chamber cyst	0		0		3	0.0%	0		
93.710	persistent pupillary membranes, iris to iris	19	0.3%	307	1.2%	134	1.1%	37	1.3%	
93.720	persistent pupillary membranes, iris to lens	3	0.0%	23	0.1%	8	0.1%	1	0.0%	
93.730	persistent pupillary membranes, iris to cornea	5	0.1%	23	0.1%	1	0.0%	2	0.1%	
93.740	persistent pupillary membranes, iris sheets	4	0.1%	40	0.2%	0		0		
93.750	persistent pupillary membranes, lens pigment foci/no strands	0		3	0.0%	19	0.2%	6	0.2%	
93.760	persistent pupillary membranes, endothelial opacity/no strands	0		1	0.0%	8	0.1%	1	0.0%	
LENS										
100.200	cataract, unspecified	57	0.9%	0		0		0		
100.210	cataract, significance unknown	243	3.8%	945	3.6%	471	3.9%	105	3.6%	
100.301	punctate cataract, anterior cortex	37	0.6%	123	0.5%	93	0.8%	11	0.4%	
100.302	punctate cataract, posterior cortex	13	0.2%	59	0.2%	36	0.3%	5	0.2%	
100.303	punctate cataract, equatorial cortex	15	0.2%	43	0.2%	20	0.2%	2	0.1%	
100.304	punctate cataract, anterior sutures	3	0.0%	25	0.1%	7	0.1%	3	0.1%	
100.305	punctate cataract, posterior sutures	26	0.4%	39	0.1%	49	0.4%	3	0.1%	
100.306	punctate cataract, nucleus	10	0.2%	64	0.2%	34	0.3%	9	0.3%	
100.307	punctate cataract, capsular	5	0.1%	23	0.1%	12	0.1%	4	0.1%	
100.311	incipient cataract, anterior cortex	56	0.9%	176	0.7%	92	0.8%	22	0.7%	

OCULAR DISORDERS REPORT CAVALIER KING CHARLES SPANIEL

LENS CONTINUED	1991-1999		2000-2009		2010-2013		2014	
100.312 incipient cataract, posterior cortex	34	0.5%	141	0.5%	66	0.5%	12	0.4%
100.313 incipient cataract, equatorial cortex	20	0.3%	91	0.3%	31	0.3%	6	0.2%
100.314 incipient cataract, anterior sutures	2	0.0%	18	0.1%	6	0.0%	0	
100.315 incipient cataract, posterior sutures	13	0.2%	48	0.2%	9	0.1%	2	0.1%
100.316 incipient cataract, nucleus	22	0.3%	122	0.5%	60	0.5%	10	0.3%
100.317 incipient cataract, capsular	0		39	0.1%	19	0.2%	3	0.1%
100.321 incomplete cataract, anterior cortex	0		0		9	0.1%	6	0.2%
100.322 incomplete cataract, posterior cortex	0		0		15	0.1%	5	0.2%
100.323 incomplete cataract, equatorial cortex	0		0		3	0.0%	1	0.0%
100.325 incomplete cataract, posterior sutures	0		0		1	0.0%	0	
100.326 incomplete cataract, nucleus	0		0		8	0.1%	6	0.2%
100.327 incomplete cataract, capsular	0		0		2	0.0%	2	0.1%
100.330 generalized/complete cataract	38	0.6%	132	0.5%	43	0.4%	4	0.1%
100.340 resorbing/hypermature cataract	0		0		2	0.0%	2	0.1%
100.375 subluxation/luxation, unspecified	0		8	0.0%	6	0.0%	1	0.0%
VITREOUS								
110.120 persistant hyaloid artery/remnant	21	0.3%	48	0.2%	5	0.0%	6	0.2%
110.130 PHPV/PTVL	0		0		2	0.0%	0	
110.135 PHPV/PTVL	0		17	0.1%	12	0.1%	2	0.1%
110.200 vitritis	0		0		4	0.0%	0	
110.320 vitreous degeneration syneresis	10	0.2%	105	0.4%	56	0.5%	16	0.5%
110.330 vitreous degeneration anterior chamber	0		19	0.1%	9	0.1%	0	
FUNDUS								
97.110 choroidal hypoplasia	1	0.0%	4	0.0%	2	0.0%	0	
97.120 coloboma	0		4	0.0%	0		0	
RETINA								
120.170 retinal dysplasia, folds	622	9.7%	2161	8.2%	573	4.7%	132	4.5%
120.180 retinal dysplasia, geographic	273	4.3%	818	3.1%	262	2.2%	54	1.8%
120.190 retinal dysplasia, detached	46	0.7%	80	0.3%	19	0.2%	3	0.1%
120.200 retinitis	0		0		2	0.0%	6	0.2%
120.310 generalized progressive retinal atrophy (PRA)	25	0.4%	92	0.4%	25	0.2%	3	0.1%
120.400 retinal hemorrhage	3	0.0%	3	0.0%	0		0	
120.910 retinal detachment without dialysis	12	0.2%	6	0.0%	2	0.0%	0	
120.920 retinal detachment with dialysis	0		0		1	0.0%	0	
120.960 retinopathy	0		0		14	0.1%	0	
OPTIC NERVE								
130.110 micropapilla	1	0.0%	16	0.1%	4	0.0%	3	0.1%
130.120 optic nerve hypoplasia	2	0.0%	10	0.0%	0		0	
130.150 optic disc coloboma	2	0.0%	4	0.0%	10	0.1%	1	0.0%
OTHER								
900.000 other, unspecified	0		159	0.6%	437	3.6%	0	
900.100 other, not inherited	54	0.8%	1043	4.0%	160	1.3%	127	4.3%
900.110 other, suspected as inherited	67	1.0%	95	0.4%	64	0.5%	13	0.4%
NORMAL								
0.000 normal globe	4260	66.7%	19514	74.4%	9682	79.8%	2306	78.4%

OCULAR DISORDERS REPORT

CESKY TERRIER - 1

CESKY TERRIER

	DISORDER	INHERITANCE	REFERENCE	BREEDING ADVICE
A.	Distichiasis	Not defined	1	Breeder option
B.	Corneal dystrophy - epithelial/stromal	Not defined	2, 3	Breeder option

Description and Comments

A. Distichiasis

Eyelashes abnormally located on the eyelid margin which may cause ocular irritation. Distichiasis may occur at any time in the life of a dog. It is difficult to make a strong recommendation with regard to breeding dogs with this entity. The hereditary basis has not been established although it seems probable due to the high incidence in some breeds. Reducing the incidence is a logical goal. When diagnosed, distichiasis should be recorded; breeding discretion is advised.

B. Corneal Dystrophy - epithelial/stromal

A non-inflammatory corneal opacity (white to gray) present in one or more of the corneal layers. Corneal dystrophy implies a probable inherited basis and is usually bilateral.

References

There are no references providing detailed descriptions of hereditary ocular conditions of the Cesky Terrier breed. The conditions listed above are generally recognized to exist in this breed, as evidenced by identification on breed eye screening examinations and/or clinical experience of veterinary ophthalmologists.

1. ACVO Genetics Committee, 2002-2003 and/or Data from CERF All-Breeds Report, 2002-2003.
2. ACVO Genetics Committee, 2007 and/or Data from CERF All-Breeds Report 2002-2006.
3. ACVO Genetics Committee, 2008 and/or Data from CERF All-Breeds Report, 2003-2007.

OCULAR DISORDERS REPORT CESKY TERRIER

Diagnostic Name	TOTAL DOGS EXAMINED	1991-1999		2000-2009		2010-2013		2014	
		#	%	#	%	#	%	#	%
EYELIDS									
25.110 distichiasis		7	18.4%	9	16.4%	2	15.4%	1	9.1%
NASOLACRIMAL									
32.110 imperforate lower nasolacrimal punctum		1	2.6%	0		0		0	
CORNEA									
70.700 corneal dystrophy		3	7.9%	5	9.1%	0		0	
UVEA									
93.710 persistent pupillary membranes, iris to iris		0		1	1.8%	1	7.7%	1	9.1%
93.750 persistent pupillary membranes, lens pigment foci/no strands		0		0		1	7.7%	0	
97.150 chororetinal coloboma, congenital		0		0		0		1	9.1%
LENS									
100.200 cataract, unspecified		1	2.6%	0		0		0	
100.210 cataract, significance unknown		1	2.6%	0		0		0	
100.301 punctate cataract, anterior cortex		0		1	1.8%	0		0	
100.307 punctate cataract, capsular		0		2	3.6%	0		0	
100.311 incipient cataract, anterior cortex		1	2.6%	0		0		0	
100.312 incipient cataract, posterior cortex		0		1	1.8%	0		0	
FUNDUS									
97.110 choroidal hypoplasia		0		0		0		1	9.1%
RETINA									
120.170 retinal dysplasia, folds		3	7.9%	4	7.3%	1	7.7%	0	
120.910 retinal detachment without dialysis		1	2.6%	0		0		0	
OPTIC NERVE									
130.110 micropapilla		0		1	1.8%	0		0	
OTHER									
900.000 other, unspecified		0		0		1	7.7%	0	
900.100 other, not inherited		0		4	7.3%	0		1	9.1%
NORMAL									
0.000 normal globe		23	60.5%	39	70.9%	10	76.9%	9	81.8%

OCULAR DISORDERS REPORT

CHESAPEAKE BAY RETRIEVER - 1

CHESAPEAKE BAY RETRIEVER

	DISORDER	INHERITANCE	REFERENCE	BREEDING ADVICE
A.	Distichiasis	Not defined	1	Breeder option
B.	Entropion	Not defined	1	Breeder option
C.	Persistent pupillary membranes			
	- iris to iris	Not defined	1-3	Breeder option
	- all other forms	Not defined	3	NO
D.	Cataract	Presumed incomplete dominant	1, 4	NO
E.	Retinal dysplasia - folds	Not defined	1	Breeder option
F.	Retinal dysplasia - geographic/detached	Not defined	1	NO
G.	Retinal atrophy - generalized (<i>prcd</i>) * a DNA test is available	Autosomal recessive	1, 5	NO

Description and Comments

A. Distichiasis

Eyelashes abnormally located in the eyelid margin which may cause ocular irritation. Distichiasis may occur at any time in the life of a dog. It is difficult to make a strong recommendation with regard to breeding dogs with this entity. The hereditary basis has not been established, although it seems probable due to the high incidence in some breeds. Reducing the incidence is a logical goal. When diagnosed, distichiasis should be recorded; breeding discretion is advised.

B. Entropion

A conformational defect resulting in "in-rolling" of one or both of the eyelids which may cause ocular irritation. It is likely that entropion is influenced by several genes (polygenic), defining the skin and other structures which make up the eyelids, the amount and weight of the skin covering the head and face, the orbital contents and the conformation of the skull. Selection

OCULAR DISORDERS REPORT

CHESAPEAKE BAY RETRIEVER - 2

should be directed against entropion and toward a head conformation that minimizes or eliminates the likelihood of the defect.

C. Persistent pupillary membranes (PPM)

Persistent blood vessel remnants in the anterior chamber of the eye which fail to regress normally by 3 months of age. These strands may bridge from iris to iris, iris to cornea, iris to lens, or form sheets of tissue in the anterior chamber. The last three forms pose the greatest threat to vision and when severe, vision impairment or blindness may occur.

D. Cataract

A partial or complete opacity of the lens and/or its capsule. In cases where cataracts are complete and affect both eyes, blindness results. The prudent approach is to assume cataracts to be hereditary except in cases known to be associated with trauma, other causes of ocular inflammation, specific metabolic diseases, persistent pupillary membrane, persistent hyaloid or nutritional deficiencies. Cataracts may involve the lens completely (diffuse) or in a localized region.

Hereditary cataracts have been described in the Chesapeake Bay Retriever and affect the young adult dog. They appear as posterior cortical, axial, triangular opacities and the Y suture tips can be affected in both the anterior and posterior cortices. Extension of the cataract into the posterior cortex and progression to impair vision can occur. An autosomal dominant inheritance with incomplete penetrance has been proposed; however, the genetics have not been completely defined and additional studies will be required.

E. Retinal dysplasia - folds

Linear, triangular, curved or curvilinear foci of retinal folding that may be single or multiple. When seen in puppies, this condition may partially or completely resolve with maturity. Its significance to vision is unknown. There are two other forms of retinal dysplasia (geographic, detached) which are known to be inherited in other breeds and, in their most severe form, cause blindness. The genetic relationship between folds and more severe forms of retinal dysplasia is undetermined.

F. Retinal dysplasia – geographic / detached

Abnormal development of the retina present at birth.

Retinal dysplasia - geographic: Any irregularly shaped area of abnormal retinal development containing both areas of thinning and areas of elevation representing folds and retinal disorganization.

Retinal dysplasia - detached: Severe retinal disorganization associated with separation (detachment) of the retina.

These two forms are associated with vision impairment or blindness. Retinal dysplasia is known to be inherited in many breeds. The genetic relationship between the three forms of retinal dysplasia is not known for all breeds.

OCULAR DISORDERS REPORT

CHESAPEAKE BAY RETRIEVER - 3

G. Retinal atrophy - generalized (*prcd*)

A degenerative disease of the retinal visual cells which progresses to blindness. This abnormality, also known as progressive retinal atrophy or PRA, may be detected by electroretinogram (not part of a routine eye screening examination) before it is apparent clinically. Except for X-linked PRA in the Siberian Husky, in all breeds studied to date, PRA is inherited as an autosomal recessive trait.

This photoreceptor degeneration is characterized by slow death of visual cells following their normal development. The disease begins clinically with signs of night blindness followed by day blindness. Ophthalmoscopic abnormalities characteristic of mid-stage disease are found in dogs between 8-12 months of age. The lesions are progressive and end-stage lesions are evident by 2-3 years of age. Other affected dogs have similar ophthalmoscopic lesions, but these are present at a later age (4-7 years). It is possible that two different types of PRA (early onset and late onset) are present in the breed; such a situation occurs in the Norwegian Elkhound. The age for early diagnosis by ERG has not been definitively established for the breed. A DNA test is available.

References

1. ACVO Genetics Committee, 1999 and/or Data from CERF All-Breeds Report, 1991-1998.
2. ACVO Genetics Committee, 2002-2003 and/or Data from CERF All-Breeds Report, 2002-2003.
3. ACVO Genetics Committee, 2005 and/or Data from CERF All-Breeds Report 2003-2004.
4. Gelatt KN. Cataracts in Chesapeake Bay retrievers. *J Am Vet Med Assoc.* 1979;175:1176.
5. Zangerl B, Goldstein O, Philp AR, et al. Identical mutation in a novel retinal gene causes progressive rod-cone degeneration in dogs and retinitis pigmentosa in humans. *Genomics.* 2006 Nov;88:551-563.

OCULAR DISORDERS REPORT CHESAPEAKE BAY RETRIEVER

Diagnostic Name	TOTAL DOGS EXAMINED		1991-1999 4494		2000-2009 5655		2010-2013 1787		2014 457	
	#	%	#	%	#	%	#	%	#	%
GLOBE										
0.110	microphthalmia	4	0.1%	3	0.1%	0		0		0
10.000	glaucoma	2	0.0%	1	0.0%	0		0		1 0.2%
EYELIDS										
20.140	ectopic cilia	0		1	0.0%	0		0		0
20.160	macropalpebral fissure	0		3	0.1%	0		0		0
21.000	entropion, unspecified	18	0.4%	29	0.5%	4	0.2%	3	0.7%	
22.000	ectropion, unspecified	3	0.1%	4	0.1%	0		0		0
25.110	distichiasis	320	7.1%	388	6.9%	144	8.1%	27	5.9%	
NICTITANS										
51.100	third eyelid cartilage anomaly	1	0.0%	0		1	0.1%	0		0
52.110	prolapsed gland of the third eyelid	0		0		2	0.1%	0		0
CORNEA										
70.210	corneal pannus	1	0.0%	0		0		0		0
70.700	corneal dystrophy	21	0.5%	38	0.7%	11	0.6%	2	0.4%	
70.730	corneal endothelial degeneration	1	0.0%	0		0		0		0
UVEA										
93.120	iris cyst	3	0.1%	12	0.2%	3	0.2%	1	0.2%	
93.150	iris coloboma	0		1	0.0%	0		0		0
93.170	anterior chamber cyst	0		0		1	0.1%	1	0.2%	
93.710	persistent pupillary membranes, iris to iris	62	1.4%	97	1.7%	45	2.5%	12	2.6%	
93.720	persistent pupillary membranes, iris to lens	2	0.0%	7	0.1%	2	0.1%	0		0
93.730	persistent pupillary membranes, iris to cornea	1	0.0%	2	0.0%	0		0		0
93.740	persistent pupillary membranes, iris sheets	6	0.1%	8	0.1%	0		0		0
93.750	persistent pupillary membranes, lens pigment foci/no strands	0		2	0.0%	24	1.3%	6	1.3%	
93.760	persistent pupillary membranes, endothelial opacity/no strands	0		0		4	0.2%	0		0
95.120	ciliary body cyst	0		0		1	0.1%	1	0.2%	
LENS										
100.200	cataract, unspecified	74	1.6%	0		0		0		0
100.210	cataract, significance unknown	146	3.2%	266	4.7%	70	3.9%	21	4.6%	
100.301	punctate cataract, anterior cortex	18	0.4%	15	0.3%	9	0.5%	1	0.2%	
100.302	punctate cataract, posterior cortex	40	0.9%	48	0.8%	17	1.0%	1	0.2%	
100.303	punctate cataract, equatorial cortex	16	0.4%	14	0.2%	4	0.2%	1	0.2%	
100.304	punctate cataract, anterior sutures	5	0.1%	2	0.0%	1	0.1%	1	0.2%	
100.305	punctate cataract, posterior sutures	21	0.5%	12	0.2%	9	0.5%	0		0
100.306	punctate cataract, nucleus	2	0.0%	4	0.1%	1	0.1%	0		0
100.307	punctate cataract, capsular	1	0.0%	14	0.2%	2	0.1%	1	0.2%	
100.311	incipient cataract, anterior cortex	24	0.5%	23	0.4%	4	0.2%	1	0.2%	
100.312	incipient cataract, posterior cortex	77	1.7%	99	1.8%	32	1.8%	6	1.3%	
100.313	incipient cataract, equatorial cortex	20	0.4%	26	0.5%	5	0.3%	2	0.4%	
100.314	incipient cataract, anterior sutures	4	0.1%	2	0.0%	0		1	0.2%	
100.315	incipient cataract, posterior sutures	17	0.4%	20	0.4%	3	0.2%	1	0.2%	
100.316	incipient cataract, nucleus	6	0.1%	10	0.2%	1	0.1%	0		0
100.317	incipient cataract, capsular	1	0.0%	13	0.2%	6	0.3%	0		0
100.321	incomplete cataract, anterior cortex	0		0		0		1	0.2%	

OCULAR DISORDERS REPORT CHESAPEAKE BAY RETRIEVER

LENS CONTINUED	1991-1999	2000-2009	2010-2013	2014
100.322 incomplete cataract, posterior cortex	0	0	2 0.1%	2 0.4%
100.330 generalized/complete cataract	25 0.6%	16 0.3%	2 0.1%	0
100.375 subluxation/luxation, unspecified	2 0.0%	3 0.1%	1 0.1%	0
VITREOUS				
110.120 persistent hyaloid artery/remnant	9 0.2%	10 0.2%	0	1 0.2%
110.135 PHPV/PTVL	3 0.1%	5 0.1%	2 0.1%	0
110.200 vitritis	0	0	8 0.4%	6 1.3%
110.320 vitreous degeneration syneresis	16 0.4%	18 0.3%	4 0.2%	2 0.4%
110.330 vitreous degeneration anterior chamber	0	22 0.4%	10 0.6%	0
FUNDUS				
97.110 choroidal hypoplasia	3 0.1%	0	0	0
RETINA				
120.170 retinal dysplasia, folds	25 0.6%	38 0.7%	14 0.8%	1 0.2%
120.180 retinal dysplasia, geographic	26 0.6%	19 0.3%	3 0.2%	0
120.190 retinal dysplasia, detached	0	1 0.0%	0	1 0.2%
120.200 retinitis	0	0	0	1 0.2%
120.310 generalized progressive retinal atrophy (PRA)	42 0.9%	37 0.7%	8 0.4%	1 0.2%
120.400 retinal hemorrhage	0	1 0.0%	0	0
120.910 retinal detachment without dialysis	1 0.0%	0	0	0
OPTIC NERVE				
130.110 micropapilla	0	1 0.0%	0	0
130.120 optic nerve hypoplasia	1 0.0%	1 0.0%	0	0
130.150 optic disc coloboma	0	2 0.0%	0	0
OTHER				
900.000 other, unspecified	0	41 0.7%	86 4.8%	0
900.100 other, not inherited	22 0.5%	306 5.4%	21 1.2%	25 5.5%
900.110 other, suspected as inherited	33 0.7%	19 0.3%	7 0.4%	2 0.4%
NORMAL				
0.000 normal globe	3623 80.6%	4759 84.2%	1572 88.0%	403 88.2%

OCULAR DISORDERS REPORT

CHIHUAHUA - 1

CHIHUAHUA

	DISORDER	INHERITANCE	REFERENCE	BREEDING ADVICE
A.	Distichiasis	Not defined	1	Breeder option
B.	Corneal dystrophy - endothelial	Not defined	2, 3	NO
C.	Persistent pupillary membranes			
	- iris to iris	Not defined	2, 4	Breeder option
	- all other forms	Not defined	4	NO
D.	Cataract	Not defined	2	NO
E.	Vitreous degeneration	Not defined	2	Breeder option

Description and Comments

A. Distichiasis

Eyelashes abnormally located on the eyelid margin which may cause ocular irritation. Distichiasis may occur at any time in the life of a dog. It is difficult to make a strong recommendation with regard to breeding dogs with this entity. The hereditary basis has not been established although it seems probable due to the high incidence in some breeds. Reducing the incidence is a logical goal. When diagnosed, distichiasis should be recorded; breeding discretion is advised.

B. Corneal dystrophy - endothelial

An abnormal loss of the inner lining of the cornea that causes progressive fluid retention (edema). With time the edema results in keratitis and decreased vision. This usually does not occur until the animal is older.

In the Chihuahua, this is a primary degenerative endothelial disease leading to progressive and permanent corneal edema. It is suspected to be a heritable disorder. There is no sex predilection. The condition is observed in older dogs, 6 to 13 years of age with a mean of 9.5 years. The corneal edema starts asymptotically in the dorsal temporal corneal quadrant of one eye and slowly progresses medially, eventually involving the entire cornea. Typically, it becomes bilateral. In the later stages discomfort, intracorneal bullae with subsequent ulceration and keratoconus may develop. Histologically, the primary endothelial disease appears slightly different from the clinically similar disorder of the Boston Terrier.

OCULAR DISORDERS REPORT

CHIHUAHUA - 2

C. Persistent pupillary membranes (PPM)

Persistent blood vessel remnants in the anterior chamber of the eye which fail to regress normally by 3 months of age. These strands may bridge from iris to iris, iris to cornea, iris to lens, or form sheets of tissue in the anterior chamber. The last three forms pose the greatest threat to vision and when severe, vision impairment or blindness may occur.

D. Cataract

A partial or complete opacity of the lens and/or its capsule. In cases where cataracts are complete and affect both eyes, blindness results. The prudent approach is to assume cataracts to be hereditary except in cases known to be associated with trauma, other causes of ocular inflammation, specific metabolic diseases, persistent pupillary membrane, persistent hyaloid or nutritional deficiencies. Cataracts may involve the lens completely (diffuse) or in a localized region.

E. Vitreous degeneration

A liquefaction of the vitreous gel which may predispose to retinal detachment.

References

There are few references providing detailed descriptions of hereditary ocular conditions of the Chihuahua breed. The conditions listed above are generally recognized to exist in this breed, as evidenced by identification on breed eye screening examinations and/or clinical experience of veterinary ophthalmologists.

1. ACVO Genetics Committee, 2011 and/or Data from CERF All-Breeds Report, 2010.
2. ACVO Genetics Committee, 1999 and/or Data from CERF All-Breeds Report, 1991-1998.
3. Martin CL and Dice PF. Corneal endothelial dystrophy in the dog. *J Am Anim Hosp Assoc.* 1982;18:327.
4. ACVO Genetics Committee, 2005 and/or Data from CERF All-Breeds Report 2003-2004.

OCULAR DISORDERS REPORT CHIHUAHUA

Diagnostic Name	TOTAL DOGS EXAMINED		1991-1999		2000-2009		2010-2013		2014	
	#	%	#	%	#	%	#	%	#	%
EYELIDS										
20.140	ectopic cilia	0		0		1	0.2%	0		0
21.000	entropion, unspecified	0		3	0.6%	0		0		0
25.110	distichiasis	5	3.8%	21	3.9%	36	6.1%	18	14.1%	
NASOLACRIMAL										
32.110	imperforate lower nasolacrimal punctum	0		0		0		2	1.6%	
40.910	keratoconjunctivitis sicca	0		0		1	0.2%	0		
NICTITANS										
52.110	prolapsed gland of the third eyelid	1	0.8%	0		0		2	1.6%	
CORNEA										
70.700	corneal dystrophy	0		2	0.4%	1	0.2%	0		
70.730	corneal endothelial degeneration	2	1.5%	1	0.2%	1	0.2%	0		
UVEA										
93.710	persistent pupillary membranes, iris to iris	7	5.4%	34	6.3%	45	7.7%	15	11.7%	
93.720	persistent pupillary membranes, iris to lens	0		0		3	0.5%	1	0.8%	
93.730	persistent pupillary membranes, iris to cornea	0		1	0.2%	1	0.2%	0		
93.750	persistent pupillary membranes, lens pigment foci/no strands	0		0		4	0.7%	0		
93.760	persistent pupillary membranes, endothelial opacity/no strands	0		1	0.2%	1	0.2%	0		
LENS										
100.200	cataract, unspecified	3	2.3%	0		0		0		
100.210	cataract, significance unknown	0		16	3.0%	19	3.2%	5	3.9%	
100.301	punctate cataract, anterior cortex	2	1.5%	2	0.4%	4	0.7%	0		
100.303	punctate cataract, equatorial cortex	1	0.8%	0		1	0.2%	0		
100.304	punctate cataract, anterior sutures	0		0		1	0.2%	0		
100.305	punctate cataract, posterior sutures	0		2	0.4%	0		1	0.8%	
100.306	punctate cataract, nucleus	0		0		0		1	0.8%	
100.311	incipient cataract, anterior cortex	2	1.5%	10	1.8%	8	1.4%	1	0.8%	
100.312	incipient cataract, posterior cortex	4	3.1%	3	0.6%	6	1.0%	1	0.8%	
100.313	incipient cataract, equatorial cortex	1	0.8%	2	0.4%	2	0.3%	0		
100.314	incipient cataract, anterior sutures	0		0		2	0.3%	0		
100.315	incipient cataract, posterior sutures	0		0		2	0.3%	0		
100.316	incipient cataract, nucleus	4	3.1%	1	0.2%	1	0.2%	0		
100.317	incipient cataract, capsular	0		0		1	0.2%	0		
100.321	incomplete cataract, anterior cortex	0		0		1	0.2%	0		
100.330	generalized/complete cataract	2	1.5%	9	1.7%	1	0.2%	0		
100.375	subluxation/luxation, unspecified	0		1	0.2%	0		0		
VITREOUS										
110.120	persistant hyaloid artery/remnant	0		0		1	0.2%	1	0.8%	
110.135	PHPV/PTVL	0		0		1	0.2%	1	0.8%	
110.200	vitritis	0		0		1	0.2%	2	1.6%	
110.320	vitreous degeneration syneresis	13	10.0%	15	2.8%	21	3.6%	3	2.3%	
110.330	vitreous degeneration anterior chamber	0		4	0.7%	5	0.9%	0		

OCULAR DISORDERS REPORT CHIHUAHUA

	1991-1999	2000-2009	2010-2013	2014
FUNDUS				
97.110 choroidal hypoplasia	0	0	1 0.2%	0
RETINA				
120.170 retinal dysplasia, folds	2 1.5%	3 0.6%	1 0.2%	1 0.8%
120.180 retinal dysplasia, geographic	0	1 0.2%	2 0.3%	0
120.310 generalized progressive retinal atrophy (PRA)	3 2.3%	5 0.9%	1 0.2%	1 0.8%
120.960 retinopathy	0	0	1 0.2%	0
OPTIC NERVE				
130.110 micropapilla	0	1 0.2%	0	0
130.150 optic disc coloboma	0	1 0.2%	0	0
OTHER				
900.000 other, unspecified	0	5 0.9%	16 2.7%	0
900.100 other, not inherited	1 0.8%	20 3.7%	6 1.0%	3 2.3%
900.110 other, suspected as inherited	1 0.8%	2 0.4%	1 0.2%	1 0.8%
NORMAL				
0.000 normal globe	95 73.1%	454 83.9%	507 86.4%	101 78.9%

OCULAR DISORDERS REPORT

CHINESE CRESTED - 1

CHINESE CRESTED

	DISORDER	INHERITANCE	REFERENCE	BREEDING ADVICE
A.	Persistent pupillary membranes - iris to iris - all other forms	Not defined Not defined	1, 2 2	Breeder option NO
B.	Lens luxation * a DNA test is available	Not defined	3	NO
C.	Cataract	Not defined	4	NO
D.	Vitreous degeneration	Not defined	2,4,5,6	Breeder option
E.	Retinal atrophy - generalized (<i>prcd</i>) * a DNA test is available	Autosomal recessive	2, 7	NO

Description and Comments

A. Persistent pupillary membrane (PPM)

Persistent blood vessel remnants in the anterior chamber of the eye which fail to regress normally by 3 months of age. These strands may bridge from iris to iris, iris to cornea, iris to lens, or form sheets of tissue in the anterior chamber. The last three forms pose the greatest threat to vision and when severe, vision impairment or blindness may occur.

B. Lens luxation

Partial (subluxation) or complete displacement of the lens from its normal anatomic site behind the pupil. Lens luxation not associated with trauma or inflammation is presumed to be inherited. Lens luxation may result in elevated intraocular pressure (glaucoma) causing vision impairment or blindness. A DNA test is available.

C. Cataract

A partial or complete opacity of the lens and/or its capsule. In cases where cataracts are complete and affect both eyes, blindness results. The prudent approach is to assume cataracts to be hereditary except in cases known to be associated with trauma, other causes of ocular inflammation, specific metabolic diseases, persistent pupillary membrane, persistent hyaloid or nutritional deficiencies. Cataracts may involve the lens completely

OCULAR DISORDERS REPORT

CHINESE CRESTED - 2

(diffuse) or in a localized region.

D. Vitreous degeneration

Liquefaction of the vitreous gel which may predispose to retinal detachment.

E. Retinal atrophy - generalized (*prcd*)

A degenerative disease of the retinal visual cells which progresses to blindness. This abnormality, also known as Progressive Retinal Atrophy or PRA, may be detected by electroretinogram (not part of a routine eye screening examination) before it is apparent clinically. Except for X-linked PRA in the Siberian Husky, in all breeds studied to date, PRA is inherited as an autosomal recessive trait. A DNA test is available.

References

There are few references providing detailed descriptions of hereditary ocular conditions of the Chinese Crested breed. The conditions listed above are generally recognized to exist in this breed, as evidenced by identification on breed eye screening examinations and/or clinical experience of veterinary ophthalmologists.

1. ACVO Genetics Committee, 2000-2002 and/or Data from CERF All-Breeds Report, 2000-2002.
2. ACVO Genetics Committee, 2005 and/or Data from CERF All-Breeds Report 2003-2004.
3. Farias FH, Johnson GS, Taylor JF, et al. An ADAMTS17 splice donor site mutation in dogs with primary lens luxation. *Invest Ophthalmol Vis Sci*. 2010 Sep;51:4716-4721.
4. ACVO Genetics Committee, 1999 and/or Data from CERF All-Breeds Report, 1991-1998.
5. ACVO Genetics Committee, 2008 and/or Data from CERF All-Breeds Report, 2003-2007.
6. ACVO Genetics Committee, 2007 and/or Data from CERF All-Breeds Report 2002-2006.
7. Zangerl B, Goldstein O, Philp AR, et al. Identical mutation in a novel retinal gene causes progressive rod-cone degeneration in dogs and retinitis pigmentosa in humans. *Genomics*. 2006 Nov;88:551-563.

OCULAR DISORDERS REPORT CHINESE CRESTED

Diagnostic Name	TOTAL DOGS EXAMINED		1991-1999 472		2000-2009 4606		2010-2013 1099		2014 221	
	#	%	#	%	#	%	#	%	#	%
GLOBE										
0.110	microphthalmia	0		3	0.1%	1	0.1%	0		
10.000	glaucoma	0		1	0.0%	1	0.1%	0		
EYELIDS										
20.140	ectopic cilia	0		0		1	0.1%	0		
21.000	entropion, unspecified	0		4	0.1%	0		0		
25.110	distichiasis	1	0.2%	23	0.5%	8	0.7%	3	1.4%	
NASOLACRIMAL										
32.110	imperforate lower nasolacrimal punctum	0		0		1	0.1%	0		
40.910	keratoconjunctivitis sicca	1	0.2%	14	0.3%	3	0.3%	0		
NICTITANS										
52.110	prolapsed gland of the third eyelid	0		2	0.0%	1	0.1%	0		
CORNEA										
70.210	corneal pannus	4	0.8%	1	0.0%	0		0		
70.220	pigmentary keratitis	1	0.2%	4	0.1%	1	0.1%	0		
70.700	corneal dystrophy	2	0.4%	26	0.6%	5	0.5%	0		
70.730	corneal endothelial degeneration	0		2	0.0%	0		0		
UVEA										
93.110	iris hypoplasia	0		3	0.1%	1	0.1%	1	0.5%	
93.120	iris cyst	0		3	0.1%	0		0		
93.150	iris coloboma	1	0.2%	0		0		1	0.5%	
93.710	persistent pupillary membranes, iris to iris	4	0.8%	112	2.4%	37	3.4%	7	3.2%	
93.720	persistent pupillary membranes, iris to lens	3	0.6%	7	0.2%	0		1	0.5%	
93.730	persistent pupillary membranes, iris to cornea	2	0.4%	7	0.2%	1	0.1%	0		
93.740	persistent pupillary membranes, iris sheets	2	0.4%	3	0.1%	0		0		
93.750	persistent pupillary membranes, lens pigment foci/no strands	0		0		2	0.2%	1	0.5%	
93.760	persistent pupillary membranes, endothelial opacity/no strands	0		0		2	0.2%	0		
95.120	ciliary body cyst	0		0		1	0.1%	0		
LENS										
100.210	cataract, significance unknown	3	0.6%	114	2.5%	27	2.5%	4	1.8%	
100.301	punctate cataract, anterior cortex	2	0.4%	15	0.3%	12	1.1%	0		
100.302	punctate cataract, posterior cortex	1	0.2%	13	0.3%	3	0.3%	0		
100.303	punctate cataract, equatorial cortex	1	0.2%	8	0.2%	4	0.4%	0		
100.304	punctate cataract, anterior sutures	0		2	0.0%	0		0		
100.305	punctate cataract, posterior sutures	0		3	0.1%	3	0.3%	1	0.5%	
100.306	punctate cataract, nucleus	0		6	0.1%	2	0.2%	0		
100.307	punctate cataract, capsular	0		3	0.1%	2	0.2%	0		
100.311	incipient cataract, anterior cortex	2	0.4%	26	0.6%	13	1.2%	0		
100.312	incipient cataract, posterior cortex	0		22	0.5%	9	0.8%	0		
100.313	incipient cataract, equatorial cortex	2	0.4%	19	0.4%	8	0.7%	1	0.5%	
100.314	incipient cataract, anterior sutures	0		2	0.0%	0		0		
100.315	incipient cataract, posterior sutures	1	0.2%	3	0.1%	0		1	0.5%	
100.316	incipient cataract, nucleus	0		5	0.1%	0		0		
100.317	incipient cataract, capsular	0		1	0.0%	0		0		

OCULAR DISORDERS REPORT CHINESE CRESTED

LENS CONTINUED	1991-1999	2000-2009	2010-2013	2014
100.321 incomplete cataract, anterior cortex	0	0	2 0.2%	0
100.322 incomplete cataract, posterior cortex	0	0	2 0.2%	0
100.330 generalized/complete cataract	2 0.4%	21 0.5%	2 0.2%	1 0.5%
100.375 subluxation/luxation, unspecified	2 0.4%	20 0.4%	2 0.2%	0
VITREOUS				
110.120 persistent hyaloid artery/remnant	2 0.4%	4 0.1%	0	0
110.135 PHPV/PTVL	0	1 0.0%	1 0.1%	0
110.200 vitritis	0	0	10 0.9%	3 1.4%
110.320 vitreous degeneration syneresis	15 3.2%	406 8.8%	79 7.2%	16 7.2%
110.330 vitreous degeneration anterior chamber	0	186 4.0%	28 2.5%	0
FUNDUS				
97.110 choroidal hypoplasia	0	1 0.0%	2 0.2%	0
97.120 coloboma	0	2 0.0%	0	0
RETINA				
120.170 retinal dysplasia, folds	0	27 0.6%	3 0.3%	2 0.9%
120.180 retinal dysplasia, geographic	1 0.2%	5 0.1%	0	0
120.190 retinal dysplasia, detached	2 0.4%	0	0	0
120.200 retinitis	0	0	0	1 0.5%
120.310 generalized progressive retinal atrophy (PRA)	5 1.1%	81 1.8%	7 0.6%	1 0.5%
120.400 retinal hemorrhage	0	2 0.0%	2 0.2%	0
120.910 retinal detachment without dialysis	0	7 0.2%	1 0.1%	0
OPTIC NERVE				
130.110 micropapilla	0	3 0.1%	1 0.1%	0
130.120 optic nerve hypoplasia	4 0.8%	6 0.1%	3 0.3%	0
130.150 optic disc coloboma	0	8 0.2%	0	0
OTHER				
900.000 other, unspecified	0	26 0.6%	42 3.8%	0
900.100 other, not inherited	3 0.6%	149 3.2%	11 1.0%	8 3.6%
900.110 other, suspected as inherited	6 1.3%	14 0.3%	2 0.2%	0
NORMAL				
0.000 normal globe	413 87.5%	3943 85.6%	941 85.6%	198 89.6%

OCULAR DISORDERS REPORT

CHINESE SHAR PEI - 1

CHINESE SHAR PEI

	DISORDER	INHERITANCE	REFERENCE	BREEDING ADVICE
A.	Glaucoma	Not defined	1	NO
B.	Entropion	Not defined	1-5	NO
C.	Prolapsed gland of third eyelid	Not defined	1	Breeder option
D.	Corneal dystrophy - epithelial/stromal	Not defined	1-3	Breeder option
E.	Chronic superficial keratitis/pannus	Not defined	6	Breeder option
F.	Persistent pupillary membranes - iris to iris	Not defined	6	Breeder option
G.	Cataract	Not defined	1	NO
H.	Lens luxation	Simple autosomal recessive	1, 7	NO
I.	Retinal atrophy - generalized	Not defined	1	NO

Description and Comments

A. Glaucoma

Glaucoma is characterized by an elevation of intraocular pressure (IOP) which, when sustained, causes intraocular damage resulting in blindness. The elevated IOP occurs because the fluid cannot leave through the iridocorneal angle. Diagnosis and classification of glaucoma requires measurement of the intraocular pressure (tonometry) and examination of the iridocorneal angle (gonioscopy). Neither of these tests is part of a routine breed eye screening exam.

OCULAR DISORDERS REPORT

CHINESE SHAR PEI - 2

B. Entropion

A conformational defect resulting in an "in-rolling" of one or both of the eyelids which may cause ocular irritation. It is likely that entropion is influenced by several genes (polygenic), defining the skin and other structures which make up the eyelids, the amount and weight of the skin covering the head and face, the orbital contents, and the conformation of the skull.

The condition is a particularly severe problem in the Shar-Pei and is compounded by breeder selection for facial conformation with heavy skin folds which encourages formation of entropion.

C. Prolapse of the gland of the third eyelid

This condition, which is often referred to as "cherry eye", represents a protrusion of the glandular portion of the third eyelid. The mode of inheritance of this disorder is unknown. Exposure of the gland may cause ocular irritation and be associated with decreased tears (Keratoconjunctivitis sicca).

D. Corneal dystrophy - epithelial/stromal

A non-inflammatory corneal opacity (white to gray) present in one or more of the corneal layers; usually inherited and bilateral.

E. Chronic superficial keratitis/Pannus

A bilateral inflammatory disease of the cornea which usually starts as a grayish haze to the ventral or ventrolateral cornea, followed by the formation of a vascularized subepithelial growth that begins to spread toward the central cornea; pigmentation follows the vascularization. If severe, vision impairment occurs. Pannus may be associated with plasma cell infiltration of the nictitans.

F. Persistent pupillary membranes (PPM)

Persistent blood vessel remnants in the anterior chamber of the eye which fail to regress normally by 3 months of age. These strands may bridge from iris to iris, iris to cornea, iris to lens, or form sheets of tissue in the anterior chamber. The last three forms pose the greatest threat to vision and when severe, vision impairment or blindness may occur.

G. Cataract

A partial or complete opacity of the lens and/or its capsule. In cases where cataracts are complete and affect both eyes, blindness results. The prudent approach is to assume cataracts to be hereditary except in cases known to be associated with trauma, other causes of ocular inflammation, specific metabolic diseases, persistent pupillary membrane, persistent hyaloid or nutritional deficiencies. Cataracts may involve the lens completely (diffuse) or in a localized region.

OCULAR DISORDERS REPORT

CHINESE SHAR PEI - 3

H. Lens luxation

Partial (subluxation) or complete displacement of the lens from the normal anatomic site behind the pupil. Lens luxation not associated with trauma or inflammation is presumed to be inherited. Lens luxation may result in elevated intraocular pressure (glaucoma) causing vision impairment or blindness.

I. Retinal atrophy - generalized

A degenerative disease of the retinal visual cells which progresses to blindness. This abnormality, also known as progressive retinal atrophy or PRA, may be detected by electroretinogram (not part of a routine eye screening examination) before it is apparent clinically. PRA is inherited as an autosomal recessive trait in most breeds.

References

1. ACVO Genetics Committee, 1999 and/or Data from CERF All-Breeds Report, 1991-1998.
2. Lenarduzzi R. Management of eyelid problems in Chinese Shar-Pei puppies. *Vet Med Small Anim Clin.* 1983;78:548.
3. Bedford PGC. Entropion in Shar Peis (Correspondence). *Vet Rec.* 1984;115:666.
4. Startup FG. Entropion in the Shar Pei (Correspondence). *Vet Rec.* 1985;116:57.
5. Barnett KC. Inherited eye disease in the dog and cat. *J Small Anim Pract.* 1988;29:462.
6. ACVO Genetics Committee, 2005 and/or Data from CERF All-Breeds Report 2003-2004.
7. Lazarus JA, Pickett JP and Champagne ES. Primary lens luxation in the Chinese Shar Pei: clinical and hereditary characteristics. *Vet Ophthalmol.* 1998;1:101-107.

OCULAR DISORDERS REPORT CHINESE SHAR-PEI

Diagnostic Name	TOTAL DOGS EXAMINED	1991-1999		2000-2009		2010-2013		2014	
		#	%	#	%	#	%	#	%
GLOBE									
0.110 microphthalmia		0		1	0.6%	0		0	
EYELIDS									
21.000 entropion, unspecified		182	56.0%	71	42.3%	27	41.5%	13	65.0%
22.000 ectropion, unspecified		8	2.5%	2	1.2%	2	3.1%	0	
25.110 distichiasis		1	0.3%	1	0.6%	1	1.5%	0	
NICTITANS									
51.100 third eyelid cartilage anomaly		0		1	0.6%	0		0	
52.110 prolapsed gland of the third eyelid		1	0.3%	1	0.6%	0		0	
CORNEA									
70.210 corneal pannus		25	7.7%	4	2.4%	0		0	
70.220 pigmentary keratitis		3	0.9%	1	0.6%	4	6.2%	2	10.0%
70.700 corneal dystrophy		2	0.6%	1	0.6%	1	1.5%	0	
70.730 corneal endothelial degeneration		3	0.9%	3	1.8%	0		0	
UVEA									
93.710 persistent pupillary membranes, iris to iris		7	2.2%	8	4.8%	0		0	
93.720 persistent pupillary membranes, iris to lens		2	0.6%	3	1.8%	0		0	
93.730 persistent pupillary membranes, iris to cornea		3	0.9%	2	1.2%	0		0	
93.750 persistent pupillary membranes, lens pigment foci/no strands		0		0		2	3.1%	0	
93.760 persistent pupillary membranes, endothelial opacity/no strands		0		0		1	1.5%	0	
93.810 uveal melanoma		0		1	0.6%	0		0	
LENS									
100.200 cataract, unspecified		4	1.2%	0		0		0	
100.210 cataract, significance unknown		5	1.5%	8	4.8%	0		0	
100.301 punctate cataract, anterior cortex		1	0.3%	0		0		0	
100.302 punctate cataract, posterior cortex		1	0.3%	0		0		0	
100.305 punctate cataract, posterior sutures		1	0.3%	1	0.6%	0		0	
100.307 punctate cataract, capsular		0		1	0.6%	0		0	
100.311 incipient cataract, anterior cortex		0		2	1.2%	0		0	
100.312 incipient cataract, posterior cortex		3	0.9%	2	1.2%	0		0	
100.314 incipient cataract, anterior sutures		1	0.3%	0		0		0	
100.315 incipient cataract, posterior sutures		0		1	0.6%	1	1.5%	0	
100.316 incipient cataract, nucleus		0		0		1	1.5%	0	
100.330 generalized/complete cataract		2	0.6%	0		0		0	
100.375 subluxation/luxation, unspecified		7	2.2%	2	1.2%	0		0	
VITREOUS									
110.120 persistent hyaloid artery/remnant		0		1	0.6%	0		0	
110.320 vitreous degeneration syneresis		0		1	0.6%	0		0	
RETINA									
120.170 retinal dysplasia, folds		1	0.3%	3	1.8%	0		0	
120.180 retinal dysplasia, geographic		0		1	0.6%	0		0	
120.310 generalized progressive retinal atrophy (PRA)		2	0.6%	0		0		0	
120.910 retinal detachment without dialysis		1	0.3%	0		0		0	

OCULAR DISORDERS REPORT CHINESE SHAR-PEI

	1991-1999	2000-2009	2010-2013	2014
OPTIC NERVE				
130.120 optic nerve hypoplasia	1 0.3%	0	0	0
OTHER				
900.000 other, unspecified	0	2 1.2%	7 10.8%	0
900.100 other, not inherited	3 0.9%	11 6.5%	1 1.5%	0
900.110 other, suspected as inherited	16 4.9%	3 1.8%	0	3 15.0%
NORMAL				
0.000 normal globe	153 47.1%	85 50.6%	30 46.2%	7 35.0%

OCULAR DISORDERS REPORT

CHINOOK - 1

CHINOOK

	DISORDER	INHERITANCE	REFERENCE	BREEDING ADVICE
A.	Persistent pupillary membranes - iris to iris	Not defined	1	Breeder option
B.	Cataract	Not defined	1	NO
C.	Vitreous degeneration	Not defined	2, 3	Breeder option
D.	Retinal dysplasia - folds	Not defined	1	Breeder option

Description and Comments

A. Persistent pupillary membranes (PPM)

Persistent blood vessel remnants in the anterior chamber of the eye which fail to regress normally by 3 months of age. These strands may bridge from iris to iris, iris to cornea, iris to lens, or form sheets of tissue in the anterior chamber. The last three forms pose the greatest threat to vision and when severe, vision impairment or blindness may occur.

B. Cataract

A partial or complete opacity of the lens and/or its capsule. In cases where cataracts are complete and affect both eyes, blindness results. The prudent approach is to assume cataracts to be hereditary except in cases known to be associated with trauma, other causes of ocular inflammation, specific metabolic diseases, persistent pupillary membrane, persistent hyaloid or nutritional deficiencies. Cataracts may involve the lens completely (diffuse) or in a localized region.

C. Vitreous degeneration

Liquefaction of the vitreous gel which may predispose to retinal detachment.

OCULAR DISORDERS REPORT

CHINOOK - 2

D. Retinal dysplasia - folds

Linear, triangular, curved or curvilinear foci of retinal folding that may be single or multiple. When seen in puppies, this condition may partially or completely resolve with maturity. Its significance to vision is unknown. There are two other forms of retinal dysplasia (geographic, detached) which are known to be inherited in other breeds and, in their most severe form, cause blindness. The genetic relationship between folds and more severe forms of retinal dysplasia is undetermined.

References

There are no references providing detailed descriptions of hereditary ocular conditions of the Chinook breed. The conditions listed above are generally recognized to exist in this breed, as evidenced by identification on breed eye screening examinations and/or clinical experience of veterinary ophthalmologists.

1. ACVO Genetics Committee, 2005 and/or Data from CERF All-Breeds Report 2003-2004.
2. ACVO Genetics Committee, 2006 and/or Data from CERF All-Breeds Report, 2001-2005.
3. ACVO Genetics Committee, 2009 and/or Data from CERF All-Breeds Report, 2008.

OCULAR DISORDERS REPORT CHINOOK

Diagnostic Name	TOTAL DOGS EXAMINED		1991-1999		2000-2009		2010-2013		2014	
	#	%	#	%	#	%	#	%	#	%
EYELIDS										
20.140	ectopic cilia	0		0		1	0.3%	0		
25.110	distichiasis	0		3	0.4%	4	1.1%	0		
NASOLACRIMAL										
40.910	keratoconjunctivitis sicca	0		0		2	0.6%	0		
NICTITANS										
51.100	third eyelid cartilage anomaly	0		1	0.1%	1	0.3%	0		
CORNEA										
70.700	corneal dystrophy	0		1	0.1%	1	0.3%	0		
70.730	corneal endothelial degeneration	0		1	0.1%	0		0		
UVEA										
93.710	persistent pupillary membranes, iris to iris	3	2.9%	46	5.5%	37	10.6%	2	3.1%	
93.720	persistent pupillary membranes, iris to lens	0		1	0.1%	1	0.3%	0		
93.760	persistent pupillary membranes, endothelial opacity/no strands	0		0		1	0.3%	0		
LENS										
100.200	cataract, unspecified	2	2.0%	0		0		0		
100.210	cataract, significance unknown	10	9.8%	45	5.4%	14	4.0%	3	4.6%	
100.301	punctate cataract, anterior cortex	0		4	0.5%	1	0.3%	0		
100.302	punctate cataract, posterior cortex	1	1.0%	0		0		0		
100.305	punctate cataract, posterior sutures	0		1	0.1%	1	0.3%	0		
100.306	punctate cataract, nucleus	1	1.0%	4	0.5%	1	0.3%	1	1.5%	
100.311	incipient cataract, anterior cortex	1	1.0%	6	0.7%	1	0.3%	0		
100.312	incipient cataract, posterior cortex	2	2.0%	12	1.4%	1	0.3%	0		
100.313	incipient cataract, equatorial cortex	4	3.9%	3	0.4%	0		0		
100.314	incipient cataract, anterior sutures	0		1	0.1%	0		0		
100.315	incipient cataract, posterior sutures	0		7	0.8%	1	0.3%	1	1.5%	
100.316	incipient cataract, nucleus	0		4	0.5%	2	0.6%	1	1.5%	
100.317	incipient cataract, capsular	0		3	0.4%	1	0.3%	0		
100.321	incomplete cataract, anterior cortex	0		0		0		1	1.5%	
100.322	incomplete cataract, posterior cortex	0		0		1	0.3%	0		
100.330	generalized/complete cataract	1	1.0%	8	1.0%	0		0		
VITREOUS										
110.120	persistant hyaloid artery/remnant	0		2	0.2%	0		0		
110.320	vitreous degeneration syneresis	0		12	1.4%	3	0.9%	1	1.5%	
110.330	vitreous degeneration anterior chamber	0		0		1	0.3%	0		
RETINA										
120.170	retinal dysplasia, folds	1	1.0%	50	6.0%	11	3.1%	0		
120.180	retinal dysplasia, geographic	0		1	0.1%	0		0		
120.310	generalized progressive retinal atrophy (PRA)	0		1	0.1%	0		0		
OTHER										
900.000	other, unspecified	0		6	0.7%	13	3.7%	0		
900.100	other, not inherited	1	1.0%	40	4.8%	3	0.9%	3	4.6%	

OCULAR DISORDERS REPORT CHINOOK

OTHER CONTINUED	1991-1999	2000-2009	2010-2013	2014
900.110 other, suspected as inherited	2 2.0%	0	1 0.3%	0
NORMAL 0.000 normal globe	80 78.4%	698 84.2%	314 89.7%	54 83.1%

OCULAR DISORDERS REPORT

CHOW CHOW - 1

CHOW CHOW

	DISORDER	INHERITANCE	REFERENCE	BREEDING ADVICE
A.	Entropion	Not defined	1	NO
B.	Ectropion	Not defined	2	Breeder option
C.	Corneal dystrophy - endothelial	Not defined	1	NO
D.	Exposure keratopathy syndrome/ Pigmentary keratitis	Not defined	2, 3	Breeder option
E.	Persistent pupillary membranes			
	- iris to iris	Not defined	1, 4	Breeder option
	- iris to lens	Not defined	5	NO
	- iris to cornea	Not defined	5	NO
	- all other forms	Not defined	4	NO
F.	Glaucoma	Not defined	1, 6, 7	NO
G.	Cataract	Not defined	1, 8	NO

DESCRIPTION AND COMMENTS

A. Entropion

A conformational defect resulting in an "in-rolling" of one or both of the eyelids which may cause ocular irritation. It is likely that entropion is influenced by several genes (polygenic), defining the skin and other structures which make up the eyelids, the amount and weight of the skin covering the head and face, the orbital contents, and the conformation of the skull.

Entropion in the Chow Chow has been observed for decades and is definitely related to the amount of skin covering the head and face. Because of the conformation admired by both fanciers and the judges, it is doubtful that we will see a significant change in the incidence of entropion as folds are, in many cases, desired by these individuals. Entropion requires surgical correction in the Chow Chow to return comfort and decrease chances for vision loss.

OCULAR DISORDERS REPORT

CHOW CHOW - 2

B. Ectropion

A conformational defect resulting in eversion of the eyelids, which may cause ocular irritation due to exposure. It is likely that ectropion is influenced by several genes (polygenic) defining the skin and other structures which make up the eyelids, the amount and weight of the skin covering the head and face, the orbital contents and the conformation of the skull.

C. Corneal dystrophy - endothelial

Corneal endothelial dystrophy is an abnormal loss of the inner lining of the cornea that causes progressive fluid retention (edema). With time the edema results in keratitis and decreased vision.

D. Exposure keratopathy syndrome / Pigmentary keratitis

A corneal disease involving all or part of the cornea, resulting from inadequate blinking. This results from a combination of anatomic features including shallow orbits, exophthalmos, macroblepharon and lagophthalmos.

E. Persistent pupillary membranes (PPM)

Persistent blood vessel remnants in the anterior chamber of the eye which fail to regress normally by 3 months of age. These strands may bridge from iris to iris, iris to cornea, iris to lens, or form sheets of tissue in the anterior chamber. The last three forms pose the greatest threat to vision and when severe, vision impairment or blindness may occur.

Major PPM's have been observed in this breed. Many ophthalmologists have observed puppies so severely affected that they are temporarily or permanently blind. The blindness is due to adherence of the membranes to the cornea and/or lens.

F. Glaucoma

Glaucoma is characterized by an elevation of intraocular pressure (IOP) which, when sustained, causes intraocular damage resulting in blindness. The elevated intraocular pressure occurs because the fluid cannot leave through the iridocorneal angle. Diagnosis and classification of glaucoma requires measurement of the IOP (tonometry) and examination of the iridocorneal angle (gonioscopy). Neither of these tests is part of a routine screening exam for certification.

Age of onset in the Chow Chow appears to be anywhere between 3-6 years of age and has been observed as a bilateral condition. Gonioscopy has shown extremely narrow iridocorneal angles and in many regions no evidence of trabecular meshwork.

OCULAR DISORDERS REPORT

CHOW CHOW - 3

G. Cataract

A partial or complete opacity of the lens and/or its capsule. In cases where cataracts are complete and affect both eyes, blindness results. The prudent approach is to assume cataracts to be hereditary except in cases known to be associated with trauma, other causes of ocular inflammation, specific metabolic diseases, persistent pupillary membrane, persistent hyaloid or nutritional deficiencies. Cataracts may involve the lens completely (diffuse) or in a localized region.

In the Chow Chow, the only reported cataract is congenital. The clinical appearance is variable, ranging from small nuclear or capsular opacities to generalized opacity. The central lens (nucleus) is most consistently affected with variable involvement of the peripheral lens (cortex). Concurrent ocular anomalies may include entropion, microphthalmia, persistent pupillary membranes, and retinal folds, although any direct relationship of these latter conditions to the cataract is unclear.

References

1. ACVO Genetics Committee, 1999 and/or Data from CERF All-Breeds Report, 1991-1998.
2. ACVO Genetics Committee, 2008 and/or Data from CERF All-Breeds Report, 2003-2007.
3. ACVO Genetics Committee, 2007 and/or Data from CERF All-Breeds Report 2002-2006.
4. ACVO Genetics Committee, 2005 and/or Data from CERF All-Breeds Report 2003-2004.
5. ACVO Genetics Committee, 2009 and/or Data from CERF All-Breeds Report, 2008.
6. Gelatt KN and MacKay EO. Prevalence of the breed-related glaucomas in pure-bred dogs in North America. *Vet Ophthalmol.* 2004 Mar-Apr;7:97-111.
7. Corcaran KA and Koch SA. Primary glaucoma in the Chow chows. *Prog Vet Comp Ophthalmol.* 1994;4:193.
8. Collins BK, Collier LL, Johnson GS, et al. Familial cataracts and concurrent ocular anomalies in chow chows. *J Am Vet Med Assoc.* 1992 May 15;200:1485-1491.

OCULAR DISORDERS REPORT CHOW CHOW

Diagnostic Name	TOTAL DOGS EXAMINED		1991-1999		2000-2009		2010-2013		2014	
	#	%	#	%	#	%	#	%	#	%
GLOBE										
0.110 microphthalmia	2	0.5%	2	0.3%	0		0		0	
EYELIDS										
20.160 macropalpebral fissure	1	0.3%	1	0.2%	1	0.4%	0		0	
21.000 entropion, unspecified	118	30.7%	183	30.6%	38	15.3%	13		21.0%	
22.000 ectropion, unspecified	7	1.8%	10	1.7%	3	1.2%	2		3.2%	
25.110 distichiasis	5	1.3%	1	0.2%	1	0.4%	0			
NASOLACRIMAL										
40.910 keratoconjunctivitis sicca	0		0		0		1		1.6%	
CORNEA										
70.210 corneal pannus	5	1.3%	4	0.7%	0		0			
70.220 pigmentary keratitis	0		17	2.8%	5	2.0%	3		4.8%	
70.700 corneal dystrophy	4	1.0%	4	0.7%	0		0			
70.730 corneal endothelial degeneration	9	2.3%	7	1.2%	1	0.4%	0			
UVEA										
93.140 corneal endothelial pigment without PPM	0		4	0.7%	1	0.4%	0			
93.710 persistent pupillary membranes, iris to iris	87	22.7%	254	42.5%	98	39.5%	20		32.3%	
93.720 persistent pupillary membranes, iris to lens	5	1.3%	9	1.5%	4	1.6%	0			
93.730 persistent pupillary membranes, iris to cornea	18	4.7%	26	4.3%	10	4.0%	0			
93.740 persistent pupillary membranes, iris sheets	2	0.5%	6	1.0%	0		0			
93.750 persistent pupillary membranes, lens pigment foci/no strands	0		0		13	5.2%	3		4.8%	
93.760 persistent pupillary membranes, endothelial opacity/no strands	0		0		1	0.4%	1		1.6%	
LENS										
100.210 cataract, significance unknown	5	1.3%	19	3.2%	3	1.2%	1		1.6%	
100.301 punctate cataract, anterior cortex	2	0.5%	0		0		0			
100.302 punctate cataract, posterior cortex	3	0.8%	2	0.3%	0		0			
100.303 punctate cataract, equatorial cortex	0		2	0.3%	0		0			
100.305 punctate cataract, posterior sutures	1	0.3%	0		0		0			
100.306 punctate cataract, nucleus	1	0.3%	0		0		1		1.6%	
100.307 punctate cataract, capsular	0		1	0.2%	0		0			
100.311 incipient cataract, anterior cortex	4	1.0%	1	0.2%	0		0			
100.312 incipient cataract, posterior cortex	4	1.0%	4	0.7%	1	0.4%	0			
100.315 incipient cataract, posterior sutures	0		0		1	0.4%	0			
100.316 incipient cataract, nucleus	1	0.3%	2	0.3%	0		0			
100.330 generalized/complete cataract	1	0.3%	0		0		0			
VITREOUS										
110.120 persistent hyaloid artery/remnant	3	0.8%	1	0.2%	0		0			
110.320 vitreous degeneration syneresis	1	0.3%	1	0.2%	0		0			
RETINA										
120.170 retinal dysplasia, folds	0		2	0.3%	0		0			
120.180 retinal dysplasia, geographic	0		1	0.2%	0		0			
120.190 retinal dysplasia, detached	1	0.3%	0		0		0			
120.310 generalized progressive retinal atrophy (PRA)	4	1.0%	3	0.5%	0		1		1.6%	

OCULAR DISORDERS REPORT CHOW CHOW

	1991-1999	2000-2009	2010-2013	2014
OPTIC NERVE				
130.120 optic nerve hypoplasia	1 0.3%	0	0	0
OTHER				
900.000 other, unspecified	0	6 1.0%	11 4.4%	0
900.100 other, not inherited	0	22 3.7%	2 0.8%	1 1.6%
900.110 other, suspected as inherited	9 2.3%	6 1.0%	2 0.8%	0
NORMAL				
0.000 normal globe	175 45.6%	265 44.3%	130 52.4%	33 53.2%

OCULAR DISORDERS REPORT

CLUMBER SPANIEL - 1

CLUMBER SPANIEL

	DISORDER	INHERITANCE	REFERENCE	BREEDING ADVICE
A.	Microphthalmia	Not defined	1	NO
B.	Entropion	Not defined	1, 2	Breeder option
C.	Ectropion	Not defined	1	Breeder option
D.	Macroblepharon/ Exposure keratopathy syndrome	Not defined	1	Breeder option
E.	Distichiasis	Not defined	1	Breeder option
F.	Keratoconjunctivitis sicca	Not defined	1, 3	NO
G.	Persistent pupillary membranes			
	- iris to iris	Not defined	1, 4	Breeder option
	- all other forms	Not defined	4	NO
H.	Cataract	Not defined	1	NO
I.	Retinal dysplasia - folds	Not defined	1	Breeder option

Description and Comments

A. Microphthalmia

Microphthalmia is a congenital defect characterized by a small eye often associated with defects of the cornea, iris (coloboma), anterior chamber, lens (cataract) and/or retina

An association has been made between partial albinism, multiple ocular defects (especially microphthalmia) and deafness in a number of canine breeds including the Collie. From these reports it appears that a predominantly white hair coat is associated with a higher incidence of ocular defects.

OCULAR DISORDERS REPORT

CLUMBER SPANIEL - 2

B. Entropion

A conformational defect resulting in "in-rolling" of one or both of the eyelids, which may cause ocular irritation. It is likely that entropion is influenced by several genes (polygenic), defining the skin and other structures which make up the eyelids, the amount and weight of the skin covering the head and face, the orbital contents and the conformation of the skull.

C. Ectropion

A conformational defect resulting in eversion of the eyelids, which may cause ocular irritation. It is likely that ectropion is influenced by several genes (polygenic), defining the skin and other structures which make up the eyelids, the amount and weight of the skin covering the head and face, the orbital contents and the conformation of the skull.

D. Macoblepharon/exposure keratopathy syndrome

Macoblepharon is defined as an exceptionally large palpebral fissure, macoblepharon in conjunction with laxity of the lateral canthal structures may lead to lower lid ectropion and upper lid entropion. Exposure keratopathy syndrome is a corneal disease involving all or part of the cornea, resulting from inadequate blinking. This results from a combination of anatomic features including shallow orbits, exophthalmos, macoblepharon and lagophthalmos. Either of these conditions may lead to severe ocular irritation.

E. Distichiasis

Eyelashes abnormally located on the eyelid margin which may cause ocular irritation. Distichiasis may occur at any time in the life of a dog. It is difficult to make a strong recommendation with regard to breeding dogs with this entity. The hereditary basis has not been established, although it seems probable due to the high incidence in some breeds. Reducing the incidence is a logical goal. When diagnosed, distichiasis should be recorded; breeding discretion is advised.

F. Keratoconjunctivitis sicca

An abnormality of the tear film, most commonly a deficiency of the aqueous portion, although the mucin and/or lipid layers may be affected; results in ocular irritation and/or vision impairment.

G. Persistent pupillary membranes

Persistent blood vessel remnants in the anterior chamber of the eye which fail to regress normally by 3 months of age. These strands may bridge from iris to iris, iris to cornea, iris to lens, or form sheets of tissue in the anterior chamber. The last three forms pose the greatest threat to vision and when severe, vision impairment or blindness may occur.

OCULAR DISORDERS REPORT

CLUMBER SPANIEL - 3

H. Cataract

A partial or complete opacity of the lens and/or its capsule. In cases where cataracts are complete and affect both eyes, blindness results. The prudent approach is to assume cataracts to be hereditary except in cases known to be associated with trauma, other causes of ocular inflammation, specific metabolic diseases, persistent pupillary membrane, persistent hyaloid or nutritional deficiencies. Cataracts may involve the lens completely (diffuse) or in a localized region.

I. Retinal dysplasia - folds

Linear, triangular, curved or curvilinear foci of retinal folding that may be single or multiple. When seen in puppies, this condition may partially or completely resolve with maturity. Its significance to vision is unknown. There are two other forms of retinal dysplasia (geographic, detached) which are known to be inherited in other breeds and, in their most severe form, cause blindness. The genetic relationship between folds and more severe forms of retinal dysplasia is undetermined.

References

There are few references providing detailed descriptions of hereditary ocular conditions of the Clumber Spaniel breed. The conditions listed above are generally recognized to exist in this breed, as evidenced by identification on breed eye screening examinations and/or clinical experience of veterinary ophthalmologists.

1. ACVO Genetics Committee, 1999 and/or Data from CERF All-Breeds Report, 1991-1998.
2. Hodgman SFJ. Abnormalities and defects in pedigree dogs: I. An investigation into the existence of abnormalities in pedigree dogs in British Isles. *J Small Anim Pract.* 1963;4:447.
3. ACVO Genetics Committee, 2008 and/or Data from CERF All-Breeds Report, 2003-2007.
4. ACVO Genetics Committee, 2005 and/or Data from CERF All-Breeds Report 2003-2004.

OCULAR DISORDERS REPORT CLUMBER SPANIEL

Diagnostic Name	TOTAL DOGS EXAMINED	1991-1999		2000-2009		2010-2013		2014	
		#	%	#	%	#	%	#	%
GLOBE									
0.110 microphthalmia		4	0.4%	2	0.2%	0		0	
EYELIDS									
20.140 ectopic cilia		0		1	0.1%	0		0	
20.160 macropalpebral fissure		63	6.4%	92	7.0%	12	4.1%	0	
21.000 entropion, unspecified		227	22.9%	269	20.5%	55	19.0%	19	32.8%
22.000 ectropion, unspecified		195	19.7%	184	14.0%	38	13.1%	10	17.2%
25.110 distichiasis		48	4.8%	106	8.1%	28	9.7%	6	10.3%
NASOLACRIMAL									
32.110 imperforate lower nasolacrimal punctum		1	0.1%	0		4	1.4%	2	3.4%
40.910 keratoconjunctivitis sicca		4	0.4%	10	0.8%	3	1.0%	0	
NICTITANS									
52.110 prolapsed gland of the third eyelid		0		1	0.1%	0		0	
CORNEA									
70.210 corneal pannus		9	0.9%	4	0.3%	0		0	
70.220 pigmentary keratitis		7	0.7%	4	0.3%	0		0	
70.700 corneal dystrophy		2	0.2%	3	0.2%	0		0	
UVEA									
93.710 persistent pupillary membranes, iris to iris		30	3.0%	27	2.1%	3	1.0%	1	1.7%
93.720 persistent pupillary membranes, iris to lens		1	0.1%	1	0.1%	0		0	
93.730 persistent pupillary membranes, iris to cornea		4	0.4%	2	0.2%	0		0	
93.740 persistent pupillary membranes, iris sheets		1	0.1%	0		0		0	
93.760 persistent pupillary membranes, endothelial opacity/no strands		0		0		2	0.7%	0	
LENS									
100.200 cataract, unspecified		15	1.5%	0		0		0	
100.210 cataract, significance unknown		21	2.1%	54	4.1%	11	3.8%	0	
100.301 punctate cataract, anterior cortex		11	1.1%	8	0.6%	2	0.7%	0	
100.302 punctate cataract, posterior cortex		9	0.9%	13	1.0%	4	1.4%	2	3.4%
100.303 punctate cataract, equatorial cortex		0		5	0.4%	1	0.3%	0	
100.304 punctate cataract, anterior sutures		0		1	0.1%	0		0	
100.305 punctate cataract, posterior sutures		5	0.5%	5	0.4%	5	1.7%	0	
100.306 punctate cataract, nucleus		5	0.5%	0		0		0	
100.307 punctate cataract, capsular		1	0.1%	0		0		0	
100.311 incipient cataract, anterior cortex		6	0.6%	8	0.6%	1	0.3%	0	
100.312 incipient cataract, posterior cortex		14	1.4%	25	1.9%	1	0.3%	0	
100.313 incipient cataract, equatorial cortex		3	0.3%	1	0.1%	4	1.4%	0	
100.314 incipient cataract, anterior sutures		2	0.2%	0		0		0	
100.315 incipient cataract, posterior sutures		5	0.5%	7	0.5%	0		3	5.2%
100.316 incipient cataract, nucleus		5	0.5%	2	0.2%	0		0	
100.317 incipient cataract, capsular		1	0.1%	3	0.2%	1	0.3%	0	
100.322 incomplete cataract, posterior cortex		0		0		0		1	1.7%
100.330 generalized/complete cataract		4	0.4%	1	0.1%	0		0	

OCULAR DISORDERS REPORT CLUMBER SPANIEL

	1991-1999	2000-2009	2010-2013	2014
VITREOUS				
110.120 persistant hyaloid artery/remnant	2 0.2%	4 0.3%	0	0
110.135 PHPV/PTVL	0	3 0.2%	0	0
FUNDUS				
97.110 choroidal hypoplasia	2 0.2%	0	0	0
97.120 coloboma	3 0.3%	0	0	0
RETINA				
120.170 retinal dysplasia, folds	77 7.8%	89 6.8%	10 3.4%	1 1.7%
120.180 retinal dysplasia, geographic	4 0.4%	3 0.2%	0	0
120.310 generalized progressive retinal atrophy (PRA)	8 0.8%	6 0.5%	2 0.7%	0
120.910 retinal detachment without dialysis	0	1 0.1%	0	0
120.960 retinopathy	0	0	1 0.3%	0
OPTIC NERVE				
130.150 optic disc coloboma	0	1 0.1%	1 0.3%	0
OTHER				
900.000 other, unspecified	0	10 0.8%	15 5.2%	0
900.100 other, not inherited	5 0.5%	56 4.3%	1 0.3%	2 3.4%
900.110 other, suspected as inherited	14 1.4%	7 0.5%	0	1 1.7%
NORMAL				
0.000 normal globe	515 52.0%	732 55.8%	156 53.8%	25 43.1%

OCULAR DISORDERS REPORT

COCKER SPANIEL - 1

COCKER SPANIEL

(*American)

*The official breed name is Cocker Spaniel. The designation "American" has been used to avoid confusion and emphasize the distinction from the English Cocker Spaniel breed.

	DISORDER	INHERITANCE	REFERENCE	BREEDING ADVICE
A.	Keratoconjunctivitis sicca / dry eye	Not defined	1, 2	NO
B.	Glaucoma	Not defined	1, 10, 11	NO
C.	Entropion	Not defined	1	Breeder option
D.	Ectropion	Not defined	1	Breeder option
E.	Distichiasis	Not defined	1-4	Breeder option
F.	Eury/Macropharon	Not defined	1	Breeder option
E.	Imperforate lacrimal punctum	Not defined	1	Breeder option
F.	Prolapsed gland of the third eyelid	Not defined	1, 5	Breeder option
H.	Corneal dystrophy - epithelial/stromal	Not defined	1	Breeder option
I.	Corneal dystrophy - posterior polymorphous	Not defined	1, 6	Breeder option
J.	Chronic superficial keratitis/pannus	Not defined	7	Breeder option
K.	Exposure keratopathy syndrome/Pigmentary keratitis	Not defined	1, 8	Breeder option
L.	Persistent pupillary membranes - iris to iris	Not defined	9	Breeder option
N.	Cataract	Presumed autosomal recessive	1, 2, 12-15	NO

©2014, American College of Veterinary Ophthalmologists

OCULAR DISORDERS REPORT

COCKER SPANIEL - 2

O.	Retinal atrophy - generalized (<i>prcd</i>) * a DNA test is available	Autosomal recessive	1, 16-18	NO
P.	Retinal dysplasia - folds	Not defined	1, 19	Breeder option
Q.	Retinal dysplasia - geographic/detached	Not defined	1, 19	NO

Description and Comments

A. Keratoconjunctivitis sicca/Dry eye

An abnormality of the tear film, most commonly a deficiency of the aqueous portion, although the mucin and/or lipid layers may be affected; results in ocular irritation and/or vision impairment.

B. Glaucoma

An elevation of intraocular pressure (IOP) which, when sustained, causes intraocular damage resulting in blindness. The elevated IOP occurs because the fluid cannot leave through the iridocorneal angle. Diagnosis and classification of glaucoma requires measurement of IOP (tonometry) and examination of the iridocorneal angle (gonioscopy). Neither of these tests is part of a routine breed eye screening exam.

C. Entropion

A conformational defect resulting in an "in-rolling" of one or both of the eyelids which may cause ocular irritation. It is likely that entropion is influenced by several genes (polygenic), defining the skin and other structures which make up the eyelids, the amount and weight of the skin covering the head and face, the orbital contents, and the conformation of the skull.

D. Ectropion

A conformational defect resulting in eversion of the eyelids, which may cause ocular irritation due to exposure. It is likely that ectropion is influenced by several genes (polygenic) defining the skin and other structures which make up the eyelids, the amount and weight of the skin covering the head and face, the orbital contents and the conformation of the skull.

E. Distichiasis

Eyelashes abnormally located on the eyelid margin which may cause ocular irritation. Distichiasis may occur at any time in the life of a dog. It is difficult to make a strong recommendation with regard to breeding dogs with this entity. The hereditary basis has not been established although it seems probable due to the high incidence in some breeds.

©2014, American College of Veterinary Ophthalmologists

OCULAR DISORDERS REPORT

COCKER SPANIEL - 3

Reducing the incidence is a logical goal. When diagnosed, distichiasis should be recorded; breeding discretion is advised.

F. Eury/Macroblepharon

Macroblepharon is defined as an exceptionally large palpebral fissure, macroblepharon in conjunction with laxity of the lateral canthal structures may lead to lower lid ectropion and upper lid entropion.

G. Imperforate lacrimal punctum

A developmental anomaly resulting in failure of opening of the lacrimal duct adjacent to the eye. The lower punctum is more frequently affected. This defect usually results in epiphora, an overflow of tears onto the face.

H. Prolapsed gland of the third eyelid

Protrusion of the tear gland associated with the third eyelid. The mode of inheritance of this disorder is unknown. The exposed gland may become irritated. Commonly referred to as "cherry eye".

I. Corneal dystrophy - epithelial/stromal

A non-inflammatory corneal opacity (white to gray) present in one or more of the corneal layers; usually inherited and bilateral.

J. Corneal dystrophy - posterior polymorphous

Posterior polymorphous dystrophy appears as multifocal, non-pigmented, vesicular to linear posterior corneal opacities at the level of the corneal endothelium. The condition is bilateral and has been seen in dogs from 1-7 years of age. Progression of the dystrophy is limited, and there is no treatment. It differs from endothelial dystrophy by an absence of corneal edema. Corneal endothelial cells distant from the corneal opacities are normal.

K. Chronic superficial keratitis/Pannus

A bilateral inflammatory disease of the cornea which usually starts as a grayish haze to the ventral or ventrolateral cornea, followed by the formation of a vascularized subepithelial growth that begins to spread toward the central cornea; pigmentation follows the vascularization. If severe, vision impairment occurs. Pannus may be associated with plasma cell infiltration of the nictitans.

L. Exposure keratopathy syndrome / Pigmentary keratitis

A corneal disease involving all or part of the cornea, resulting from inadequate blinking. This results from a combination of anatomic features including shallow orbits, exophthalmos, macroblepharon and lagophthalmos.

OCULAR DISORDERS REPORT

COCKER SPANIEL - 4

M. Persistent pupillary membranes (PPM)

Persistent blood vessel remnants in the anterior chamber of the eye which fail to regress normally by 3 months of age. These strands may bridge from iris to iris, iris to cornea, iris to lens, or form sheets of tissue in the anterior chamber. The last three forms pose the greatest threat to vision and when severe, vision impairment or blindness may occur

N. Cataract

A partial or complete opacity of the lens and/or its capsule. In cases where cataracts are complete and affect both eyes, blindness results. The prudent approach is to assume cataracts to be hereditary except in cases known to be associated with trauma, other causes of ocular inflammation, specific metabolic diseases, persistent pupillary membrane, persistent hyaloid or nutritional deficiencies. Cataracts may involve the lens completely (diffuse) or in a localized region.

In this breed, the onset of cataract may occur at an early age (less than 2 years) with rapid progression to maturity and associated with significant lens-induced inflammation.

O. Retinal atrophy - generalized (*prcd*)

A degenerative disease of the retinal visual cells which progresses to blindness. This abnormality, also known as progressive retinal atrophy or PRA, may be detected by electroretinogram (not part of a routine eye screening examination) before it is apparent clinically.

This photoreceptor degeneration is characterized by slow death of visual cells following their normal development. The disease begins clinically with signs of night blindness followed by day blindness.

Studies have shown that PRA in the Cocker Spaniel is inherited as autosomal recessive. The mutation is allelic to that present in Miniature Poodles, Portuguese Water Dog, Labrador Retriever and English Cocker Spaniels. The locus is termed the progressive rod-cone degeneration (*prcd*) gene. A marker-based linkage test is now available for early diagnosis.

The test identifies genetically normal dogs (Type A) with 100% accuracy. The carrier state (type B) will not be affected but may produce PRA bred to an affected dog. The affected (Type C) is at risk for developing PRA. ERG testing is recommended to confirm this. In both type B and type C, false allele readings may lead to misdiagnosis. Current efforts are under research to eliminate these false readings.

P. Retinal dysplasia - folds

Linear, triangular, curved or curvilinear foci of retinal folding that may be single or multiple. When seen in puppies, this condition may partially or completely resolve with maturity. Its significance to vision is unknown. There are two other forms of retinal dysplasia (geographic, detached) which are known to be inherited in other breeds and, in their most severe form, cause blindness. The genetic relationship between folds and more severe forms of retinal dysplasia is undetermined.

OCULAR DISORDERS REPORT

COCKER SPANIEL - 5

- Q. Retinal dysplasia – geographic, detached

Abnormal development of the retina present at birth.

Retinal dysplasia - geographic: Any irregularly shaped area of abnormal retinal development containing both areas of thinning and areas of elevation representing folds and retinal disorganization.

Retinal dysplasia - detached: Severe retinal disorganization associated with separation (detachment) of the retina.

These two forms are associated with vision impairment or blindness. Retinal dysplasia is known to be inherited in many breeds. The genetic relationship between the three forms of retinal dysplasia is not known for all breeds.

References

1. ACVO Genetics Committee, 1999 and/or Data from CERF All-Breeds Report, 1991-1998.
2. Williams LW. A survey of ocular findings in the American cocker spaniel. *J Am Anim Hosp Assoc.* 1975;15:603.
3. Bedford PGC. The treatment of canine distichiasis by the method of partial tarsal plate excision. *J Am Anim Hosp Assoc.* 1979;15:59.
4. Lavach JD. Diseases of the eyelids (Part II). *Comp Cont Educ Pract Vet.* 1979;1:485.
5. Morgan RV, Duddy JM and McClurg K. Prolapse of the third eyelid in the dog: A retrospective study of 89 cases (1980-1990). *J Am Anim Hosp Assoc.* 1993;29:56.
6. Gwin RM, editor Posterior polymorphous dystrophy of the cornea in cocker spaniels: Preliminary clinical and specular microscopic findings. *Proc Am Coll Vet Ophthalmol;* 1983.
7. ACVO Genetics Committee, 2005 and/or Data from CERF All-Breeds Report 2003-2004.
8. ACVO Genetics Committee, 2008 and/or Data from CERF All-Breeds Report, 2003-2007.
9. ACVO Genetics Committee, 2006 and/or Data from CERF All-Breeds Report, 2001-2005.
10. Gelatt KN and MacKay EO. Prevalence of the breed-related glaucomas in pure-bred dogs in North America. *Vet Ophthalmol.* 2004 Mar-Apr;7:97-111.
11. Lovekin LG. Clinicopathologic changes in primary glaucoma in the Cocker spaniel. *Am J Vet Res.* 1978;29:379.
12. Gelatt KN and Mackay EO. Prevalence of primary breed-related cataracts in the dog in North America. *Vet Ophthalmol.* 2005 Mar-Apr;8:101-111.

OCULAR DISORDERS REPORT

COCKER SPANIEL - 6

13. Olesen HP, Jensen OA and Norn MS. Congenital hereditary cataract in Cocker Spaniels. *J Small Anim Pract.* 1974 Dec;15:741-750.
14. Yakely WL. A study of inheritability of cataracts in the American cocker spaniel *J Am Vet Med Assoc.* 1978;172:814.
15. Barnett KC. Comparative aspects of canine hereditary eye disease. *Adv Vet Sci Comp Med.* 1976;20:39-67.
16. Barnett KC. Canine retinopathies III. The other breeds. *J Small Anim Pract.* 1965;6:185.
17. Aguirre GD and Acland GM. Variation in retinal degeneration phenotype inherited at the prcd locus. *Exp Eye Res.* 1988 May;46:663-687.
18. Zangerl B, Goldstein O, Philp AR, et al. Identical mutation in a novel retinal gene causes progressive rod-cone degeneration in dogs and retinitis pigmentosa in humans. *Genomics.* 2006 Nov;88:551-563.
19. MacMillan AD and Lipton DE. Heritability of multifocal retinal dysplasia in American Cocker Spaniels. *J Am Vet Med Assoc.* 1978 Mar 1;172:568-572.

OCULAR DISORDERS REPORT COCKER SPANIEL

Diagnostic Name	TOTAL DOGS EXAMINED		1991-1999 27349		2000-2009 21729		2010-2013 5710		2014 1218	
	#	%	#	%	#	%	#	%	#	%
GLOBE										
0.110 microphthalmia	25	0.1%	8	0.0%	2	0.0%	0			
10.000 glaucoma	27	0.1%	1	0.0%	4	0.1%	0			
EYELIDS										
20.110 eyelid dermoid	2	0.0%	0		0		0		0	
20.140 ectopic cilia	39	0.1%	12	0.1%	4	0.1%	0		0	
20.160 macropalpebral fissure	105	0.4%	67	0.3%	7	0.1%	0		0	
21.000 entropion, unspecified	91	0.3%	59	0.3%	1	0.0%	3	0.2%		
22.000 ectropion, unspecified	623	2.3%	291	1.3%	38	0.7%	20	1.6%		
25.110 distichiasis	14836	54.2%	9921	45.7%	2826	49.5%	566	46.5%		
NASOLACRIMAL										
32.110 imperforate lower nasolacrimal punctum	352	1.3%	6	0.0%	39	0.7%	28	2.3%		
40.910 keratoconjunctivitis sicca	144	0.5%	73	0.3%	95	1.7%	14	1.1%		
NICTITANS										
51.100 third eyelid cartilage anomaly	6	0.0%	2	0.0%	0		0			
52.110 prolapsed gland of the third eyelid	90	0.3%	96	0.4%	27	0.5%	3	0.2%		
CORNEA										
70.210 corneal pannus	375	1.4%	119	0.5%	3	0.1%	0			
70.220 pigmentary keratitis	114	0.4%	226	1.0%	97	1.7%	32	2.6%		
70.700 corneal dystrophy	753	2.8%	616	2.8%	156	2.7%	30	2.5%		
70.730 corneal endothelial degeneration	20	0.1%	15	0.1%	2	0.0%	0			
UVEA										
90.250 pigmentary uveitis	0		1	0.0%	0		0		0	
93.110 iris hypoplasia	0		0		4	0.1%	0		0	
93.120 iris cyst	3	0.0%	13	0.1%	4	0.1%	0		0	
93.140 corneal endothelial pigment without PPM	0		2	0.0%	0		0		0	
93.150 iris coloboma	2	0.0%	4	0.0%	0		2	0.2%		
93.710 persistent pupillary membranes, iris to iris	45	0.2%	78	0.4%	29	0.5%	5	0.4%		
93.720 persistent pupillary membranes, iris to lens	19	0.1%	11	0.1%	0		0			
93.730 persistent pupillary membranes, iris to cornea	20	0.1%	13	0.1%	2	0.0%	0			
93.740 persistent pupillary membranes, iris sheets	13	0.0%	14	0.1%	1	0.0%	0			
93.750 persistent pupillary membranes, lens pigment foci/no strands	0		0		21	0.4%	8	0.7%		
93.760 persistent pupillary membranes, endothelial opacity/no strands	0		0		4	0.1%	0			
93.810 uveal melanoma	0		0		1	0.0%	0			
97.150 chorioretinal coloboma, congenital	0		0		0		2	0.2%		
LENS										
100.200 cataract, unspecified	1023	3.7%	0		0		0		0	
100.210 cataract, significance unknown	1164	4.3%	1544	7.1%	454	8.0%	101	8.3%		
100.301 punctate cataract, anterior cortex	490	1.8%	320	1.5%	99	1.7%	19	1.6%		
100.302 punctate cataract, posterior cortex	275	1.0%	187	0.9%	54	0.9%	5	0.4%		
100.303 punctate cataract, equatorial cortex	70	0.3%	52	0.2%	17	0.3%	3	0.2%		
100.304 punctate cataract, anterior sutures	70	0.3%	54	0.2%	4	0.1%	5	0.4%		
100.305 punctate cataract, posterior sutures	90	0.3%	77	0.4%	11	0.2%	8	0.7%		
100.306 punctate cataract, nucleus	50	0.2%	20	0.1%	5	0.1%	1	0.1%		

OCULAR DISORDERS REPORT COCKER SPANIEL

LENS CONTINUED	1991-1999	2000-2009	2010-2013	2014
100.307 punctate cataract, capsular	4 0.0%	39 0.2%	16 0.3%	2 0.2%
100.311 incipient cataract, anterior cortex	439 1.6%	457 2.1%	94 1.6%	24 2.0%
100.312 incipient cataract, posterior cortex	529 1.9%	532 2.4%	100 1.8%	20 1.6%
100.313 incipient cataract, equatorial cortex	121 0.4%	146 0.7%	32 0.6%	4 0.3%
100.314 incipient cataract, anterior sutures	41 0.1%	52 0.2%	12 0.2%	1 0.1%
100.315 incipient cataract, posterior sutures	95 0.3%	71 0.3%	16 0.3%	2 0.2%
100.316 incipient cataract, nucleus	111 0.4%	61 0.3%	11 0.2%	2 0.2%
100.317 incipient cataract, capsular	4 0.0%	53 0.2%	13 0.2%	5 0.4%
100.321 incomplete cataract, anterior cortex	0	0	25 0.4%	11 0.9%
100.322 incomplete cataract, posterior cortex	0	0	24 0.4%	11 0.9%
100.323 incomplete cataract, equatorial cortex	0	0	4 0.1%	1 0.1%
100.324 incomplete cataract, anterior sutures	0	0	1 0.0%	0
100.325 incomplete cataract, posterior sutures	0	0	1 0.0%	0
100.326 incomplete cataract, nucleus	0	0	1 0.0%	0
100.330 generalized/complete cataract	581 2.1%	363 1.7%	47 0.8%	10 0.8%
100.340 resorbing/hypermature cataract	0	0	9 0.2%	2 0.2%
100.375 subluxation/luxation, unspecified	32 0.1%	29 0.1%	6 0.1%	0
VITREOUS				
110.120 persistent hyaloid artery/remnant	21 0.1%	14 0.1%	0	3 0.2%
110.135 PHPV/PTVL	3 0.0%	5 0.0%	1 0.0%	0
110.200 vitritis	0	0	0	2 0.2%
110.320 vitreous degeneration syneresis	57 0.2%	51 0.2%	16 0.3%	6 0.5%
110.330 vitreous degeneration anterior chamber	0	11 0.1%	5 0.1%	0
FUNDUS				
97.110 choroidal hypoplasia	13 0.0%	17 0.1%	2 0.0%	0
97.120 coloboma	11 0.0%	3 0.0%	0	0
RETINA				
120.170 retinal dysplasia, folds	3725 13.6%	2448 11.3%	458 8.0%	87 7.1%
120.180 retinal dysplasia, geographic	102 0.4%	49 0.2%	12 0.2%	2 0.2%
120.190 retinal dysplasia, detached	4 0.0%	5 0.0%	0	0
120.200 retinitis	0	0	1 0.0%	5 0.4%
120.310 generalized progressive retinal atrophy (PRA)	264 1.0%	160 0.7%	31 0.5%	2 0.2%
120.400 retinal hemorrhage	7 0.0%	0	0	0
120.910 retinal detachment without dialysis	13 0.0%	1 0.0%	0	0
120.960 retinopathy	0	0	11 0.2%	0
OPTIC NERVE				
130.110 micropapilla	2 0.0%	2 0.0%	0	0
130.120 optic nerve hypoplasia	7 0.0%	3 0.0%	0	0
130.150 optic disc coloboma	73 0.3%	22 0.1%	11 0.2%	3 0.2%
OTHER				
900.000 other, unspecified	0	144 0.7%	307 5.4%	0
900.100 other, not inherited	75 0.3%	961 4.4%	63 1.1%	76 6.2%
900.110 other, suspected as inherited	452 1.7%	186 0.9%	27 0.5%	7 0.6%
NORMAL				
0.000 normal globe	10559 38.6%	9649 44.4%	2791 48.9%	542 44.5%

OCULAR DISORDERS REPORT

COLLIE - 1

COLLIE (Rough and smooth varieties)

	DISORDER	INHERITANCE	REFERENCE	BREEDING ADVICE
A.	Microphthalmia	Not defined	1, 2	NO
B.	Distichiasis	Not defined	1	Breeder option
C.	Corneal dystrophy - epithelial/stromal	Not defined	3	Breeder option
D.	Proliferative keratoconjunctivitis	Not defined	1, 4-6	Breeder option
E.	Persistent pupillary membranes			
	- iris to iris	Not defined	1, 3	Breeder option
	- iris to lens	Not defined	7	NO
	- all other forms	Not defined	3	NO
F.	Cataract	Not defined	1	NO
G.	Persistent hyaloid artery	Not defined	8	Breeder option
H.	Retinal dysplasia - folds	Not defined	1	Breeder option
I.	Retinal atrophy - generalized (<i>prcd</i>)	Not defined	1	NO
J.	Retinal atrophy- Rod/cone dysplasia type 2- (<i>rcd2</i>) * a DNA test is available	autosomal recessive	9-13	NO
K.	Central progressive retinal atrophy	Not defined	14	NO
L.	Stationary night blindness	Presumed autosomal recessive	15	NO

OCULAR DISORDERS REPORT

COLLIE - 2

M.	Choroidal hypoplasia (Collie Eye Anomaly) - Staphyloma/coloboma - Retinal detachment - Retinal hemorrhage - Optic nerve coloboma * a DNA test is available	autosomal recessive	1, 16-40	NO
----	--	------------------------	----------	----

Description and Comments

A. Microphthalmia

Microphthalmia is a congenital defect characterized by a small eye often associated with defects of the cornea, iris (coloboma), anterior chamber, lens (cataract) and/or retina

An association has been made between partial albinism, multiple ocular defects (especially microphthalmia) and deafness in a number of canine breeds including the Collie. From these reports it appears that a predominantly white hair coat is associated with a higher incidence of ocular defects.

B. Distichiasis

Eyelashes abnormally located on the eyelid margin which may cause ocular irritation. Distichiasis may occur at any time. The hereditary basis has not been established although it seems probable due to the high incidence in some breeds. Reducing the incidence is a logical goal. In the Collie, because there is significant clinical disease associated with the abnormal hairs, breeding of affected animals should be discouraged.

C. Corneal dystrophy - epithelial/stromal

A non-inflammatory corneal opacity (white to gray) present in one or more of the corneal layers; usually inherited and bilateral.

D. Proliferative keratoconjunctivitis

An acquired condition characterized by a progressive, pink, fleshy mass involving the cornea, raised bands of inflammatory tissue on the anterior aspect of the nictitating membrane, and conjunctivitis. The condition is most likely immune-mediated but affects Collies more frequently than other breeds.

E. Persistent pupillary membranes (PPM)

Persistent blood vessel remnants in the anterior chamber of the eye which fail to regress normally by 3 months of age. These strands may bridge from iris to iris, iris to cornea, iris to lens, or form sheets of tissue in the anterior chamber. The last three forms pose the greatest threat to vision and when severe, vision impairment or blindness may occur.

OCULAR DISORDERS REPORT

COLLIE - 3

In the Collie, this is a particularly serious problem noted frequently on routine screening examination. The majority of persistent pupillary membranes identified on routine screening examinations include iris sheets, and bridging from the iris to cornea and the iris to lens. These may result in vision impairment.

F. Cataract

A partial or complete opacity of the lens and/or its capsule. In cases where cataracts are complete and affect both eyes, blindness results. The prudent approach is to assume cataracts to be hereditary except in cases known to be associated with trauma, other causes of ocular inflammation, specific metabolic diseases, persistent pupillary membrane, persistent hyaloid or nutritional deficiencies. Cataracts may involve the lens completely (diffuse) or in a localized region.

G. Persistent hyaloid artery (PHA)

Congenital defect resulting from abnormalities in the development and regression of the hyaloid artery. The blood vessel remnant can be present in the vitreous as a small patent vascular strand (PHA) or as a non-vascular strand that appears gray-white (persistent hyaloid remnant).

H. Retinal dysplasia - folds

Linear, triangular, curved or curvilinear foci of retinal folding that may be single or multiple. When seen in puppies, this condition may partially or completely resolve with maturity. Its significance to vision is unknown. There are two other forms of retinal dysplasia (geographic, detached) which are known to be inherited in other breeds and, in their most severe form, cause blindness. The genetic relationship between folds and more severe forms of retinal dysplasia is undetermined

I. Retinal atrophy - generalized

A degenerative disease of the retinal visual cells which progresses to blindness. This abnormality, also known as progressive retinal atrophy or PRA, may be detected by electroretinogram (not part of a routine eye screening examination) before it is apparent clinically. PRA is inherited as an autosomal recessive trait in most breeds. A DNA test is available

In the Collie, the rod/cone degeneration occurs much less commonly. The visual cells develop normally and then undergo degeneration, with blindness occurring in the adult dog (age 5-7 years).

J. Retinal atrophy - Rod-cone dysplasia type 2- (*rcd2*)

An inherited retinal disease characterized by abortive or abnormal development of rods and cones. The disease can be detected histologically by 6 weeks. Clinical night blindness is observed as early as 6 weeks with total blindness by 1 year of age. It may be diagnosed as

OCULAR DISORDERS REPORT

COLLIE - 4

early as 24 days with an ERG. Histologically the disease can be detected by 6 weeks. This form of retinal dysplasia is clinically similar to, but genetically distinct from that seen in the Irish Setter. A DNA test is available.

K. Central progressive retinal atrophy (CPRA)

A progressive retinal degeneration in which photoreceptor death occurs secondary to disease of the underlying pigment epithelium. Progression is slow and some animals never lose vision. CPRA occurs in England, but is uncommon elsewhere.

The lesions first appear in the posterior pole (central retina), enlarge, coalesce and result in secondary retinal atrophy; progression from the posterior pole to the periphery occurs later. The age of onset varies from young adults to older animals but usually before 5 years of age. Although reported to be dominant with incomplete penetrance, the mode of inheritance of CPRA remains undetermined. The disease has rarely been seen in dogs bred and raised in the U.S. This limited geographic distribution has led some to speculate about a nutritional basis.

L. Stationary night blindness

An inherited defect in vision in which rod function is markedly abnormal or absent, but cone function is either normal or minimally affected. The condition does not progress to complete blindness, and there is no ophthalmoscopic evidence of retinal degeneration. Definitive diagnosis requires electroretinography.

M. Choroidal hypoplasia (Collie Eye Anomaly)

- Staphyloma/coloboma
- Retinal detachment
- Retinal hemorrhage
- Optic nerve coloboma

A spectrum of malformations present at birth and ranging from inadequate development of the choroid (choroidal hypoplasia) to defects of the choroid, retina, or optic nerve (coloboma/staphyloma) to complete retinal detachment (with or without hemorrhage). Mildly affected animals will have no detectable vision deficit.

This disorder is collectively referred to as "Collie Eye Anomaly". Although there is a lack of scientific evidence, it is believed that the incidence and severity of this entity was decreased by breeding only "mildly affected" Collies. At this time, the Genetics Committee of the ACVO recommends against breeding Collies with any form of the Collie Eye anomaly.

References

1. ACVO Genetics Committee, 1999 and/or Data from CERF All-Breeds Report, 1991-1998.
2. Gwin RM, et al. Multiple ocular defects associated with partial albinism and deafness in the dog. *J Am Anim Hosp Assoc.* 1981;17.

©2014, American College of Veterinary Ophthalmologists

OCULAR DISORDERS REPORT

COLLIE - 5

3. ACVO Genetics Committee, 2005 and/or Data from CERF All-Breeds Report 2003-2004.
4. Blogg RJ. Proliferative keratoconjunctivitis in the Collie. *Trans Am Coll Vet Ophthalmol.* 1977;8.
5. Smith JS. Infiltrative corneal lesions resembling fibrous histiocytoma. *J Am Vet Med Assoc.* 1976;169.
6. Paulsen ME, et al. Nodular granulomatous episclerokeratitis in dogs: 19 cases (1973-1985). *J Am Vet Med Assoc.* 1987;190.
7. ACVO Genetics Committee, 2009 and/or Data from CERF All-Breeds Report, 2008.
8. ACVO Genetics Committee, 2006 and/or Data from CERF All-Breeds Report, 2001-2005.
9. Wolf ED, et al. Rod-cone dysplasia in the Collie. *J Am Vet Med Assoc.* 1978;173.
10. Santos-Anderson. An inherited retinopathy in Collies. *Invest Ophthalmol Vis Sci.* 1980;11.
11. Woodford. Cyclic nucleotide metabolism in inherited retinopathy in the Collie. *Exp Eye Res.* 1982;34.
12. Acland GM, et al., editor. Canine early onset hereditary retinal degenerations: Genetic and biochemical distinction of three diseases. *Proc Am Coll Vet Ophthalmol;* 1980.
13. Kukekova AV, Goldstein O, Johnson JL, et al. Canine RD3 mutation establishes rod-cone dysplasia type 2 (rcd2) as ortholog of human and murine rd3. *Mamm Genome.* 2009 Feb;20:109-123.
14. McLellan GJ, Watson P, et al.. Vitamin E deficiency in canine retinal pigment epithelial dystrophy (central progressive retinal atrophy). *Proc Am Coll Vet Ophthalmol.* 1997;27.
15. Pickett JP, Lindley DM, Boosinger TR, et al. Stationary night blindness in a Collie. *Prog Vet Comp Ophthal.* 1991;1.
16. Magrane W. Congenital anomaly of the optic nerve in Collies. *North Am Vet.* 1953;34.
17. Roberts SR. Congenital posterior ectasia of the sclera in Collie dogs. *American journal of ophthalmology.* 1960;50.
18. Donovan EF and Wyman M. Ocular fundus anomaly in the Collie. *J Am Vet Med Assoc.* 1965;147.
19. Roberts SR and Dellaporta A. Congenital posterior ectasia of the sclera in Collie dogs. I. Clinical features. *American journal of ophthalmology.* 1965;59.
20. Freeman HM, Donovan RD and Schepens CL. Retinal detachment, chorioretinal

OCULAR DISORDERS REPORT

COLLIE - 6

- changes and staphyloma in the Collie. Ophthalmoscopic findings. *Arch Ophthalmol.* 1966;76.
21. Roberts SR, et al. The Collie ectasia syndrome. *American journal of ophthalmology.* 1966;62.
 22. Roberts SR, Delaporta A and Winter FC. The Collie ectasia syndrome. Pathology of eyes of pups one to fourteen days of age. *American journal of ophthalmology.* 1966;61.
 23. Roberts SR. Color dilution and hereditary defects in Collie dogs. *American journal of ophthalmology.* 1967;6.
 24. Yakely WL, et al. Genetic transmission of an ocular fundus anomaly in Collies. *J Am Vet Med Assoc.* 1968;155.
 25. Donovan RH, Freeman HM and Schepens CL. Anomaly of the Collie eye. *J Am Vet Med Assoc.* 1969;155.
 26. Freeman HM, et al. Chorioretinal changes, juxtapapillary staphyloma and retinal detachment in the Collie. *Mod Probl Ophthalmol.* 1969;8.
 27. Latshaw WK, Wyman M and Venzke NG. Embryologic development of an anomaly of ocular fundus in the Collie dog. *Am J Vet Res.* 1969;30.
 28. Roberts SR. The Collie eye anomaly. *J Am Anim Hosp Assoc.* 1969;165.
 29. Wyman M and Donovan DF. Eye anomaly of the Collie. *J Am Vet Med Assoc.* 1969;46.
 30. Blogg JR. Collie eye anomaly. *Aust Vet J.* 1970;46.
 31. Bjerkas E. Collie eye anomaly in the rough Collie in Norway. *J Small Anim Pract.* 1991;32.
 32. Yakely WL. Decreased prevalence through selective breeding. *J Am Vet Med Assoc.* 1972;161.
 33. Barnett KC. Collie eye anomaly. *J Small Anim Pract.* 1979;20.
 34. Brown GC, et al. Congenital pits of the optic nerve head. Experimental studies in Collie dogs. *Arch Ophthalmol.* 1979;97.
 35. Bedford PGC. Collie eye anomaly in the United Kingdom. *Vet Rec.* 1982;111.
 36. Stades FC and Barnett KC. Collie eye anomaly in Collies in the Netherlands. *Vet Q.* 1981;3.
 37. Vainisi SJ, et al. Treatment of serous retinal detachments associated with optic disk pits in dogs. *J Am Vet Med Assoc.* 1989;195.

OCULAR DISORDERS REPORT

COLLIE - 7

38. Lowe JK, Kukekova AV, Kirkness EF, et al. Linkage mapping of the primary disease locus for Collie eye anomaly. *Genomics*. 2003;82:86-95.
39. Wallin-Hakansson B, Wallin-Hakansson N and Hedhammar A. Influence of selective breeding on prevalence of chorioretinal dysplasia and coloboma in the Rough Collie in Sweden. *J Small Anim Pract*. 2000;41:56-59.
40. Parker HG, Kukekova AV, Akey DT, et al. Breed relationships facilitate fine-mapping studies: a 7.8-kb deletion cosegregates with Collie eye anomaly across multiple dog breeds. *Genome Res*. 2007 Nov;17:1562-1571.

OCULAR DISORDERS REPORT COLLIE

Diagnostic Name	TOTAL DOGS EXAMINED		1991-1999 24617		2000-2009 21417		2010-2013 6164		2014 1423	
	#	%	#	%	#	%	#	%	#	%
GLOBE										
0.110 microphthalmia	282	1.1%	340	1.6%	158	2.6%	23	1.6%		
10.000 glaucoma	6	0.0%	1	0.0%	0		0			
EYELIDS										
20.110 eyelid dermoid	1	0.0%	0		0		0		0	
20.140 ectopic cilia	4	0.0%	1	0.0%	0		0		0	
20.160 macropalpebral fissure	0		1	0.0%	0		0		0	
21.000 entropion, unspecified	18	0.1%	31	0.1%	3	0.0%	0		0	
22.000 ectropion, unspecified	5	0.0%	3	0.0%	0		0		0	
25.110 distichiasis	484	2.0%	357	1.7%	135	2.2%	17	1.2%		
NASOLACRIMAL										
32.110 imperforate lower nasolacrimal punctum	1	0.0%	4	0.0%	0		0		0	
40.910 keratoconjunctivitis sicca	1	0.0%	1	0.0%	3	0.0%	0		0	
NICTITANS										
51.100 third eyelid cartilage anomaly	0		0		1	0.0%	0		0	
52.110 prolapsed gland of the third eyelid	0		1	0.0%	1	0.0%	0		0	
CORNEA										
70.210 corneal pannus	2	0.0%	0		0		0		0	
70.220 pigmentary keratitis	2	0.0%	5	0.0%	0		0		0	
70.700 corneal dystrophy	212	0.9%	127	0.6%	24	0.4%	12	0.8%		
70.730 corneal endothelial degeneration	5	0.0%	7	0.0%	0		0		0	
UVEA										
90.250 pigmentary uveitis	0		1	0.0%	0		0		0	
93.110 iris hypoplasia	0		0		2	0.0%	1	0.1%		
93.120 iris cyst	6	0.0%	6	0.0%	7	0.1%	0		0	
93.140 corneal endothelial pigment without PPM	0		1	0.0%	0		0		0	
93.150 iris coloboma	11	0.0%	8	0.0%	4	0.1%	0		0	
93.170 anterior chamber cyst	0		0		0		1	0.1%		
93.710 persistent pupillary membranes, iris to iris	2597	10.5%	3776	17.6%	1592	25.8%	349	24.5%		
93.720 persistent pupillary membranes, iris to lens	129	0.5%	168	0.8%	83	1.3%	27	1.9%		
93.730 persistent pupillary membranes, iris to cornea	55	0.2%	50	0.2%	13	0.2%	2	0.1%		
93.740 persistent pupillary membranes, iris sheets	30	0.1%	33	0.2%	1	0.0%	1	0.1%		
93.750 persistent pupillary membranes, lens pigment foci/no strands	0		0		12	0.2%	4	0.3%		
93.760 persistent pupillary membranes, endothelial opacity/no strands	0		2	0.0%	9	0.1%	0			
93.810 uveal melanoma	0		0		2	0.0%	0			
95.120 ciliary body cyst	0		0		1	0.0%	0			
97.150 chorioretinal coloboma, congenital	0		0		13	0.2%	49	3.4%		
LENS										
100.200 cataract, unspecified	114	0.5%	0		0		0		0	
100.210 cataract, significance unknown	154	0.6%	214	1.0%	99	1.6%	25	1.8%		
100.301 punctate cataract, anterior cortex	35	0.1%	27	0.1%	17	0.3%	1	0.1%		
100.302 punctate cataract, posterior cortex	17	0.1%	3	0.0%	2	0.0%	0			
100.303 punctate cataract, equatorial cortex	2	0.0%	1	0.0%	2	0.0%	0			
100.304 punctate cataract, anterior sutures	15	0.1%	6	0.0%	4	0.1%	0			

OCULAR DISORDERS REPORT COLLIE

LENS CONTINUED	1991-1999		2000-2009		2010-2013		2014	
100.305 punctate cataract, posterior sutures	9	0.0%	6	0.0%	2	0.0%	3	0.2%
100.306 punctate cataract, nucleus	28	0.1%	59	0.3%	36	0.6%	7	0.5%
100.307 punctate cataract, capsular	6	0.0%	16	0.1%	2	0.0%	3	0.2%
100.311 incipient cataract, anterior cortex	31	0.1%	38	0.2%	15	0.2%	2	0.1%
100.312 incipient cataract, posterior cortex	50	0.2%	42	0.2%	12	0.2%	1	0.1%
100.313 incipient cataract, equatorial cortex	14	0.1%	15	0.1%	7	0.1%	0	
100.314 incipient cataract, anterior sutures	20	0.1%	9	0.0%	3	0.0%	2	0.1%
100.315 incipient cataract, posterior sutures	13	0.1%	6	0.0%	2	0.0%	1	0.1%
100.316 incipient cataract, nucleus	53	0.2%	60	0.3%	19	0.3%	2	0.1%
100.317 incipient cataract, capsular	0		20	0.1%	3	0.0%	0	
100.321 incomplete cataract, anterior cortex	0		0		1	0.0%	0	
100.326 incomplete cataract, nucleus	0		0		0		2	0.1%
100.330 generalized/complete cataract	33	0.1%	13	0.1%	2	0.0%	1	0.1%
100.375 subluxation/luxation, unspecified	4	0.0%	2	0.0%	1	0.0%	0	
VITREOUS								
110.120 persistent hyaloid artery/remnant	240	1.0%	101	0.5%	6	0.1%	5	0.4%
110.135 PHPV/PTVL	12	0.0%	21	0.1%	11	0.2%	2	0.1%
110.320 vitreous degeneration syneresis	16	0.1%	18	0.1%	10	0.2%	0	
110.330 vitreous degeneration anterior chamber	0		1	0.0%	1	0.0%	0	
FUNDUS								
97.110 choroidal hypoplasia	16556	67.3%	14527	67.8%	4314	70.0%	1002	70.4%
97.120 coloboma	1375	5.6%	808	3.8%	159	2.6%	0	
RETINA								
120.170 retinal dysplasia, folds	1196	4.9%	1625	7.6%	603	9.8%	124	8.7%
120.180 retinal dysplasia, geographic	32	0.1%	21	0.1%	2	0.0%	0	
120.190 retinal dysplasia, detached	22	0.1%	32	0.1%	23	0.4%	6	0.4%
120.310 generalized progressive retinal atrophy (PRA)	89	0.4%	585	2.7%	140	2.3%	0	
120.400 retinal hemorrhage	72	0.3%	33	0.2%	0		0	
120.910 retinal detachment without dialysis	441	1.8%	316	1.5%	66	1.1%	0	
120.920 retinal detachment with dialysis	0		0		30	0.5%	18	1.3%
120.960 retinopathy	0		0		1	0.0%	0	
OPTIC NERVE								
130.110 micropapilla	13	0.1%	76	0.4%	24	0.4%	5	0.4%
130.120 optic nerve hypoplasia	127	0.5%	72	0.3%	22	0.4%	5	0.4%
130.150 optic disc coloboma	2118	8.6%	1395	6.5%	534	8.7%	120	8.4%
OTHER								
900.000 other, unspecified	0		41	0.2%	91	1.5%	0	
900.100 other, not inherited	50	0.2%	208	1.0%	13	0.2%	16	1.1%
900.110 other, suspected as inherited	291	1.2%	260	1.2%	10	0.2%	13	0.9%
NORMAL								
0.000 normal globe	6611	26.9%	5687	26.6%	1477	24.0%	329	23.1%

OCULAR DISORDERS REPORT

COTON DE TULEAR-1

COTON DE TULEAR

	DISORDER	INHERITANCE	REFERENCE	BREEDING ADVICE
A.	Distichiasis	Not defined	1	Breeder option
B.	Corneal dystrophy - epithelial/stromal	Not defined	2	Breeder option
D.	Persistent pupillary membranes			
	- iris to iris	Not defined	2	Breeder option
	- all other forms	Not defined	2	NO
D.	Cataract	Not defined	2	NO
E.	Vitreous degeneration	Not defined	2	Breeder option
F.	Retinal dysplasia - folds	Presumed autosomal recessive	3	Breeder option
G.	Retinal atrophy - generalized	Not defined	3	NO
H.	Multifocal retinopathy - cmr2 (retinal dysplasia-bullae) * a DNA test is available	Autosomal recessive	4, 5	Breeder Option

Description and Comments

A. Distichiasis

Eyelashes abnormally located on the eyelid margin which may cause ocular irritation. Distichiasis may occur at any time in the life of a dog. It is difficult to make a strong recommendation with regard to breeding dogs with this entity. The hereditary basis has not been established, although it seems probable due to the high incidence in some breeds. Reducing the incidence is a logical goal. When diagnosed, distichiasis should be recorded; breeding discretion is advised.

OCULAR DISORDERS REPORT

COTON DE TULEAR-2

B. Corneal dystrophy - epithelial/stromal

A non-inflammatory corneal opacity (white to gray) present in one or more of the corneal layers; usually inherited and bilateral.

C. Persistent pupillary membranes (PPM)

Persistent blood vessel remnants in the anterior chamber of the eye which fail to regress normally by 3 months of age. These strands may bridge from iris to iris, iris to cornea, iris to lens, or form sheets of tissue in the anterior chamber. The last three forms pose the greatest threat to vision and when severe, vision impairment or blindness may occur.

D. Cataract

A partial or complete opacity of the lens and/or its capsule. In cases where cataracts are complete and affect both eyes, blindness results. The prudent approach is to assume cataracts to be hereditary except in cases known to be associated with trauma, other causes of ocular inflammation, specific metabolic diseases, persistent pupillary membrane, persistent hyaloid or nutritional deficiencies. Cataracts may involve the lens completely (diffuse) or in a localized region.

E. Vitreous degeneration

Liquefaction of the vitreous gel which may predispose to retinal detachment.

F. Retinal dysplasia - folds

Linear, triangular, curved or curvilinear foci of retinal folding or bullae that may be single or multiple. Its significance to vision is unknown. There are two other forms of retinal dysplasia (geographic, detached) which are known to be inherited in other breeds and, in their most severe form, cause blindness. The genetic relationship between folds and more severe forms of retinal dysplasia is undetermined.

“Different from folds, a retinopathy has been observed in this breed which develops within the first 6 months presenting as multifocal bullous lesions as below (cmr). Once the lesions appear they do not progress or cause visual dysfunction.”

G. Retinal atrophy - generalized (PRA)

A degenerative disease of the retinal visual cells which progresses to blindness. This abnormality, also known as progressive retinal atrophy or PRA, may be detected by electroretinogram (not part of a routine eye screening examination) before it is apparent clinically. Except for X-linked PRA in the Siberian Husky, in all breeds studied to date, PRA is inherited as an autosomal recessive trait.

OCULAR DISORDERS REPORT

COTON DE TULEAR-3

H. Multifocal retinopathy – cmr2

Canine Multi-focal Retinopathy type 2 (cmr2) is characterized by numerous distinct (i.e. multi-focal), roughly circular patches of elevated retina (multifocal bullous retinal detachments). There is typically a serous subretinal fluid in the Coton de Tulear, although there may be accumulation of subretinal material that produces gray-tan-pink colored lesions. These lesions, looking somewhat like blisters, vary in location and size, although typically they are present in both eyes of the affected dog.

The disease generally develops in young dogs between 15 weeks to 1 year of age. The lesions typically remain static in size and color beyond 1 year of age. The bullae appear to gradually lose the serous subretinal fluid after 4-5 years of age. Discrete areas of tapetal hyper-reflectivity might also be seen. Most dogs exhibit no noticeable problem with vision despite their abnormal appearing retinas. Electroretinograms reveal significant differences in photopic flickers in affected dogs.

Canine Multi-focal Retinopathy type 2 is caused by a mutation in the Bestrophin 1 gene (BEST1) and is described to be recessively inherited in the Coton du Tulear. A DNA test is available.

References

1. ACVO Genetics Committee, 2007 and/or Data from CERF All-Breeds Report 2002-2006.
2. ACVO Genetics Committee, 2005 and/or Data from CERF All-Breeds Report 2003-2004.
3. ACVO Genetics Committee, 1999 and/or Data from CERF All-Breeds Report, 1991-1998.
4. Guziewicz KE, Zangerl B, Lindauer SJ, et al. Bestrophin gene mutations cause canine multifocal retinopathy: a novel animal model for best disease. *Invest Ophthalmol Vis Sci*. 2007 May;48:1959-1967.
5. Grahn BH, Sandmeyer LL and Breaux C. Retinopathy of Coton de Tulear dogs: clinical manifestations, electroretinographic, ultrasonographic, fluorescein and indocyanine green angiographic, and optical coherence tomographic findings. *Vet Ophthalmol*. 2008 Jul-Aug;11:242-249.

OCULAR DISORDERS REPORT COTON DE TULEAR

Diagnostic Name	TOTAL DOGS EXAMINED		1991-1999 428		2000-2009 3260		2010-2013 1053		2014 234	
	#	%	#	%	#	%	#	%	#	%
GLOBE										
0.110 microphthalmia	0		1	0.0%	0		0		0	
EYELIDS										
20.140 ectopic cilia	0		1	0.0%	0		0		0	
21.000 entropion, unspecified	0		4	0.1%	0		0		0	
25.110 distichiasis	3	0.7%	29	0.9%	11	1.0%	2	0.9%		
NASOLACRIMAL										
32.110 imperforate lower nasolacrimal punctum	0		0		1	0.1%	0		0	
40.910 keratoconjunctivitis sicca	0		1	0.0%	0		0		0	
NICTITANS										
52.110 prolapsed gland of the third eyelid	1	0.2%	9	0.3%	3	0.3%	0		0	
CORNEA										
70.220 pigmentary keratitis	0		1	0.0%	0		0		0	
70.700 corneal dystrophy	3	0.7%	32	1.0%	10	0.9%	0		0	
70.730 corneal endothelial degeneration	0		1	0.0%	0		0		0	
UVEA										
93.110 iris hypoplasia	0		0		3	0.3%	0		0	
93.120 iris cyst	0		2	0.1%	2	0.2%	0		0	
93.150 iris coloboma	0		2	0.1%	0		0		0	
93.710 persistent pupillary membranes, iris to iris	12	2.8%	310	9.5%	74	7.0%	27	11.5%		
93.720 persistent pupillary membranes, iris to lens	1	0.2%	7	0.2%	0		0		0	
93.730 persistent pupillary membranes, iris to cornea	1	0.2%	4	0.1%	1	0.1%	0		0	
93.740 persistent pupillary membranes, iris sheets	0		1	0.0%	0		0		0	
93.750 persistent pupillary membranes, lens pigment foci/no strands	0		0		1	0.1%	0		0	
93.760 persistent pupillary membranes, endothelial opacity/no strands	0		0		10	0.9%	1	0.4%		
LENS										
100.210 cataract, significance unknown	11	2.6%	113	3.5%	21	2.0%	11	4.7%		
100.301 punctate cataract, anterior cortex	0		6	0.2%	2	0.2%	0		0	
100.302 punctate cataract, posterior cortex	0		3	0.1%	1	0.1%	0		0	
100.303 punctate cataract, equatorial cortex	0		3	0.1%	0		0		0	
100.305 punctate cataract, posterior sutures	0		7	0.2%	1	0.1%	0		0	
100.306 punctate cataract, nucleus	0		2	0.1%	0		0		0	
100.307 punctate cataract, capsular	0		2	0.1%	1	0.1%	0		0	
100.311 incipient cataract, anterior cortex	2	0.5%	8	0.2%	3	0.3%	0		0	
100.312 incipient cataract, posterior cortex	0		9	0.3%	5	0.5%	0		0	
100.313 incipient cataract, equatorial cortex	0		6	0.2%	5	0.5%	0		0	
100.314 incipient cataract, anterior sutures	0		2	0.1%	0		0		0	
100.315 incipient cataract, posterior sutures	0		1	0.0%	2	0.2%	0		0	
100.316 incipient cataract, nucleus	0		4	0.1%	0		0		0	
100.317 incipient cataract, capsular	0		4	0.1%	1	0.1%	0		0	
100.321 incomplete cataract, anterior cortex	0		0		0		1	0.4%		
100.330 generalized/complete cataract	2	0.5%	5	0.2%	0		0		0	
100.375 subluxation/luxation, unspecified	0		0		1	0.1%	0		0	

OCULAR DISORDERS REPORT COTON DE TULEAR

	1991-1999	2000-2009	2010-2013	2014
VITREOUS				
110.120 persistant hyaloid artery/remnant	0	3 0.1%	0	1 0.4%
110.135 PHPV/PTVL	0	1 0.0%	0	0
110.200 vitritis	0	0	1 0.1%	1 0.4%
110.320 vitreous degeneration syneresis	3 0.7%	28 0.9%	10 0.9%	1 0.4%
110.330 vitreous degeneration anterior chamber	0	2 0.1%	2 0.2%	0
FUNDUS				
97.110 choroidal hypoplasia	0	1 0.0%	0	0
RETINA				
120.170 retinal dysplasia, folds	7 1.6%	6 0.2%	7 0.7%	0
120.180 retinal dysplasia, geographic	2 0.5%	8 0.2%	0	0
120.190 retinal dysplasia, detached	0	3 0.1%	0	0
120.310 generalized progressive retinal atrophy (PRA)	8 1.9%	19 0.6%	2 0.2%	2 0.9%
120.370 multifocal retinopathy	0	2 0.1%	0	0
120.910 retinal detachment without dialysis	1 0.2%	0	0	0
120.960 retinopathy	0	0	1 0.1%	0
OPTIC NERVE				
130.110 micropapilla	1 0.2%	2 0.1%	0	0
130.120 optic nerve hypoplasia	2 0.5%	0	0	0
130.150 optic disc coloboma	0	1 0.0%	0	0
OTHER				
900.000 other, unspecified	0	20 0.6%	24 2.3%	0
900.100 other, not inherited	4 0.9%	145 4.4%	9 0.9%	12 5.1%
900.110 other, suspected as inherited	11 2.6%	18 0.6%	3 0.3%	1 0.4%
NORMAL				
0.000 normal globe	368 86.0%	2803 86.0%	956 90.8%	203 86.8%

OCULAR DISORDERS REPORT

CURLY-COATED RETRIEVER - 1

CURLY-COATED RETRIEVER

	DISORDER	INHERITANCE	REFERENCE	BREEDING ADVICE
A.	Distichiasis	Not defined	1	Breeder option
B.	Corneal dystrophy - epithelial/stromal	Not defined	1	Breeder option
C.	Persistent pupillary membranes - iris to iris	Not defined	2	Breeder option
D.	Cataract	Not defined	1, 3	NO
E.	Vitreous degeneration	Not defined	4, 5	Breeder option
F.	Choroidal hypoplasia	Not defined	6	NO
G.	Optic nerve coloboma	Not defined	6	NO
H.	Retinal dysplasia - folds	Not defined	6	Breeder option

Description and Comments

A. Distichiasis

Eyelashes abnormally located on the eyelid margin which may cause ocular irritation. Distichiasis may occur at any time in the life of a dog. It is difficult to make a strong recommendation with regard to breeding dogs with this entity. The hereditary basis has not been established, although it seems probable due to the high incidence in some breeds. Reducing the incidence is a logical goal. When diagnosed, distichiasis should be recorded; breeding discretion is advised.

B. Corneal dystrophy - epithelial/stromal

A non-inflammatory corneal opacity (white to gray) present in one or more of the corneal layers. Corneal dystrophy implies a probable inherited basis and is usually bilateral.

C. Persistent pupillary membrane (PPM)

OCULAR DISORDERS REPORT

CURLY-COATED RETRIEVER - 2

Persistent blood vessel remnants in the anterior chamber of the eye which fail to regress normally by 3 months of age. These strands may bridge from iris to iris, iris to cornea, iris to lens, or form sheets of tissue in the anterior chamber. The last three forms pose the greatest threat to vision and when severe, vision impairment or blindness may occur.

D. Cataract

A partial or complete opacity of the lens and/or its capsule. In cases where cataracts are complete and affect both eyes, blindness results. The prudent approach is to assume cataracts to be hereditary except in cases known to be associated with trauma, other causes of ocular inflammation, specific metabolic diseases, persistent pupillary membrane, persistent hyaloid or nutritional deficiencies. Cataracts may involve the lens completely (diffuse) or in a localized region.

In the Curly-Coated Retriever the following cataracts have been reported:

1. **Anterior cortical subcapsular cataract:**
Anterior subcapsular striate cortical cataracts usually occur bilaterally, slowly progress and usually occur between 5-8 years of age.
2. **Posterior subcapsular cataract:**
Posterior polar subcapsular opacities occur at 2-4 years of age and progress slowly.

E. Vitreous degeneration

Liquefaction of the vitreous gel which may predispose to retinal detachment.

F. Choroidal hypoplasia

Inadequate development of the choroid present at birth and non-progressive. This condition is more commonly identified in the Collie breed where it is a manifestation of "Collie Eye Anomaly".

G. Optic nerve coloboma

A congenital cavity in the optic nerve which, if large, may cause blindness or vision impairment.

H. Retinal dysplasia - folds

Linear, triangular, curved or curvilinear foci of retinal folding that may be single or multiple. When seen in puppies, this condition may partially or completely resolve with maturity. Its significance to vision is unknown. There are two other forms of retinal dysplasia (geographic, detached) which are known to be inherited in other breeds and, in their most severe form, cause blindness. The genetic relationship between folds and more severe forms of retinal dysplasia is undetermined.

OCULAR DISORDERS REPORT

CURLY-COATED RETRIEVER - 3

References

There are few references providing detailed descriptions of hereditary ocular conditions of the Curly-Coated Retriever breed. The conditions listed above are generally recognized to exist in this breed, as evidenced by identification on breed eye screening examinations and/or clinical experience of veterinary ophthalmologists.

1. ACVO Genetics Committee, 1999 and/or Data from CERF All-Breeds Report, 1991-1998.
2. ACVO Genetics Committee, 2005 and/or Data from CERF All-Breeds Report 2003-2004.
3. Barnett KC. Comparative aspects of canine hereditary eye disease. *Adv Vet Sci Comp Med.* 1976;20:39-67.
4. ACVO Genetics Committee, 2006 and/or Data from CERF All-Breeds Report, 2001-2005.
5. ACVO Genetics Committee, 2009 and/or Data from CERF All-Breeds Report, 2008.
6. ACVO Genetics Committee, 2002-2003 and/or Data from CERF All-Breeds Report, 2002-2003.

OCULAR DISORDERS REPORT CURLY-COATED RETRIEVER

Diagnostic Name	TOTAL DOGS EXAMINED	1991-1999		2000-2009		2010-2013		2014	
		#	%	#	%	#	%	#	%
GLOBE									
0.110 microphthalmia		0		1	0.1%	0		0	
EYELIDS									
20.140 ectopic cilia		0		3	0.3%	1	0.6%	0	
21.000 entropion, unspecified		5	0.7%	5	0.6%	1	0.6%	0	
22.000 ectropion, unspecified		1	0.1%	0		0		2	3.5%
25.110 distichiasis		46	6.3%	67	7.4%	25	14.5%	3	5.3%
NICTITANS									
51.100 third eyelid cartilage anomaly		0		0		1	0.6%	0	
52.110 prolapsed gland of the third eyelid		0		0		1	0.6%	0	
CORNEA									
70.700 corneal dystrophy		6	0.8%	4	0.4%	3	1.7%	0	
70.730 corneal endothelial degeneration		1	0.1%	0		0		0	
UVEA									
90.250 pigmentary uveitis		0		1	0.1%	0		0	
93.120 iris cyst		0		1	0.1%	0		0	
93.710 persistent pupillary membranes, iris to iris		20	2.7%	38	4.2%	8	4.6%	0	
93.720 persistent pupillary membranes, iris to lens		2	0.3%	2	0.2%	0		0	
93.730 persistent pupillary membranes, iris to cornea		4	0.5%	1	0.1%	0		0	
93.740 persistent pupillary membranes, iris sheets		0		2	0.2%	0		0	
93.750 persistent pupillary membranes, lens pigment foci/no strands		0		1	0.1%	6	3.5%	2	3.5%
93.760 persistent pupillary membranes, endothelial opacity/no strands		0		0		1	0.6%	0	
LENS									
100.200 cataract, unspecified		19	2.6%	0		0		0	
100.210 cataract, significance unknown		16	2.2%	62	6.9%	17	9.8%	7	12.3%
100.301 punctate cataract, anterior cortex		6	0.8%	3	0.3%	3	1.7%	0	
100.302 punctate cataract, posterior cortex		6	0.8%	3	0.3%	2	1.2%	0	
100.303 punctate cataract, equatorial cortex		1	0.1%	1	0.1%	0		0	
100.304 punctate cataract, anterior sutures		0		0		1	0.6%	0	
100.305 punctate cataract, posterior sutures		1	0.1%	6	0.7%	1	0.6%	0	
100.307 punctate cataract, capsular		0		6	0.7%	1	0.6%	0	
100.311 incipient cataract, anterior cortex		3	0.4%	7	0.8%	1	0.6%	0	
100.312 incipient cataract, posterior cortex		3	0.4%	6	0.7%	2	1.2%	1	1.8%
100.313 incipient cataract, equatorial cortex		4	0.5%	5	0.6%	2	1.2%	0	
100.314 incipient cataract, anterior sutures		0		1	0.1%	0		0	
100.315 incipient cataract, posterior sutures		0		3	0.3%	1	0.6%	0	
100.316 incipient cataract, nucleus		2	0.3%	1	0.1%	0		0	
100.317 incipient cataract, capsular		0		3	0.3%	0		0	
100.375 subluxation/luxation, unspecified		0		2	0.2%	1	0.6%	0	
VITREOUS									
110.120 persistent hyaloid artery/remnant		1	0.1%	0		0		0	
110.320 vitreous degeneration syneresis		0		17	1.9%	0		0	
110.330 vitreous degeneration anterior chamber		0		3	0.3%	0		0	

OCULAR DISORDERS REPORT CURLY-COATED RETRIEVER

	1991-1999	2000-2009	2010-2013	2014
FUNDUS				
97.110 choroidal hypoplasia	13 1.8%	0	0	0
RETINA				
120.170 retinal dysplasia, folds	8 1.1%	5 0.6%	2 1.2%	1 1.8%
120.180 retinal dysplasia, geographic	0	3 0.3%	0	0
120.310 generalized progressive retinal atrophy (PRA)	5 0.7%	6 0.7%	0	0
OPTIC NERVE				
130.120 optic nerve hypoplasia	2 0.3%	1 0.1%	0	0
130.150 optic disc coloboma	10 1.4%	3 0.3%	0	0
OTHER				
900.000 other, unspecified	0	9 1.0%	7 4.0%	0
900.100 other, not inherited	2 0.3%	31 3.4%	3 1.7%	4 7.0%
900.110 other, suspected as inherited	11 1.5%	2 0.2%	1 0.6%	0
NORMAL				
0.000 normal globe	600 82.1%	746 82.4%	141 81.5%	48 84.2%

DACHSHUND

	DISORDER	INHERITANCE	REFERENCE	BREEDING ADVICE
A.	Microphthalmia and multiple ocular defects	Not defined	1-3	NO
B.	Distichiasis	Not defined	1	Breeder option
C.	Dermoid	Not defined	1, 4	Breeder option
D.	Chronic superficial keratitis/pannus	Presumed autosomal recessive	1, 5	NO
E.	Punctate keratitis	Not defined	1, 6	NO
F.	Corneal dystrophy - epithelial/stromal	Not defined	1, 7	Breeder option
G.	Corneal dystrophy - endothelial	Not defined	1, 7, 8	NO
H.	Iris coloboma	Not defined	9	NO
I.	Persistent pupillary membranes			
	- iris to iris	Not defined	9, 10	Breeder option
	- iris to cornea	Not defined	10	NO
	- iris to lens	Not defined	11	NO
J.	Uveodermatologic syndrome	Not defined	12	NO
K.	Cataract	Not defined	1	NO
L.	Persistent hyaloid artery	Not defined	10, 13	Breeder option
M.	Retinal atrophy - generalized * a DNA test is available	Not defined	1, 14-16	NO
N.	Retinal degeneration - day blindness	Not defined	17-25	NO

O.	Retinopathy - associated with ceroid lipofuscinosis * a DNA test is available	Not defined	26, 27	NO
P.	Retinal dysplasia - folds	Not defined	9, 10	Breeder option
Q.	Coloboma/ Staphyloma (Smooth standard only)	Not defined	28	NO
R.	Optic nerve coloboma	Not defined	1	NO
S.	Optic nerve hypoplasia	Not defined	10	NO
T.	Micropapilla	Not defined	1, 10	Breeder option

Description and Comments

A. Microphthalmia and multiple ocular anomalies

Microphthalmia is a congenital defect characterized by a small eye often with associated defects of the cornea, anterior chamber, lens and/or retina.

An association has been made between partial albinism, multiple ocular defects (especially microphthalmia) and deafness in a number of canine breeds including the Dachshund. From these reports it appears that a predominantly white hair coat is associated with a higher incidence of ocular defects.

B. Distichiasis

Eyelashes abnormally located on the eyelid margin which may cause ocular irritation. Distichiasis may occur at any time in the life of a dog. It is difficult to make a strong recommendation with regard to breeding dogs with this entity. The hereditary basis has not been established, although it seems probable due to the high incidence in some breeds. Reducing the incidence is a logical goal. When diagnosed, distichiasis should be recorded; breeding discretion is advised.

C. Dermoid

A dermoid is a focal area of normal epidermal tissue (skin) that forms in an abnormal location (usually the cornea, conjunctiva or eyelid). The lesion generally causes discomfort to the affected animal.

D. Chronic superficial keratitis / Pannus

A bilateral disease of the cornea which usually starts as a grayish haze to the ventral or ventrolateral cornea, followed by the formation of a vascularized subepithelial growth that begins to spread toward the central cornea; pigmentation follows the vascularization. If severe, vision impairment occurs. Pannus may be associated with plasma cell infiltration of the nictitans.

E. Punctate keratitis

Focal circular rings usually affecting the central subepithelial and/or anterior portion of the cornea. There often is an associated dry eye with corneal erosions. The mode of inheritance is unknown.

F. Corneal dystrophy - epithelial/stromal

A non-inflammatory corneal opacity (white to gray) present in one or more of the corneal layers. Corneal dystrophy implies a probable inherited basis and is usually bilateral.

G. Corneal dystrophy - endothelial

An abnormal loss of the inner lining of the cornea that causes progressive fluid retention (edema). With time the edema results in keratitis and decreased vision.

H. Iris coloboma

A coloboma is a congenital defect which may affect the iris, choroid or optic disc. Iris colobomas are seen as notches in the pupillary margin.

I. Persistent pupillary membranes (PPM)

Persistent blood vessel remnants in the anterior chamber of the eye which fail to regress normally by 3 months of age. These strands may bridge from iris to iris, iris to cornea, iris to lens, or form sheets of tissue in the anterior chamber. The last three forms pose the greatest threat to vision and when severe, vision impairment or blindness may occur.

J. Uveodermatologic syndrome

Uveodermatologic syndrome in the Dachshund bears many similarities to a condition in people called Vogt-Koyanagi-Harada (or VKH) syndrome. Thus, the condition in dogs is often referred to as VKH or VKH-like syndrome. It is an immune-mediated disease in which pigmented cells (melanocytes) in the eye and in the skin are destroyed by white blood cells (lymphocytes). The first clinical signs are usually inflammation of the intraocular structures (or uveitis) in both eyes. Adhesions between the iris and lens (posterior synechia) and the peripheral iris and cornea (peripheral anterior synechia) develop rapidly. Other complications include cataract development, retinal degeneration, retinal separation or detachment, optic disc atrophy and secondary glaucoma. The uveitis is very difficult to control medically and ultimately results in blindness in most affected dogs. Whitening of the hair (poliosis) and skin (vitiligo) may also be noted in advanced cases. The genetics of this condition are unclear, but some genetic predisposition is indicated by the higher prevalence of this disorder in

Dachshund compared with other dog breeds. Affected dogs are generally young, ranging in age between 1 ½ to 4 years.

K. Cataract

A partial or complete opacity of the lens and/or its capsule. In cases where cataracts are complete and affect both eyes, blindness results. The prudent approach is to assume cataracts to be hereditary except in cases known to be associated with trauma, other causes of ocular inflammation, specific metabolic diseases, persistent pupillary membrane, persistent hyaloid or nutritional deficiencies. Cataracts may involve the lens completely (diffuse) or in a localized region.

L. Persistent hyaloid artery (PHA)

Congenital defect resulting from abnormalities in the development and regression of the hyaloid artery. The blood vessel remnant can be present in the vitreous as a small patent vascular strand (PHA) or as a non-vascular strand that appears gray-white (persistent hyaloid remnant).

M. Retinal atrophy - generalized

A degenerative disease of the retinal visual cells which progresses to blindness. This abnormality, also known as progressive retinal atrophy or PRA, may be detected by electroretinogram before it is apparent clinically. In all breeds studied to date, retinal atrophy is recessively inherited.

At least in the Miniature Longhaired Dachshund, this condition has presumed polygenic inheritance. A DNA test is available.

N. Retinal degeneration - day blindness (also called hemeralopia)

Selective degeneration of cone photoreceptors resulting in greater vision impairment in bright light.

O. Retinopathy associated with ceroid lipofuscinosis

Progressive, multifocal serous retinal detachments first appear in Longhaired Dachshunds with late infantile neuronal ceroid lipofuscinosis at age 5-10 months. Late infantile ceroid neuronal lipofuscinosis in Miniature Dachshunds is a fatal, autosomal recessive, inherited lysosomal storage disease characterized by progressive neurodegeneration. The disease results from a defect in the TPP1 (Tripeptidyl peptidase) gene. Inheritance of the retinopathy is linked to the gene causing late infantile neuronal ceroid lipofuscinosis.

P. Retinal dysplasia - folds

Linear, triangular, curved or curvilinear foci of retinal folding that may be single or multiple. When seen in puppies, this condition may partially or completely resolve with maturity. Its significance to vision is unknown. There are two other forms of retinal dysplasia (geographic, detached) which are known to be inherited in other breeds and, in their most severe form, cause blindness. The genetic relationship between folds and

more severe forms of retinal dysplasia is undetermined

Q. Coloboma / staphyloma

A coloboma is a congenital defect which may affect the iris, choroid or optic disc. Iris colobomas are seen as notches in the pupillary margin. Scleral ectasia is defined as a congenital thinning and secondary distention of the sclera; when lined by uveal tissue it is called a staphyloma. These may be anteriorly located, apparent as a bulge beneath the upper eyelid or posteriorly located, requiring visualization with an ophthalmoscope. These conditions may or may not be genetically related to the same anomalies seen associated with microphthalmia (entity "A" above).

R. Optic nerve coloboma

A congenital cavity in the optic nerve which, if large, may cause blindness or vision impairment.

S. Optic nerve hypoplasia

Optic nerve hypoplasia refers to a congenital defect of the optic nerve which causes blindness and abnormal pupil response in the affected eye. May be difficult to differentiate between micropapilla and optic nerve hypoplasia on a routine (dilated) screening ophthalmoscopic exam.

T. Micropapilla

Micropapilla refers to a small optic disc which is not associated with vision impairment. Optic nerve hypoplasia refers to a congenital defect of the optic nerve which causes blindness and abnormal pupil response in the affected eye. It may be difficult to differentiate between micropapilla and optic nerve hypoplasia on a routine (dilated) screening ophthalmoscopic exam.

References

1. ACVO Genetics Committee, 1999 and/or Data from CERF All-Breeds Report, 1991-1998.
2. Sorsby A and Davey JB. Ocular associations of dappling (or merling) in the coat colour of dogs 1. Clinical and genetical data. *J Genet.* 1954;52:425.
3. Dausch O. Eye changes in the merle syndrome in the dschund. *Dtsch Tierorxtl Wschr.* 1977;84:453.
4. Brandsch H and Schmidt V. Analysis of heredity for dermoid in the dog eye. *Mh Vet-Med.* 1982;37:305.
5. Brandsch H and Nicodem K. Heredity of keratitis in long-haired dachshunds. *Mh Vet-Med.* 1982;37:216.
6. Claus BN, editor. A genealogic survey of superficial punctate keratitis in the population of Danish longhaired dachshunds. *ECVO Proceedings*; 2007.

7. Cooley PL and Dice PF, 2nd. Corneal dystrophy in the dog and cat. *Vet Clin North Am Small Anim Pract.* 1990 May;20:681-692.
8. Martin CL and Dice PF. Corneal endothelial dystrophy in the dog. *J Am Anim Hosp Assoc.* 1982;18:327.
9. ACVO Genetics Committee, 2000-2002 and/or Data from CERF All-Breeds Report, 2000-2002.
10. ACVO Genetics Committee, 2005 and/or Data from CERF All-Breeds Report 2003-2004.
11. ACVO Genetics Committee, 2009 and/or Data from CERF All-Breeds Report, 2008.
12. Herrera HD and Duchene AG. Uveodermatological syndrome (Vogt-Koyanagi-Harada-like syndrome) with generalized depigmentation in a Dachshund. *Vet Ophthalmol.* 1998;1:47-51.
13. ACVO Genetics Committee, 2002-2003 and/or Data from CERF All-Breeds Report, 2002-2003.
14. Priester W. Canine progressive retinal atrophy: Occurrence by age, breed, and sex. *American Journal of Veterinary Research.* 1974;35:571-574.
15. Curtis R and Barnett KC. Progressive retinal atrophy in miniature longhaired dachshund dogs. *The British veterinary journal.* 1993 Jan-Feb;149:71-85.
16. Kotani T, Maehara S, Ito N, et al., editors. Progressive retinal atrophy in 12 Miniature Dashchund dogs. *ACVO Proceedings;* 2002; Denver, CO.
17. Ropstad EO, Bjerkas E and Narfstrom K, editors. Clinical and fundoscopic signs of early onset day blindness (hemeralopia) in wirehaired Dachshunds. *ECVO/ESVO;* 2005; Oporto, Portugal.
18. Mellersh CS, Bournsnel ME, Pettitt L, et al. Canine RPGRIP1 mutation establishes cone-rod dystrophy in miniature longhaired dachshunds as a homologue of human Leber congenital amaurosis. *Genomics.* 2006 Sep;88:293-301.
19. Ropstad EO, Bjerkas E and Narfstrom K. Clinical findings in early onset cone-rod dystrophy in the Standard Wire-haired Dachshund. *Vet Ophthalmol.* 2007 Mar-Apr;10:69-75.
20. Turney C, Chong NH, Alexander RA, et al. Pathological and electrophysiological features of a canine cone-rod dystrophy in the miniature longhaired dachshund. *Invest Ophthalmol Vis Sci.* 2007 Sep;48:4240-4249.
21. Ropstad EO, Narfstrom K, Lingaas F, et al. Functional and structural changes in the retina of wire-haired dachshunds with early-onset cone-rod dystrophy. *Invest Ophthalmol Vis Sci.* 2008 Mar;49:1106-1115.
22. Miyadera K, Kato K, Aguirre-Hernandez J, et al. Phenotypic variation and genotype-phenotype discordance in canine cone-rod dystrophy with an RPGRIP1 mutation. *Mol*

Vis. 2009;15:2287-2305.

23. Wiik AC, Thoresen SI, Wade C, et al. A population study of a mutation allele associated with cone-rod dystrophy in the standard wire-haired dachshund. *Anim Genet.* 2009 Aug;40:572-574.
24. Wiik AC, Wade C, Biagi T, et al. A deletion in nephronophthisis 4 (NPHP4) is associated with recessive cone-rod dystrophy in standard wire-haired dachshund. *Genome Res.* 2008 Sep;18:1415-1421.
25. Zhang Q, Acland GM, Parshall CJ, et al. Characterization of canine photoreceptor phosducin cDNA and identification of a sequence variant in dogs with photoreceptor dysplasia. *Gene.* 1998 Jul 30;215:231-239.
26. Pearce JW, Whiting REH, Castaner L, et al., editors. Multifocal retinopathy in a colony of miniature longhaired dachshunds with late infantile neuronal ceroid lipofuscinosis. *43rd Annual Meeting of the American College of Veterinary Ophthalmologists*; 2012 October 17–20; Portland, Oregon, USA.
27. Awano T, Katz ML, O'Brien DP, et al. A frame shift mutation in canine TPP1 (the ortholog of human CLN2) in a juvenile Dachshund with neuronal ceroid lipofuscinosis. *Molecular genetics and metabolism.* 2006 Nov;89:254-260.
28. ACVO Genetics Committee, 2008 and/or Data from CERF All-Breeds Report, 2003-2007.

OCULAR DISORDERS REPORT DACHSHUND

Diagnostic Name	TOTAL DOGS EXAMINED		1991-1999 2389		2000-2009 2571		2010-2013 883		2014 135	
	#	%	#	%	#	%	#	%	#	%
GLOBE										
0.110	microphthalmia	5	0.2%	13	0.5%	1	0.1%	1	0.7%	
10.000	glaucoma	1	0.0%	0		1	0.1%	0		
EYELIDS										
21.000	entropion, unspecified	6	0.3%	0		0		0		
25.110	distichiasis	91	3.8%	150	5.8%	107	12.1%	9	6.7%	
NASOLACRIMAL										
32.110	imperforate lower nasolacrimal punctum	0		1	0.0%	0		0		
40.910	keratoconjunctivitis sicca	2	0.1%	0		0		0		
NICTITANS										
51.100	third eyelid cartilage anomaly	0		1	0.0%	1	0.1%	0		
52.110	prolapsed gland of the third eyelid	1	0.0%	0		7	0.8%	0		
CORNEA										
70.210	corneal pannus	2	0.1%	0		1	0.1%	0		
70.700	corneal dystrophy	7	0.3%	21	0.8%	2	0.2%	0		
70.730	corneal endothelial degeneration	2	0.1%	4	0.2%	3	0.3%	0		
UVEA										
93.110	iris hypoplasia	0		2	0.1%	3	0.3%	1	0.7%	
93.120	iris cyst	0		3	0.1%	1	0.1%	0		
93.150	iris coloboma	5	0.2%	18	0.7%	1	0.1%	1	0.7%	
93.710	persistent pupillary membranes, iris to iris	45	1.9%	128	5.0%	63	7.1%	5	3.7%	
93.720	persistent pupillary membranes, iris to lens	10	0.4%	13	0.5%	1	0.1%	0		
93.730	persistent pupillary membranes, iris to cornea	6	0.3%	16	0.6%	5	0.6%	3	2.2%	
93.740	persistent pupillary membranes, iris sheets	3	0.1%	1	0.0%	0		0		
93.750	persistent pupillary membranes, lens pigment foci/no strands	0		2	0.1%	48	5.4%	9	6.7%	
93.760	persistent pupillary membranes, endothelial opacity/no strands	0		0		6	0.7%	1	0.7%	
LENS										
100.200	cataract, unspecified	43	1.8%	0		0		0		
100.210	cataract, significance unknown	71	3.0%	133	5.2%	35	4.0%	6	4.4%	
100.301	punctate cataract, anterior cortex	13	0.5%	9	0.4%	5	0.6%	1	0.7%	
100.302	punctate cataract, posterior cortex	8	0.3%	3	0.1%	3	0.3%	1	0.7%	
100.303	punctate cataract, equatorial cortex	6	0.3%	2	0.1%	1	0.1%	0		
100.304	punctate cataract, anterior sutures	2	0.1%	0		2	0.2%	0		
100.305	punctate cataract, posterior sutures	3	0.1%	2	0.1%	4	0.5%	0		
100.306	punctate cataract, nucleus	2	0.1%	4	0.2%	1	0.1%	1	0.7%	
100.307	punctate cataract, capsular	4	0.2%	5	0.2%	5	0.6%	0		
100.311	incipient cataract, anterior cortex	17	0.7%	24	0.9%	6	0.7%	1	0.7%	
100.312	incipient cataract, posterior cortex	7	0.3%	11	0.4%	2	0.2%	0		
100.313	incipient cataract, equatorial cortex	5	0.2%	8	0.3%	1	0.1%	0		
100.314	incipient cataract, anterior sutures	2	0.1%	0		0		0		
100.315	incipient cataract, posterior sutures	6	0.3%	8	0.3%	4	0.5%	0		
100.316	incipient cataract, nucleus	2	0.1%	4	0.2%	0		1	0.7%	
100.317	incipient cataract, capsular	1	0.0%	6	0.2%	0		0		
100.324	incomplete cataract, anterior sutures	0		0		0		1	0.7%	

OCULAR DISORDERS REPORT DACHSHUND

LENS CONTINUED	1991-1999	2000-2009	2010-2013	2014
100.330 generalized/complete cataract	23 1.0%	12 0.5%	1 0.1%	1 0.7%
100.340 resorbing/hypermature cataract	0	0	1 0.1%	0
100.375 subluxation/luxation, unspecified	1 0.0%	4 0.2%	0	0
VITREOUS				
110.120 persistent hyaloid artery/remnant	15 0.6%	20 0.8%	2 0.2%	0
110.135 PHPV/PTVL	2 0.1%	8 0.3%	5 0.6%	0
110.320 vitreous degeneration syneresis	11 0.5%	15 0.6%	6 0.7%	2 1.5%
110.330 vitreous degeneration anterior chamber	0	1 0.0%	0	0
FUNDUS				
97.110 choroidal hypoplasia	0	5 0.2%	0	0
97.120 coloboma	4 0.2%	9 0.4%	1 0.1%	0
RETINA				
120.170 retinal dysplasia, folds	15 0.6%	30 1.2%	2 0.2%	6 4.4%
120.180 retinal dysplasia, geographic	1 0.0%	6 0.2%	0	0
120.190 retinal dysplasia, detached	1 0.0%	0	0	0
120.310 generalized progressive retinal atrophy (PRA)	63 2.6%	40 1.6%	11 1.2%	1 0.7%
120.400 retinal hemorrhage	0	1 0.0%	0	0
120.910 retinal detachment without dialysis	2 0.1%	2 0.1%	1 0.1%	0
120.920 retinal detachment with dialysis	0	0	0	1 0.7%
120.960 retinopathy	0	0	1 0.1%	0
OPTIC NERVE				
130.110 micropapilla	1 0.0%	8 0.3%	7 0.8%	0
130.120 optic nerve hypoplasia	23 1.0%	10 0.4%	4 0.5%	0
130.150 optic disc coloboma	15 0.6%	7 0.3%	3 0.3%	1 0.7%
OTHER				
900.000 other, unspecified	0	31 1.2%	58 6.6%	0
900.100 other, not inherited	9 0.4%	185 7.2%	16 1.8%	8 5.9%
900.110 other, suspected as inherited	34 1.4%	14 0.5%	9 1.0%	2 1.5%
NORMAL				
0.000 normal globe	1938 81.1%	2031 79.0%	679 76.9%	103 76.3%

OCULAR DISORDERS REPORT

DALMATIAN - 1

DALMATIAN

	DISORDER	INHERITANCE	REFERENCE	BREEDING ADVICE
A.	Entropion	Not defined	1, 2	Breeder option
B.	Dermoid	Not defined	1, 2	Breeder option
C.	Distichiasis	Not defined	3	Breeder option
D.	Corneal dystrophy - epithelial/stromal	Not defined	3	Breeder option
E.	Sphincter Dysplasia	Not defined	4	Breeder option
F.	Iris coloboma	Not defined	5	NO
G.	Persistent pupillary membranes - iris to iris	Not defined	5	Breeder option
H.	Glaucoma	Not defined	1, 2, 6	NO
I.	Cataract	Not defined	1, 2	NO
J.	Retinal dysplasia - folds	Not defined	5	Breeder option
K.	Ceroid- lipofuscinosis	Presumed autosomal recessive	7-10	NO

It is recommended that this breed be examined prior to pharmacological dilation to best facilitate identification of iris hypoplasia/sphincter dysplasia.

OCULAR DISORDERS REPORT

DALMATIAN - 2

Description and Comments

A. Entropion

A conformational defect resulting in an "in-rolling" of one or both of the eyelids which may cause ocular irritation. It is likely that entropion is influenced by several genes (polygenic), defining the skin and other structures which make up the eyelids, the amount and weight of the skin covering the head and face, the orbital contents, and the conformation of the skull. In the Dalmatian, entropion normally involves the lower lid.

B. Dermoid

A patch of skin, usually located on the cornea; its presence usually causes ocular irritation and if large can affect vision.

This abnormal development of the cornea has been observed so extensively in some Dalmatian dogs that little corneal tissue remains visible. It has been observed both unilaterally and bilaterally and in more than one dog in a litter on occasion. Surgical correction in most patients helps to return comfort and improve vision.

C. Distichiasis

Eyelashes abnormally located on the eyelid margin which may cause ocular irritation. Distichiasis may occur at any time in the life of a dog. It is difficult to make a strong recommendation with regard to breeding dogs with this entity. The hereditary basis has not been established, although it seems probable due to the high incidence in some breeds. Reducing the incidence is a logical goal. When diagnosed, distichiasis should be recorded; breeding discretion is advised.

D. Corneal dystrophy - epithelial/stromal

A non-inflammatory corneal opacity (white to gray) present in one or more of the corneal layers. Corneal dystrophy implies a probable inherited basis and is usually bilateral.

E. Iris sphincter dysplasia (ISD)

Defective development of the iris, or part of the iris, resulting in an immature state. ISD is the result of poorly developed iris sphincter muscles. The pupils of dogs with ISD do not properly contract in bright light. Dogs usually are uncomfortable and often squint in sunlight. The disorder exposes the interior of the eye to ultraviolet light that may potentially cause serious vision problems, such as cataracts or retinal damage, as dogs age.

F. Iris coloboma

An abnormality in the development of the iris which may present as a minor notching of the pupillary margin, a hole in the iris or complete absence of iridal development. The

OCULAR DISORDERS REPORT

DALMATIAN - 3

relationship of iris coloboma to other ocular abnormalities in this breed has not been determined.

G. Persistent pupillary membranes (PPM)

Persistent blood vessel remnants in the anterior chamber of the eye which fail to regress normally by 3 months of age. These strands may bridge from iris to iris, iris to cornea, iris to lens, or form sheets of tissue in the anterior chamber. The last three forms pose the greatest threat to vision and when severe, vision impairment or blindness may occur.

H. Glaucoma

Glaucoma is characterized by an elevation of intraocular pressure which, when sustained, causes intraocular damage resulting in blindness. The elevated intraocular pressure occurs because the fluid cannot leave through the iridocorneal angle. Diagnosis and classification of glaucoma requires measurement of the intraocular pressure (tonometry) and examination of the iridocorneal angle (gonioscopy). Neither of these tests is part of a routine breed eye screening exam.

I. Cataract

A partial or complete opacity of the lens and/or its capsule. In cases where cataracts are complete and affect both eyes, blindness results. The prudent approach is to assume cataracts to be hereditary except in cases known to be associated with trauma, other causes of ocular inflammation, specific metabolic diseases, persistent pupillary membrane, persistent hyaloid or nutritional deficiencies. Cataracts may involve the lens completely (diffuse) or in a localized region.

J. Retinal dysplasia - folds

Linear, triangular, curved or curvilinear foci of retinal folding that may be single or multiple. When seen in puppies, this condition may partially or completely resolve with maturity. Its significance to vision is unknown. There are two other forms of retinal dysplasia (geographic, detached) which are known to be inherited in other breeds and, in their most severe form, cause blindness. The genetic relationship between folds and more severe forms of retinal dysplasia is undetermined.

K. Ceroid lipofuscinosis

A systemic metabolic disorder that affects the retina and retinal pigment epithelium with accumulation of lipopigments resulting in retinal degeneration. In Dalmatians, the age of onset is approximately 6 months.

References

1. ACVO Genetics Committee, 1999 and/or Data from CERF All-Breeds Report, 1991-1998.

OCULAR DISORDERS REPORT

DALMATIAN - 4

2. Hodgman SFJ. Abnormalities and defects in pedigree dogs: I. An investigation into the existence of abnormalities in pedigree dogs in British Isles. *J Small Anim Pract.* 1963;4:447.
3. ACVO Genetics Committee, 2005 and/or Data from CERF All-Breeds Report 2003-2004.
4. ACVO Genetics Committee, 2000-2002 and/or Data from CERF All-Breeds Report, 2000-2002.
5. ACVO Genetics Committee, 2006 and/or Data from CERF All-Breeds Report, 2001-2005.
6. Slater MR and Erb HN. Effects of risk factors and prophylactic treatment on primary glaucoma in the dog. *J Am Vet Med Assoc.* 1986 May 1;188:1028-1030.
7. Jolly RD, Palmer DN and Studdert VP. Canine ceroid-lipofuscinoses: A review and classification. *J Small Anim Pract.* 1994;35:299.
8. Goebel HH, Bilzer T, Dahme E, et al. Morphological studies in canine (Dalmatian) neuronal ceroid-lipofuscinosis. *American journal of medical genetics Supplement.* 1988;5:127-139.
9. Goebel HH and Dahme E. Ultrastructure of retinal pigment epithelial and neural cells in the neuronal ceroid-lipofuscinosis affected Dalmatian dog. *Retina.* 1986 Summer-Fall;6:179-187.
10. Goebel HH and Dahme E. Retinal ultrastructure of neuronal ceroid-lipofuscinosis in the dalmatian dog. *Acta neuropathologica.* 1985;68:224-229.

OCULAR DISORDERS REPORT DALMATIAN

Diagnostic Name	TOTAL DOGS EXAMINED		1991-1999		2000-2009		2010-2013		2014	
	#	%	#	%	#	%	#	%	#	%
GLOBE										
0.110 microphthalmia	0		1	0.1%	0		0		0	
EYELIDS										
20.140 ectopic cilia	1	0.2%	0		0		0		0	
21.000 entropion, unspecified	3	0.7%	0		2	0.3%	0		0	
22.000 ectropion, unspecified	0		1	0.1%	0		0		0	
25.110 distichiasis	8	1.8%	48	3.8%	71	9.2%	10	4.4%		
NASOLACRIMAL										
32.110 imperforate lower nasolacrimal punctum	1	0.2%	0		0		0		0	
NICTITANS										
52.110 prolapsed gland of the third eyelid	0		1	0.1%	0		0		0	
CORNEA										
70.210 corneal pannus	0		1	0.1%	0		0		0	
70.700 corneal dystrophy	10	2.2%	31	2.4%	33	4.3%	6	2.6%		
70.730 corneal endothelial degeneration	2	0.4%	0		0		0		0	
UVEA										
93.110 iris hypoplasia	0		29	2.3%	21	2.7%	10	4.4%		
93.120 iris cyst	0		3	0.2%	0		0		0	
93.150 iris coloboma	0		11	0.9%	1	0.1%	3	1.3%		
93.710 persistent pupillary membranes, iris to iris	4	0.9%	11	0.9%	5	0.6%	1	0.4%		
93.720 persistent pupillary membranes, iris to lens	0		1	0.1%	1	0.1%	1	0.4%		
93.730 persistent pupillary membranes, iris to cornea	3	0.7%	1	0.1%	1	0.1%	1	0.4%		
93.740 persistent pupillary membranes, iris sheets	0		1	0.1%	0		0		0	
93.750 persistent pupillary membranes, lens pigment foci/no strands	0		0		0		2	0.9%		
LENS										
100.200 cataract, unspecified	1	0.2%	0		0		0		0	
100.210 cataract, significance unknown	6	1.3%	23	1.8%	14	1.8%	11	4.8%		
100.301 punctate cataract, anterior cortex	2	0.4%	2	0.2%	2	0.3%	0			
100.302 punctate cataract, posterior cortex	0		2	0.2%	2	0.3%	1	0.4%		
100.303 punctate cataract, equatorial cortex	1	0.2%	3	0.2%	1	0.1%	1	0.4%		
100.306 punctate cataract, nucleus	0		2	0.2%	1	0.1%	0			
100.307 punctate cataract, capsular	0		1	0.1%	0		0		0	
100.311 incipient cataract, anterior cortex	3	0.7%	9	0.7%	4	0.5%	0			
100.312 incipient cataract, posterior cortex	1	0.2%	6	0.5%	4	0.5%	0			
100.313 incipient cataract, equatorial cortex	1	0.2%	6	0.5%	3	0.4%	1	0.4%		
100.314 incipient cataract, anterior sutures	0		3	0.2%	0		0		0	
100.315 incipient cataract, posterior sutures	0		1	0.1%	0		0		0	
100.316 incipient cataract, nucleus	0		2	0.2%	3	0.4%	0		0	
100.317 incipient cataract, capsular	0		2	0.2%	0		0		0	
100.321 incomplete cataract, anterior cortex	0		0		1	0.1%	1	0.4%		
100.322 incomplete cataract, posterior cortex	0		0		1	0.1%	0		0	
100.327 incomplete cataract, capsular	0		0		0		1	0.4%		
100.330 generalized/complete cataract	2	0.4%	4	0.3%	0		0		0	
100.340 resorbing/hypermature cataract	0		0		0		1	0.4%		
100.375 subluxation/luxation, unspecified	0		4	0.3%	0		0		0	

OCULAR DISORDERS REPORT DALMATIAN

	1991-1999	2000-2009	2010-2013	2014
VITREOUS				
110.135 PHPV/PTVL	0	2 0.2%	0	0
110.200 vitritis	0	0	0	1 0.4%
110.320 vitreous degeneration syneresis	1 0.2%	11 0.9%	8 1.0%	2 0.9%
110.330 vitreous degeneration anterior chamber	0	5 0.4%	1 0.1%	0
FUNDUS				
97.110 choroidal hypoplasia	1 0.2%	0	0	0
RETINA				
120.170 retinal dysplasia, folds	1 0.2%	9 0.7%	2 0.3%	0
120.200 retinitis	0	0	0	1 0.4%
120.310 generalized progressive retinal atrophy (PRA)	1 0.2%	4 0.3%	0	0
120.400 retinal hemorrhage	0	1 0.1%	0	0
120.910 retinal detachment without dialysis	1 0.2%	0	0	0
OPTIC NERVE				
130.110 micropapilla	0	1 0.1%	0	0
OTHER				
900.000 other, unspecified	0	12 0.9%	31 4.0%	0
900.100 other, not inherited	2 0.4%	85 6.7%	17 2.2%	13 5.7%
900.110 other, suspected as inherited	23 5.1%	51 4.0%	12 1.6%	1 0.4%
NORMAL				
0.000 normal globe	383 84.4%	1066 83.4%	652 84.2%	199 87.3%

OCULAR DISORDERS REPORT

DANDIE DINMONT TERRIER - 1

DANDIE DINMONT TERRIER

DISORDER	INHERITANCE	REFERENCE	BREEDING ADVICE
A. Persistent pupillary membranes			
- iris to iris	Not defined	1, 2	Breeder option
- all other forms	Not defined	2	NO

Description and Comments

A. Persistent pupillary membranes (PPM)

Persistent blood vessel remnants in the anterior chamber of the eye which fail to regress normally by 3 months of age. These strands may bridge from iris to iris, iris to cornea, iris to lens, or form sheets of tissue in the anterior chamber. The last three forms pose the greatest threat to vision and when severe, vision impairment or blindness may occur.

References

There are no references providing detailed descriptions of hereditary ocular conditions of the Dandie Dinmont Terrier breed. The conditions listed above are generally recognized to exist in this breed, as evidenced by identification on breed eye screening examinations and/or clinical experience of veterinary ophthalmologists.

1. ACVO Genetics Committee, 2000-2002 and/or Data from CERF All-Breeds Report, 2000-2002.
2. ACVO Genetics Committee, 2005 and/or Data from CERF All-Breeds Report 2003-2004.

OCULAR DISORDERS REPORT DANDIE DINMONT

Diagnostic Name	TOTAL DOGS EXAMINED		1991-1999		2000-2009		2010-2013		2014	
	#	%	#	%	#	%	#	%	#	%
GLOBE										
0.110 microphthalmia	0		1	1.1%	0		0		0	
10.000 glaucoma	1	1.1%	0		0		0		0	
EYELIDS										
25.110 distichiasis	2	2.3%	4	4.5%	13	19.4%	2	40.0%		
CORNEA										
70.700 corneal dystrophy	2	2.3%	2	2.2%	2	3.0%	0			
UVEA										
93.120 iris cyst	0		0		1	1.5%	0			
93.170 anterior chamber cyst	0		0		1	1.5%	0			
93.710 persistent pupillary membranes, iris to iris	9	10.3%	11	12.4%	4	6.0%	1	20.0%		
93.720 persistent pupillary membranes, iris to lens	1	1.1%	0		0		0			
93.750 persistent pupillary membranes, lens pigment foci/no strands	0		0		1	1.5%	1	20.0%		
LENS										
100.200 cataract, unspecified	4	4.6%	0		0		0		0	
100.210 cataract, significance unknown	10	11.5%	8	9.0%	8	11.9%	2	40.0%		
100.301 punctate cataract, anterior cortex	0		0		1	1.5%	0			
100.302 punctate cataract, posterior cortex	0		1	1.1%	2	3.0%	0			
100.303 punctate cataract, equatorial cortex	0		0		1	1.5%	0			
100.305 punctate cataract, posterior sutures	0		1	1.1%	0		0			
100.307 punctate cataract, capsular	0		1	1.1%	2	3.0%	0			
100.311 incipient cataract, anterior cortex	1	1.1%	0		1	1.5%	0			
100.312 incipient cataract, posterior cortex	0		1	1.1%	0		0			
100.330 generalized/complete cataract	2	2.3%	3	3.4%	0		0			
100.375 subluxation/luxation, unspecified	0		1	1.1%	0		0			
VITREOUS										
110.120 persistent hyaloid artery/remnant	2	2.3%	1	1.1%	0		0			
OTHER										
900.000 other, unspecified	0		0		6	9.0%	0			
900.100 other, not inherited	1	1.1%	5	5.6%	0		0			
900.110 other, suspected as inherited	0		0		1	1.5%	0			
NORMAL										
0.000 normal globe	58	66.7%	67	75.3%	48	71.6%	4	80.0%		

OCULAR DISORDERS REPORT

DOBERMAN PINSCHER - 1

DOBERMAN PINSCHER

	DISORDER	INHERITANCE	REFERENCE	BREEDING ADVICE
A.	Microphthalmia with multiple ocular defects	Not defined	1-5	NO
B.	Distichiasis	Not defined	1	Breeder option
C.	Persistent pupillary membranes			
	- iris to iris	Not defined	1, 6	Breeder option
	- iris to lens	Not defined	6	NO
	- all other forms	Not defined	6	NO
D.	Cataract	Not defined	1	NO
E.	Persistent hyperplastic primary vitreous/Persistent hyperplastic tunica vasculosa lentis (PHPV/PHTVL)	Presumed dominant/incomplete penetrance	1, 7-15	NO
F.	Retinal dysplasia - folds	Not defined	1	Breeder option
G.	Ligneous conjunctivitis		16	NO

Description and Comments

A. Microphthalmia with multiple ocular defects

Microphthalmia is a congenital defect characterized by a small eye often associated with defects of the cornea, iris (coloboma), anterior chamber, lens (cataract) and/or retina (retinal dysplasia). Note that this syndrome is distinct from E. PHPV/PHTVL which may also be associated with microphthalmia.

B. Distichiasis

Eyelashes abnormally located on the eyelid margin which may cause ocular irritation. Distichiasis may occur at any time. It is difficult to make a strong recommendation with regards to breeding dogs with this entity. The hereditary basis has not been established although it seems probable due to the high incidence in some breeds. Reducing the

©2014, American College of Veterinary Ophthalmologists

OCULAR DISORDERS REPORT

DOBERMAN PINSCHER - 2

incidence is a logical goal. When diagnosed, distichiasis should be recorded and breeding discretion is advised.

C. Persistent pupillary membranes (PPM)

Persistent blood vessel remnants in the anterior chamber of the eye which fail to regress normally by 3 months of age. These strands may bridge from iris to iris, iris to cornea, iris to lens, or form sheets of tissue in the anterior chamber. The last three forms pose the greatest threat to vision and when severe, vision impairment or blindness may occur.

D. Cataract

Lens opacity which may affect one or both eyes and may involve the lens partially or completely. In cases where cataracts are complete and affect both eyes, blindness results. The prudent approach is to assume cataracts to be hereditary except in cases known to be associated with trauma, other causes of ocular inflammation, specific metabolic diseases, persistent pupillary membranes, persistent hyaloid or nutritional deficiencies.

Cataracts have been infrequently observed in the Doberman Pinscher and there is no specific location attributed to cataracts within the Doberman lens. Most cataracts are bilateral, usually observed within the first two years of life, and may cause significant vision loss.

E. Persistent hyperplastic primary vitreous (PHPV)/Persistent hyperplastic tunica vasculosa lentis (PHTVL)

Persistent hyperplastic primary vitreous is a congenital defect resulting from abnormalities in the development and regression of the hyaloid artery (the primary vitreous) and the interaction of this blood vessel with the posterior lens capsule/cortex during embryogenesis. This condition is often associated with persistent hyperplastic tunica vasculosa lentis which results from failure of regression of the embryologic vascular network which surrounds the developing lens.

The condition in the Doberman includes a spectrum of malformations ranging from spots of pigment on the posterior surface of the lens to posterior lenticonus, cataract and a dense fibrous plaque on the posterior surface of the lens. In the more severe forms, partial or complete vision impairment occurs. PHPV has been extensively studied in the Doberman in Europe. This disorder has been observed occasionally in the Doberman in the United States.

F. Retinal dysplasia - folds

Linear, triangular, curved or curvilinear foci of retinal folding that may be single or multiple. When seen in puppies, this condition may partially or completely resolve with maturity. Its significance to vision is unknown. There are two other forms of retinal dysplasia (geographic, detached) which are known to be inherited in other breeds and,

OCULAR DISORDERS REPORT

DOBERMAN PINSCHER - 3

in their most severe form, cause blindness. The genetic relationship between folds and more severe forms of retinal dysplasia is undetermined.

G. Ligneous conjunctivitis

A rare type of conjunctivitis characterized by the formation of thick membranes covering conjunctiva of the nictitans and eyelids of affected dogs. This condition has been diagnosed in four unrelated Doberman Pinschers, three of which had life-threatening systemic disease. Ligneous conjunctivitis has also been reported in one Yorkshire terrier.

References

1. ACVO Genetics Committee, 1999 and/or Data from CERF All-Breeds Report, 1991-1998.
2. Arnvjerg J and Jensen OA. Spontaneous microphthalmia in two Doberman puppies with anterior chamber cleavage syndrome. *J Am Anim Hosp Assoc.* 1982;18:481.
3. Bergsjø T, Arnesen K, Heim P, et al. Congenital blindness with ocular developmental anomalies, including retinal dysplasia, in Doberman Pinscher dogs. *J Am Vet Med Assoc.* 1984 Jun 1;184:1383-1386.
4. Peiffer RL, Jr. and Fischer CA. Microphthalmia, retinal dysplasia, and anterior segment dysgenesis in a litter of Doberman Pinschers. *J Am Vet Med Assoc.* 1983 Oct 15;183:875-878.
5. Lewis DG, Kelly DF and Sansom J. Congenital microphthalmia and other developmental ocular anomalies in the Doberman. *J Small Anim Pract.* 1986;27:559.
6. ACVO Genetics Committee, 2005 and/or Data from CERF All-Breeds Report 2003-2004.
7. van der Linde-Sipman JS, Stades FC and de Wolff-Rouen-daal D. Persistent hyperplastic tunica vasculosa lentis and persistent hyperplastic primary vitreous in the Doberman pinscher: Pathologic aspects. *J Am Anim Hosp Assoc.* 1983;19:791.
8. Stades FC. Persistent hyperplastic tunica vasculosa lentis and persistent hyperplastic primary vitreous (PHTVL/PHPV) in ninety closely related Pinschers. *J Am Anim Hosp Assoc.* 1980;16:739.
9. Stades FC. Persistent hyperplastic tunica vasculosa lentis and persistent hyperplastic primary vitreous in Doberman Pinschers: Techniques and results of surgery. *J Am Anim Hosp Assoc.* 1983;19:393.
10. Stades FC. Persistent hyperplastic tunica vasculosa lentis and persistent hyperplastic primary vitreous in Doberman Pinschers: Genetic aspects. *J Am Anim Hosp Assoc.* 1983;19:957.

OCULAR DISORDERS REPORT

DOBERMAN PINSCHER - 4

11. Boeve MH, van der Linde-Sipman JS, Stades FC, et al. Early morphogenesis of persistent hyperplastic tunica vasculosa lentis and primary vitreous. A transmission electron microscopic study. *Invest Ophthalmol Vis Sci.* 1990 Sep;31:1886-1894.
12. Boeve MH, van der Linde-Sipman JS and Stades FC. Early morphogenesis of persistent hyperplastic tunica vasculosa lentis and primary vitreous. The dog as an ontogenetic model. *Invest Ophthalmol Vis Sci.* 1988 Jul;29:1076-1086.
13. Stades FC, Boeve MH, van den Brom WE, et al. The incidence of PHTVL/PHPV in Dobermans and the results of breeding rules. *Vet Quarterly.* 1991;13:24.
14. Anderson DE. The incidence of PHTVL/PHPV in Dobermans and the results of breeding. *J Hered.* 1991;82:21.
15. Boeve MH and Stades FC. Persistent hyperplastic tunica vasculosa lentis and primary vitreous (PHTVL/PHPV) in the dog: A comparative review. *prog Vet Comp Ophthalmol.* 1992;2:163.
16. Ramsey DT, Ketring K, Glaze MB, et al. Ligneous conjunctivitis in four Doberman pinschers. *J Am Anim Hosp Assoc.* 1996;32:439-447.

OCULAR DISORDERS REPORT DOBERMAN PINSCHER

Diagnostic Name	TOTAL DOGS EXAMINED	1991-1999 1943		2000-2009 2144		2010-2013 795		2014 256	
		#	%	#	%	#	%	#	%
GLOBE									
0.110 microphthalmia		4	0.2%	1	0.0%	2	0.3%	0	
EYELIDS									
20.140 ectopic cilia		0		1	0.0%	0		0	
21.000 entropion, unspecified		3	0.2%	2	0.1%	1	0.1%	0	
22.000 ectropion, unspecified		0		1	0.0%	0		0	
25.110 distichiasis		33	1.7%	37	1.7%	12	1.5%	3	1.2%
NASOLACRIMAL									
40.910 keratoconjunctivitis sicca		0		1	0.0%	0		0	
NICTITANS									
51.100 third eyelid cartilage anomaly		3	0.2%	1	0.0%	1	0.1%	2	0.8%
52.110 prolapsed gland of the third eyelid		0		1	0.0%	6	0.8%	0	
CORNEA									
70.700 corneal dystrophy		5	0.3%	4	0.2%	1	0.1%	0	
70.730 corneal endothelial degeneration		0		3	0.1%	1	0.1%	0	
UVEA									
93.110 iris hypoplasia		0		1	0.0%	0		0	
93.120 iris cyst		1	0.1%	4	0.2%	1	0.1%	1	0.4%
93.140 corneal endothelial pigment without PPM		0		1	0.0%	1	0.1%	0	
93.150 iris coloboma		1	0.1%	0		0		0	
93.710 persistent pupillary membranes, iris to iris		44	2.3%	41	1.9%	22	2.8%	7	2.7%
93.720 persistent pupillary membranes, iris to lens		17	0.9%	14	0.7%	2	0.3%	0	
93.730 persistent pupillary membranes, iris to cornea		5	0.3%	2	0.1%	1	0.1%	0	
93.740 persistent pupillary membranes, iris sheets		3	0.2%	1	0.0%	0		0	
93.750 persistent pupillary membranes, lens pigment foci/no strands		0		2	0.1%	35	4.4%	18	7.0%
93.760 persistent pupillary membranes, endothelial opacity/no strands		0		0		2	0.3%	0	
93.810 uveal melanoma		0		1	0.0%	2	0.3%	0	
LENS									
100.200 cataract, unspecified		32	1.6%	0		0		0	
100.210 cataract, significance unknown		63	3.2%	162	7.6%	30	3.8%	15	5.9%
100.301 punctate cataract, anterior cortex		11	0.6%	2	0.1%	1	0.1%	1	0.4%
100.302 punctate cataract, posterior cortex		2	0.1%	1	0.0%	1	0.1%	0	
100.303 punctate cataract, equatorial cortex		0		1	0.0%	0		0	
100.304 punctate cataract, anterior sutures		1	0.1%	2	0.1%	0		1	0.4%
100.305 punctate cataract, posterior sutures		1	0.1%	7	0.3%	2	0.3%	0	
100.306 punctate cataract, nucleus		2	0.1%	2	0.1%	2	0.3%	0	
100.307 punctate cataract, capsular		1	0.1%	11	0.5%	6	0.8%	0	
100.311 incipient cataract, anterior cortex		3	0.2%	3	0.1%	2	0.3%	1	0.4%
100.312 incipient cataract, posterior cortex		6	0.3%	8	0.4%	3	0.4%	1	0.4%
100.313 incipient cataract, equatorial cortex		4	0.2%	3	0.1%	0		0	
100.315 incipient cataract, posterior sutures		1	0.1%	7	0.3%	0		0	
100.316 incipient cataract, nucleus		4	0.2%	8	0.4%	2	0.3%	2	0.8%
100.317 incipient cataract, capsular		0		8	0.4%	1	0.1%	1	0.4%
100.330 generalized/complete cataract		7	0.4%	5	0.2%	2	0.3%	0	

OCULAR DISORDERS REPORT DOBERMAN PINSCHER

LENS CONTINUED	1991-1999	2000-2009	2010-2013	2014
100.375 subluxation/luxation, unspecified	1 0.1%	1 0.0%	0	0
VITREOUS				
110.120 persistant hyaloid artery/remnant	12 0.6%	3 0.1%	0	2 0.8%
110.135 PHPV/PTVL	9 0.5%	17 0.8%	13 1.6%	1 0.4%
110.320 vitreous degeneration syneresis	2 0.1%	3 0.1%	4 0.5%	0
FUNDUS				
97.110 choroidal hypoplasia	2 0.1%	0	0	0
97.120 coloboma	1 0.1%	0	0	0
RETINA				
120.170 retinal dysplasia, folds	29 1.5%	56 2.6%	5 0.6%	2 0.8%
120.180 retinal dysplasia, geographic	2 0.1%	9 0.4%	1 0.1%	0
120.310 generalized progressive retinal atrophy (PRA)	5 0.3%	7 0.3%	0	0
120.910 retinal detachment without dialysis	2 0.1%	0	0	0
120.960 retinopathy	0	0	1 0.1%	0
OPTIC NERVE				
130.120 optic nerve hypoplasia	2 0.1%	0	1 0.1%	0
OTHER				
900.000 other, unspecified	0	20 0.9%	37 4.7%	0
900.100 other, not inherited	9 0.5%	149 6.9%	20 2.5%	12 4.7%
900.110 other, suspected as inherited	17 0.9%	26 1.2%	4 0.5%	2 0.8%
NORMAL				
0.000 normal globe	1691 87.0%	1801 84.0%	717 90.2%	234 91.4%

OCULAR DISORDERS REPORT

DOGUE DE BORDEAUX - 1

DOGUE DE BORDEAUX

	DISORDER	INHERITANCE	REFERENCE	BREEDING ADVICE
A.	Distichiasis	Not defined	1	Breeder option
B.	Ectropion	Not defined	2	Breeder option
C.	Persistent pupillary membranes - iris to iris	Not defined	3	Breeder option
D.	Cataract	Not defined	1	NO
E.	Multifocal retinopathy - cmr1 * a DNA test is available.	Autosomal recessive	4	Breeder option

Description and Comments

A. Distichiasis

Eyelashes abnormally located on the eyelid margin which may cause ocular irritation. Distichiasis may occur at any time in the life of a dog. It is difficult to make a strong recommendation with regard to breeding dogs with this entity. The hereditary basis has not been established although it seems probable due to the high incidence in some breeds. Reducing the incidence is a logical goal. When diagnosed, distichiasis should be recorded; breeding discretion is advised.

B. Ectropion

A conformational defect resulting in eversion of the eyelid(s), which may cause ocular irritation due to exposure. It is likely that ectropion is influenced by several genes (polygenic) defining the skin and other structures which make up the eyelids, the amount and weight of the skin covering the head and face, the orbital contents and the conformation of the skull.

C. Persistent pupillary membranes (PPM)

Persistent blood vessel remnants in the anterior chamber of the eye which fail to regress normally by 3 months of age. These strands may bridge from iris to iris, iris to cornea, iris to lens, or form sheets of tissue in the anterior chamber. The last three forms pose the greatest threat to vision and when severe, vision impairment or blindness may occur.

OCULAR DISORDERS REPORT

DOGUE DE BORDEAUX - 2

D. Cataract

A partial or complete opacity of the lens and/or its capsule. In cases where cataracts are complete and affect both eyes, blindness results. The prudent approach is to assume cataracts to be hereditary except in cases known to be associated with trauma, other causes of ocular inflammation, specific metabolic diseases, persistent pupillary membrane, persistent hyaloid or nutritional deficiencies. Cataracts may involve the lens completely (diffuse) or in a localized region.

E. Multifocal retinopathy

Canine Multi-focal Retinopathy type 1 (cmr1) is characterized by numerous distinct (i.e. multi-focal), roughly circular patches of elevated retina (multifocal bullous retinal detachments). There may be a serous subretinal fluid, or accumulation of subretinal material that produces gray-tan-pink colored lesions. These lesions, looking somewhat like blisters, vary in location and size, although typically they are present in both eyes of the affected dog.

The disease generally develops in young dogs between 11-20 weeks of age and there is minimal progression after 1 year of age. The lesions may flatten, leaving areas of retinal thinning and RPE hypertrophy, hyperplasia, and pigmentation. Discrete areas of tapetal hyper-reflectivity may be seen in areas of previous retinal and RPE detachments. Most dogs exhibit no noticeable problem with vision or electroretinographic abnormalities despite their abnormal appearing retinas.

Canine Multi-focal Retinopathy type 1 is caused by a mutation in the Bestrophin 1 gene (BEST1) and is described to be recessively inherited in the Great Pyrenees, Dogue de Bordeaux, Bullmastiff, and Mastiff. A DNA test is available.

References

There are no references providing detailed descriptions of hereditary conditions of the Dogue de Bordeaux breed. The conditions listed above are generally recognized to exist in this breed, as evidenced by identification on breed eye screening examinations and/or clinical experience of veterinary ophthalmologists.

1. ACVO Genetics Committee, 2000-2002 and/or Data from CERF All-Breeds Report, 2000-2002.
2. ACVO Genetics Committee, 2002-2003 and/or Data from CERF All-Breeds Report, 2002-2003.
3. ACVO Genetics Committee, 2006 and/or Data from CERF All-Breeds Report, 2001-2005.
4. Zangerl B, Wickstrom K, Slavik J, et al. Assessment of canine BEST1 variations identifies new mutations and establishes an independent bestrophinopathy model (cmr3). *Mol Vis*. 2010;16:2791-2804.

OCULAR DISORDERS REPORT DOGUE DE BORDEAUX

Diagnostic Name	TOTAL DOGS EXAMINED	1991-1999		2000-2009		2010-2013		2014		
		#	%	#	%	#	%	#	%	
EYELIDS										
20.160	macropalpebral fissure	0		4	2.2%	5	5.3%	0		
21.000	entropion, unspecified	1	20.0%	2	1.1%	11	11.7%	2	11.8%	
22.000	ectropion, unspecified	0		22	12.3%	6	6.4%	2	11.8%	
25.110	distichiasis	0		17	9.5%	10	10.6%	3	17.6%	
NICTITANS										
52.110	prolapsed gland of the third eyelid	0		1	0.6%	0		0		
CORNEA										
70.700	corneal dystrophy	0		3	1.7%	2	2.1%	0		
70.730	corneal endothelial degeneration	0		0		0		1	5.9%	
UVEA										
93.120	iris cyst	0		0		1	1.1%	0		
93.710	persistent pupillary membranes, iris to iris	0		8	4.5%	2	2.1%	1	5.9%	
93.720	persistent pupillary membranes, iris to lens	0		1	0.6%	0		0		
93.730	persistent pupillary membranes, iris to cornea	0		3	1.7%	1	1.1%	0		
93.750	persistent pupillary membranes, lens pigment foci/no strands	0		2	1.1%	2	2.1%	1	5.9%	
93.760	persistent pupillary membranes, endothelial opacity/no strands	0		0		0		1	5.9%	
95.120	ciliary body cyst	0		0		1	1.1%	0		
LENS										
100.210	cataract, significance unknown	0		5	2.8%	4	4.3%	0		
100.306	punctate cataract, nucleus	0		3	1.7%	1	1.1%	0		
100.311	incipient cataract, anterior cortex	0		1	0.6%	0		0		
100.316	incipient cataract, nucleus	0		0		1	1.1%	0		
VITREOUS										
110.120	persistant hyaloid artery/remnant	0		1	0.6%	0		0		
RETINA										
120.170	retinal dysplasia, folds	1	20.0%	3	1.7%	1	1.1%	1	5.9%	
120.200	retinitis	0		0		0		1	5.9%	
OTHER										
900.000	other, unspecified	0		4	2.2%	2	2.1%	0		
900.100	other, not inherited	0		10	5.6%	1	1.1%	1	5.9%	
900.110	other, suspected as inherited	0		2	1.1%	1	1.1%	0		
NORMAL										
0.000	normal globe	3	60.0%	133	74.3%	63	67.0%	13	76.5%	

OCULAR DISORDERS REPORT

ENGLISH COCKER SPANIEL - 1

ENGLISH COCKER SPANIEL

	DISORDER	INHERITANCE	REFERENCE	BREEDING ADVICE
A.	Keratoconjunctivitis Sicca (dry eye)	Not defined	1	NO
B.	Distichiasis	Not defined	2	Breeder option
C.	Ectropion	Not defined	2	Breeder option
D.	Imperforate lacrimal punctum	Not defined	2	Breeder option
E.	Corneal dystrophy - epithelial/stromal	Not defined	3	Breeder option
F.	Persistent pupillary membranes			
	- iris to iris	Not defined	2, 3	Breeder option
	- iris to cornea	Not defined	4	NO
	- all other forms	Not defined	3	NO
G.	Glaucoma	Not defined	2, 5, 6	NO
H.	Cataract	Not defined	2, 7-10	NO
I.	Retinal dysplasia - folds	Presumed autosomal recessive	2, 11	Breeder option
J.	Retinal atrophy - generalized (<i>prcd</i>) * a DNA test is available	Autosomal recessive	2, 12-15	NO
K.	Central progressive retinal atrophy	Not defined	16	NO

Description and Comments

A. Keratoconjunctivitis sicca (KCS) / dry eye

An abnormality of the tear film, most commonly a deficiency of the aqueous portion,

©2014, American College of Veterinary Ophthalmologists

OCULAR DISORDERS REPORT

ENGLISH COCKER SPANIEL - 2

although the mucin and/or lipid layers may be affected; results in ocular irritation and/or vision impairment.

B. Distichiasis

Eyelashes abnormally located on the eyelid margin which may cause ocular irritation. Distichiasis may occur at any time in the life of a dog. It is difficult to make a strong recommendation with regard to breeding dogs with this entity. The hereditary basis has not been established, although it seems probable due to the high incidence in some breeds. Reducing the incidence is a logical goal. When diagnosed, distichiasis should be recorded; breeding discretion is advised.

C. Ectropion

A conformational defect resulting in eversion of the eyelids which may cause ocular irritation. It is likely that ectropion is influenced by several genes (polygenic) defining the skin and other structures which make up the eyelids, the amount and weight of the skin covering the head and face, the orbital contents and the conformation of the skull.

D. Imperforate lacrimal punctum

A developmental anomaly resulting in failure of opening of the lacrimal duct located at the medial lid margins. The lower punctum is more frequently affected. This defect usually results in epiphora, an overflow of tears onto the face.

E. Corneal dystrophy - epithelial/stromal

A non-inflammatory corneal opacity (white to gray) present in one or more of the corneal layers; usually inherited and bilateral. In these dogs, lesions are circular or semicircular central crystalline deposits in the anterior corneal stroma that appear between 2 and 5 years of age. It may be associated with exophthalmos and lagophthalmos common in these dogs.

F. Persistent pupillary membranes (PPM)

Persistent blood vessel remnants in the anterior chamber of the eye which fail to regress normally by 3 months of age. These strands may bridge from iris to iris, iris to cornea, iris to lens, or form sheets of tissue in the anterior chamber. The last three forms pose the greatest threat to vision and when severe, vision impairment or blindness may occur.

In the English Cocker Spaniel, this is a particularly serious problem as the majority of ppm's identified on routine screening examination bridge from the iris to the cornea and are associated with corneal opacities which may result in vision impairment.

G. Glaucoma

Glaucoma is characterized by an elevation of intraocular pressure (IOP) which, when sustained, causes intraocular damage resulting in blindness. The elevated intraocular pressure occurs because the fluid cannot leave through the iridocorneal angle. Diagnosis

OCULAR DISORDERS REPORT

ENGLISH COCKER SPANIEL - 3

and classification of glaucoma requires measurement of the IOP (tonometry) and examination of the iridocorneal angle (gonioscopy). Neither of these tests is part of a routine screening exam for certification.

Glaucoma in the English Cocker Spaniel is recognized in England. The frequency and significance of this disease in the breed in the United States is not known, but is probably low.

H. Cataract

A partial or complete opacity of the lens and/or its capsule. In cases where cataracts are complete and affect both eyes, blindness results. The prudent approach is to assume cataracts to be hereditary except in cases known to be associated with trauma, other causes of ocular inflammation, specific metabolic diseases, persistent pupillary membrane, persistent hyaloid or nutritional deficiencies. Cataracts may involve the lens completely (diffuse) or in a localized region.

Congenital cataracts have been reported in red cocker spaniels, presumably English Cocker Spaniels, in Denmark. The cataracts affected the anterior capsule; in some cases the cortex and/or nucleus were opaque. Associated findings in some dogs were persistent pupillary membrane (PPM) and/or microphthalmia. It is likely that these cataracts are part of a syndrome characterized by multiple congenital ocular anomalies. The condition is familial, but a specific mode of inheritance has not been defined.

I. Retinal dysplasia - folds

Linear, triangular, curved or curvilinear foci of retinal folding that may be single or multiple. When seen in puppies, this condition may partially or completely resolve with maturity. Its significance to vision is unknown. There are two other forms of retinal dysplasia (geographic, detached) which are known to be inherited in other breeds and, in their most severe form, cause blindness. The genetic relationship between folds and more severe forms of retinal dysplasia is undetermined.

J. Retinal atrophy - generalized (*prcd*)

A degenerative disease of the retinal visual cells which progresses to blindness. This abnormality, also known as progressive retinal atrophy or PRA, may be detected by electroretinogram (not part of a routine eye screening examination) before it is apparent clinically. PRA is inherited as an autosomal recessive trait in most breeds.

This photoreceptor degeneration is characterized by slow death of visual cells following their normal development. The disease begins clinically with signs of night blindness followed by day blindness. Early fundus abnormalities usually appear after 4 years of age. The ERG (electroretinogram) shows marked functional abnormalities indicative of a progressive rod-cone degeneration after 18 months of age.

Studies have shown that PRA in the English Cocker Spaniel is inherited as autosomal recessive. The mutation is allelic to that present in Miniature Poodles, Portuguese Water

OCULAR DISORDERS REPORT

ENGLISH COCKER SPANIEL - 4

Dogs, Labrador Retrievers and American Cocker Spaniels. The locus is termed the progressive rod-cone degeneration (*prcd*) gene. A marker-based linkage test is now available for early diagnosis. The test identifies genetically normal dogs (Type A) with 100% accuracy. The carrier state (type B) will not be affected but may produce PRA bred to an affected dog. The affected (Type C) is at risk for developing PRA. ERG testing is recommended to confirm this. In both type B and type C, false allele readings may lead to misdiagnosis. Current efforts are under research to eliminate these false readings.

K. Central progressive retinal atrophy (CPRA)

A progressive retinal degeneration in which photoreceptor degeneration occurs secondary to disease of the underlying pigment epithelium. Progression is slow and some animals may never lose vision. CPRA is a frequent occurrence in England, but is uncommon elsewhere.

CPRA is characterized by the appearance of brown spots and patches primarily in the tapetal fundus and retinal degeneration. These areas are created by an accumulation of autofluorescent lipopigment within the retinal pigment epithelium cells. These changes are consistent with retinal changes observed in Vitamin E deficiency. Neurologic signs including ataxia and proprioceptive deficits have also been identified in affected dogs.

In the English Cocker Spaniel, retinal lesions of CPRA have been related to an underlying abnormal metabolism of Vitamin E resulting in a systemic deficiency.

References

1. Sanchez RF, Innocent G, Mould J, et al. Canine keratoconjunctivitis sicca: disease trends in a review of 229 cases. *J Small Anim Pract.* 2007 Apr;48:211-217.
2. ACVO Genetics Committee, 1999 and/or Data from CERF All-Breeds Report, 1991-1998.
3. ACVO Genetics Committee, 2005 and/or Data from CERF All-Breeds Report 2003-2004.
4. ACVO Genetics Committee, 2009 and/or Data from CERF All-Breeds Report, 2008.
5. Strande A, Nicolaissen B and Bjerkas I. Persistent pupillary membrane and congenital cataract in a litter of English cocker spaniels. *J Small Anim Pract.* 1988;29:257-260.
6. Bedford PG. A gonioscopic study of the iridocorneal angle in the English and America breeds of Cocker Spaniel and the Bassest Hound. *J Small Anim Pract.* 1977;18:631-642.
7. Bedford PG. The aetiology of primary glaucoma in the dog. *J Small Anim Pract.* 1975 Apr;16:217-239.
8. Olesen HP, Jensen OA and Norn MS. Congenital hereditary cataract in Cocker Spaniels. *J Small Anim Pract.* 1974 Dec;15:741-750.
9. Engelhardt A, Stock KF, Hamann H, et al. A retrospective study on the prevalence of primary cataracts in two pedigrees from the German population of English Cocker Spaniels. *Vet*

OCULAR DISORDERS REPORT

ENGLISH COCKER SPANIEL - 5

Ophthalmol. 2008 Jul-Aug;11:215-221.

10. Barnett KC. The diagnosis and differential diagnosis of cataract in the dog. *J Small Anim Pract.* 1985;26:305.
11. ACVO Genetics Committee, 2006 and/or Data from CERF All-Breeds Report, 2001-2005.
12. Aguirre GD and Acland GM. Variation in retinal degeneration phenotype inherited at the prcd locus. *Exp Eye Res.* 1988 May;46:663-687.
13. Gould DJ, Petersen-Jones SM, Lin CT, et al. Cloning of canine rom-1 and its investigation as a candidate gene for generalized progressive retinal atrophies in dogs. *Anim Genet.* 1997 Dec;28:391-396.
14. Aguirre GD and Acland GM. Progressive retinal atrophy in the English cocker spaniel. *Trans Am Coll Vet Ophthalmol.* 1983;14:104.
15. Zangerl B, Goldstein O, Philp AR, et al. Identical mutation in a novel retinal gene causes progressive rod-cone degeneration in dogs and retinitis pigmentosa in humans. *Genomics.* 2006 Nov;88:551-563.
16. McLellan GJ, Elks R, Lybaert P, et al. Vitamin E deficiency in dogs with retinal pigment epithelial dystrophy. *Vet Rec.* 2002, 151 (22)663-667.

OCULAR DISORDERS REPORT ENGLISH COCKER SPANIEL

Diagnostic Name	TOTAL DOGS EXAMINED		1991-1999 6339		2000-2009 3660		2010-2013 598		2014 182	
	#	%	#	%	#	%	#	%	#	%
GLOBE										
0.110 microphthalmia	11	0.2%	3	0.1%	0		0		0	
10.000 glaucoma	1	0.0%	0		0		0		0	
EYELIDS										
20.110 eyelid dermoid	1	0.0%	0		0		0		0	
20.140 ectopic cilia	3	0.0%	2	0.1%	1	0.2%	1	0.2%	0	
20.160 macropalpebral fissure	2	0.0%	0		1	0.2%	1	0.2%	0	
21.000 entropion, unspecified	27	0.4%	13	0.4%	4	0.7%	4	0.7%	0	
22.000 ectropion, unspecified	60	0.9%	33	0.9%	1	0.2%	1	0.2%	2	1.1%
25.110 distichiasis	1008	15.9%	777	21.2%	109	18.2%	109	18.2%	31	17.0%
NASOLACRIMAL										
32.110 imperforate lower nasolacrimal punctum	15	0.2%	0		0		0		1	0.5%
40.910 keratoconjunctivitis sicca	4	0.1%	6	0.2%	2	0.3%	2	0.3%	0	
NICTITANS										
52.110 prolapsed gland of the third eyelid	2	0.0%	2	0.1%	2	0.3%	2	0.3%	0	
CORNEA										
70.210 corneal pannus	8	0.1%	2	0.1%	0		0		0	
70.220 pigmentary keratitis	1	0.0%	9	0.2%	0		0		0	
70.700 corneal dystrophy	44	0.7%	39	1.1%	9	1.5%	9	1.5%	2	1.1%
70.730 corneal endothelial degeneration	31	0.5%	5	0.1%	1	0.2%	1	0.2%	0	
UVEA										
90.250 pigmentary uveitis	0		1	0.0%	0		0		0	
93.120 iris cyst	3	0.0%	2	0.1%	0		0		0	
93.140 corneal endothelial pigment without PPM	0		6	0.2%	0		0		0	
93.150 iris coloboma	2	0.0%	0		0		0		0	
93.710 persistent pupillary membranes, iris to iris	46	0.7%	67	1.8%	14	2.3%	14	2.3%	3	1.6%
93.720 persistent pupillary membranes, iris to lens	26	0.4%	11	0.3%	2	0.3%	2	0.3%	1	0.5%
93.730 persistent pupillary membranes, iris to cornea	121	1.9%	56	1.5%	7	1.2%	7	1.2%	0	
93.740 persistent pupillary membranes, iris sheets	6	0.1%	4	0.1%	0		0		0	
93.750 persistent pupillary membranes, lens pigment foci/no strands	0		0		20	3.3%	20	3.3%	8	4.4%
93.760 persistent pupillary membranes, endothelial opacity/no strands	0		7	0.2%	7	1.2%	7	1.2%	2	1.1%
LENS										
100.200 cataract, unspecified	172	2.7%	0		0		0		0	
100.210 cataract, significance unknown	311	4.9%	292	8.0%	41	6.9%	41	6.9%	16	8.8%
100.301 punctate cataract, anterior cortex	58	0.9%	31	0.8%	7	1.2%	7	1.2%	1	0.5%
100.302 punctate cataract, posterior cortex	25	0.4%	21	0.6%	3	0.5%	3	0.5%	0	
100.303 punctate cataract, equatorial cortex	8	0.1%	11	0.3%	1	0.2%	1	0.2%	0	
100.304 punctate cataract, anterior sutures	9	0.1%	2	0.1%	0		0		0	
100.305 punctate cataract, posterior sutures	14	0.2%	15	0.4%	2	0.3%	2	0.3%	1	0.5%
100.306 punctate cataract, nucleus	13	0.2%	7	0.2%	1	0.2%	1	0.2%	1	0.5%
100.307 punctate cataract, capsular	0		7	0.2%	0		0		0	
100.311 incipient cataract, anterior cortex	71	1.1%	53	1.4%	3	0.5%	3	0.5%	1	0.5%
100.312 incipient cataract, posterior cortex	75	1.2%	47	1.3%	8	1.3%	8	1.3%	2	1.1%
100.313 incipient cataract, equatorial cortex	48	0.8%	32	0.9%	4	0.7%	4	0.7%	1	0.5%

OCULAR DISORDERS REPORT ENGLISH COCKER SPANIEL

LENS CONTINUED	1991-1999		2000-2009		2010-2013		2014	
100.314 incipient cataract, anterior sutures	4	0.1%	4	0.1%	0		0	
100.315 incipient cataract, posterior sutures	14	0.2%	10	0.3%	0		0	
100.316 incipient cataract, nucleus	28	0.4%	27	0.7%	4	0.7%	0	
100.317 incipient cataract, capsular	3	0.0%	11	0.3%	0		0	
100.322 incomplete cataract, posterior cortex	0		0		1	0.2%	0	
100.330 generalized/complete cataract	64	1.0%	31	0.8%	4	0.7%	0	
100.375 subluxation/luxation, unspecified	5	0.1%	3	0.1%	0		1	0.5%
VITREOUS								
110.120 persistent hyaloid artery/remnant	4	0.1%	2	0.1%	0		2	1.1%
110.135 PHPV/PTVL	2	0.0%	2	0.1%	0		0	
110.320 vitreous degeneration syneresis	12	0.2%	9	0.2%	1	0.2%	0	
110.330 vitreous degeneration anterior chamber	0		1	0.0%	1	0.2%	0	
RETINA								
120.170 retinal dysplasia, folds	59	0.9%	86	2.3%	9	1.5%	6	3.3%
120.180 retinal dysplasia, geographic	6	0.1%	4	0.1%	2	0.3%	1	0.5%
120.190 retinal dysplasia, detached	2	0.0%	0		0		0	
120.310 generalized progressive retinal atrophy (PRA)	274	4.3%	136	3.7%	13	2.2%	0	
120.400 retinal hemorrhage	2	0.0%	1	0.0%	0		0	
120.960 retinopathy	0		0		2	0.3%	0	
OPTIC NERVE								
130.110 micropapilla	2	0.0%	0		0		0	
130.120 optic nerve hypoplasia	2	0.0%	0		0		0	
130.150 optic disc coloboma	10	0.2%	3	0.1%	2	0.3%	0	
OTHER								
900.000 other, unspecified	0		18	0.5%	29	4.8%	0	
900.100 other, not inherited	24	0.4%	217	5.9%	11	1.8%	11	6.0%
900.110 other, suspected as inherited	93	1.5%	27	0.7%	4	0.7%	1	0.5%
NORMAL								
0.000 normal globe	4409	69.6%	2396	65.5%	440	73.6%	137	75.3%

OCULAR DISORDERS REPORT

ENGLISH SETTER - 1

ENGLISH SETTER

	DISORDER	INHERITANCE	REFERENCE	BREEDING ADVICE
A.	Distichiasis	Not defined	1	Breeder option
B.	Corneal dystrophy - epithelial/stromal	Not defined	1	Breeder option
C.	Persistent pupillary membranes			
	- iris to iris	Not defined	1, 2	Breeder option
	- all other forms	Not defined	2	NO
D.	Cataract	Not defined	1	NO
E.	Retinal dysplasia			
	- folds	Not defined	1	Breeder option
	- geographic	Not defined	3	NO
F.	Retinal atrophy - generalized	Presumed autosomal recessive	1, 4	NO
G.	Retinal atrophy - rod-cone dysplasia type 1 (<i>rcd4</i>) * a DNA test is available	Autosomal recessive	5	NO
H.	Ceroid lipofuscinosis	Not defined	6-10	NO

Description and Comments

A. Distichiasis

Eyelashes abnormally located on the eyelid margin which may cause ocular irritation. Distichiasis may occur at any time in the life of the dog. The hereditary basis has not been established although it seems probable due to the high incidence in some breeds. Reducing the incidence is a logical goal.

B. Corneal dystrophy - epithelial/stromal

A non-inflammatory corneal opacity (white to gray) present in one or more of the corneal

OCULAR DISORDERS REPORT

ENGLISH SETTER - 2

layers. Corneal dystrophy implies a probable inherited basis and is usually bilateral.

C. Persistent pupillary membranes (PPM)

Persistent blood vessel remnants in the anterior chamber of the eye which fail to regress normally by 3 months of age. These strands may bridge from iris to iris, iris to cornea, iris to lens, or form sheets of tissue in the anterior chamber. The last three forms pose the greatest threat to vision and when severe, vision impairment or blindness may occur.

D. Cataract

Lens opacity which may affect one or both eyes and may involve the lens partially or completely. In cases where cataracts are complete and affect both eyes, blindness results. The prudent approach is to assume cataracts to be hereditary except in cases known to be associated with trauma, other causes of ocular inflammation, specific metabolic diseases, persistent pupillary membranes, persistent hyaloid or nutritional deficiencies.

E. Retinal dysplasia - folds

Linear, triangular, curved or curvilinear foci of retinal folding that may be single or multiple. When seen in puppies, this condition may partially or completely resolve with maturity. Its significance to vision is unknown. There are two other forms of retinal dysplasia (geographic, detached) which are known to be inherited in other breeds and, in their most severe form, cause blindness. The genetic relationship between folds and more severe forms of retinal dysplasia is undetermined.

Retinal dysplasia - geographic

Any irregularly shaped area of abnormal retinal development containing both areas of thinning and areas of elevation representing folds and areas of retinal disorganization. This form may be associated with vision impairment.

F. Retinal atrophy – generalized

A degenerative disease of the retinal visual cells which progresses to blindness. This abnormality, also known as progressive retinal atrophy or PRA, may be detected by electroretinogram (not part of a routine eye screening examination) before it is apparent clinically. Except for X-linked PRA in the Siberian Husky, in all breeds studied to date, PRA is inherited as an autosomal recessive trait.

G. Rod-cone dysplasia, type 4 (*rcd4*)

A form of PRA identified in the Gordon and Irish Setter breeds. Clinical night blindness is observed on average as late as 10 years of age and progresses to total blindness. This form of PRA has been referred to as late-onset PRA (LOPRA). The disorder is caused by a mutation present in the *C2orf71* gene. A DNA test is available that will unequivocally identify genetically normal, affected and carrier dogs. The test is accurate only for this mutation and will not identify other forms of PRA.

OCULAR DISORDERS REPORT

ENGLISH SETTER - 3

H. Ceroid lipofuscinosis

An inherited disease of man and animals characterized by the accumulation of lipopigment in various tissues of the body including the eye. It results in progressive neurologic disease including blindness. (Also called Batten's disease)

References

1. ACVO Genetics Committee, 1999 and/or Data from CERF All-Breeds Report, 1991-1998.
2. ACVO Genetics Committee, 2005 and/or Data from CERF All-Breeds Report 2003-2004.
3. ACVO Genetics Committee, 2009 and/or Data from CERF All-Breeds Report, 2008.
4. Bjerkas E. Generalised progressive retinal atrophy in the English setter in Norway. *Vet Rec.* 1990 Mar 3;126:217.
5. Downs LM, Bell JS, Freeman J, et al. Late-onset progressive retinal atrophy in the Gordon and Irish Setter breeds is associated with a frameshift mutation in C2orf71. *Anim Genet.* 2012 Jun 12.
6. Jolly RD, Palmer DN and Studdert VP. Canine ceroid-lipofuscinoses: A review and classification. *J Small Anim Pract.* 1994;35:299.
7. Nilsson SE and Wrigstad A. Electrophysiology in some animal and human hereditary diseases involving the retinal pigment epithelium. *Eye.* 1997;11 (Pt 5):698-706.
8. Koppang N. Neuronal Ceroid-Lipofuscinosis in English Setters Juvenile Amaurotic Familiar Idiocy (AFI) in English Setters. *J Small Anim Pract.* 1969;10:639-644.
9. Armstrong D, Koppang N and Nilsson SE. Canine hereditary ceroid lipofuscinosis. *European neurology.* 1982;21:147-156.
10. Koppang N. The English setter with ceroid-lipofuscinosis: a suitable model for the juvenile type of ceroid-lipofuscinosis in humans. *American journal of medical genetics Supplement.* 1988;5:117-125.

OCULAR DISORDERS REPORT ENGLISH SETTER

Diagnostic Name	TOTAL DOGS EXAMINED	1991-1999		2000-2009		2010-2013		2014	
		#	%	#	%	#	%	#	%
EYELIDS									
21.000	entropion, unspecified	2	0.4%	5	0.5%	0		0	
22.000	ectropion, unspecified	2	0.4%	1	0.1%	0		0	
25.110	distichiasis	36	6.9%	29	2.8%	3	3.5%	0	
NICTITANS									
52.110	prolapsed gland of the third eyelid	0		2	0.2%	0		0	
CORNEA									
70.700	corneal dystrophy	2	0.4%	8	0.8%	0		0	
70.730	corneal endothelial degeneration	2	0.4%	1	0.1%	0		0	
UVEA									
93.120	iris cyst	0		1	0.1%	0		0	
93.710	persistent pupillary membranes, iris to iris	4	0.8%	56	5.5%	3	3.5%	0	
93.720	persistent pupillary membranes, iris to lens	2	0.4%	3	0.3%	0		0	
93.730	persistent pupillary membranes, iris to cornea	5	1.0%	2	0.2%	0		0	
LENS									
100.200	cataract, unspecified	5	1.0%	0		0		0	
100.210	cataract, significance unknown	13	2.5%	45	4.4%	4	4.7%	0	
100.301	punctate cataract, anterior cortex	2	0.4%	2	0.2%	1	1.2%	0	
100.302	punctate cataract, posterior cortex	4	0.8%	5	0.5%	1	1.2%	0	
100.305	punctate cataract, posterior sutures	0		1	0.1%	0		1	4.3%
100.306	punctate cataract, nucleus	2	0.4%	0		0		0	
100.307	punctate cataract, capsular	0		2	0.2%	0		0	
100.311	incipient cataract, anterior cortex	0		4	0.4%	0		0	
100.312	incipient cataract, posterior cortex	1	0.2%	5	0.5%	0		0	
100.313	incipient cataract, equatorial cortex	0		0		1	1.2%	0	
100.315	incipient cataract, posterior sutures	0		1	0.1%	0		0	
100.316	incipient cataract, nucleus	0		1	0.1%	0		0	
100.317	incipient cataract, capsular	0		2	0.2%	0		0	
100.330	generalized/complete cataract	1	0.2%	1	0.1%	0		0	
100.375	subluxation/luxation, unspecified	1	0.2%	0		0		0	
VITREOUS									
110.120	persistant hyaloid artery/remnant	2	0.4%	5	0.5%	0		0	
110.135	PHPV/PTVL	0		1	0.1%	0		0	
110.320	vitreous degeneration syneresis	1	0.2%	0		2	2.4%	0	
RETINA									
120.170	retinal dysplasia, folds	5	1.0%	29	2.8%	0		0	
120.180	retinal dysplasia, geographic	1	0.2%	14	1.4%	0		0	
120.190	retinal dysplasia, detached	0		1	0.1%	0		0	
120.310	generalized progressive retinal atrophy (PRA)	4	0.8%	16	1.6%	1	1.2%	0	
OPTIC NERVE									
130.110	micropapilla	0		1	0.1%	0		0	
130.120	optic nerve hypoplasia	0		1	0.1%	0		0	

OCULAR DISORDERS REPORT ENGLISH SETTER

	1991-1999	2000-2009	2010-2013	2014
OTHER				
900.000 other, unspecified	0	3 0.3%	1 1.2%	0
900.100 other, not inherited	1 0.2%	51 5.0%	1 1.2%	0
900.110 other, suspected as inherited	1 0.2%	2 0.2%	1 1.2%	0
NORMAL				
0.000 normal globe	437 83.7%	857 83.9%	78 91.8%	22 95.7%

OCULAR DISORDERS REPORT

ENGLISH SHEPHERD - 1

ENGLISH SHEPHERD

	DISORDER	INHERITANCE	REFERENCE	BREEDING ADVICE
A.	Persistent pupillary membranes - iris to iris	Not defined	1	Breeder option
B.	Retinal atrophy - generalized (<i>prcd</i>) * a DNA test is available	Autosomal recessive	*	NO

Description and Comments

A. Persistent pupillary membranes (PPM)

Persistent blood vessel remnants in the anterior chamber of the eye which fail to regress normally by 3 months of age. These strands may bridge from iris to iris, iris to cornea, iris to lens, or form sheets of tissue in the anterior chamber. The last three forms pose the greatest threat to vision and when severe, vision impairment or blindness may occur.

B. Retinal atrophy - generalized (*prcd*)

A degenerative disease of the retinal visual cells which progresses to blindness. This abnormality, also known as progressive retinal atrophy or PRA, may be detected by electroretinogram (not part of a routine eye screening examination) before it is apparent clinically. This photoreceptor degeneration is characterized by slow death of visual cells following their normal development. The disease begins clinically with signs of night blindness followed by day blindness. A DNA test is available.

References

There are no references providing detailed descriptions of hereditary ocular conditions of the English Shepherd breed. The conditions listed above are generally recognized to exist in this breed, as evidenced by identification on breed eye screening examinations and/or clinical experience of veterinary ophthalmologists.

1. ACVO Genetics Committee, 2005 and/or Data from CERF All-Breeds Report 2003-2004.

OCULAR DISORDERS REPORT ENGLISH SHEPHERD

Diagnostic Name	TOTAL DOGS EXAMINED	1991-1999		2000-2009		2010-2013		2014	
		#	%	#	%	#	%	#	%
GLOBE									
0.110 microphthalmia		2	6.7%	0		0		0	
EYELIDS									
21.000 entropion, unspecified		4	13.3%	1	1.7%	0		0	
CORNEA									
70.210 corneal pannus		0		0		1	5.9%	0	
70.700 corneal dystrophy		0		0		1	5.9%	0	
UVEA									
93.710 persistent pupillary membranes, iris to iris		1	3.3%	4	6.7%	0		0	
93.720 persistent pupillary membranes, iris to lens		0		1	1.7%	0		0	
LENS									
100.210 cataract, significance unknown		1	3.3%	0		1	5.9%	0	
100.301 punctate cataract, anterior cortex		2	6.7%	0		0		0	
100.315 incipient cataract, posterior sutures		0		1	1.7%	0		0	
100.317 incipient cataract, capsular		0		1	1.7%	0		0	
100.321 incomplete cataract, anterior cortex		0		0		2	11.8%	0	
100.322 incomplete cataract, posterior cortex		0		0		2	11.8%	1	7.1%
100.330 generalized/complete cataract		0		0		3	17.6%	1	7.1%
RETINA									
120.170 retinal dysplasia, folds		2	6.7%	0		0		0	
OTHER									
900.100 other, not inherited		0		4	6.7%	2	11.8%	2	14.3%
900.110 other, suspected as inherited		0		0		1	5.9%	0	
NORMAL									
0.000 normal globe		26	86.7%	53	88.3%	10	58.8%	13	92.9%

OCULAR DISORDERS REPORT

ENGLISH SPRINGER SPANIEL - 1

ENGLISH SPRINGER SPANIEL

	DISORDER	INHERITANCE	REFERENCE	BREEDING ADVICE
A.	Glaucoma	Not defined	1	NO
B.	Distichiasis	Not defined	2	Breeder option
C.	Entropion	Not defined	1	Breeder option
D.	Corneal dystrophy - epithelial/stromal	Not defined	1	Breeder option
E.	Persistent pupillary membranes - iris to iris - all other forms	Not defined Not defined	1, 3 3	Breeder option NO
F.	Cataract	Not defined	1	NO
G.	Persistent hyaloid artery	Not defined	4, 5	Breeder option
H.	Vitreous degeneration	Not defined	6	Breeder option
I.	Retinal dysplasia - geographic/ detached	Autosomal recessive	1, 7-11	NO
J.	Retinal atrophy - generalized * a DNA test is available	Autosomal recessive	1, 12-14	NO
K.	Retinal atrophy - cord-1 * a DNA test is available	Autosomal recessive	15	NO
L.	Retinal dysplasia - folds	Presumed autosomal recessive	1, 7-11	NO
M.	Refractive error	Not defined	16, 17	Breeder option

©2014, American College of Veterinary Ophthalmologists

OCULAR DISORDERS REPORT

ENGLISH SPRINGER SPANIEL - 2

Description and Comments

A. Glaucoma

An elevation of intraocular pressure (IOP) which, when sustained, causes intraocular damage resulting in blindness. The elevated IOP occurs when drainage of fluid through the iridocorneal angle (or filtration angle) is impaired. Diagnosis and classification of glaucoma requires measurement of IOP (tonometry) and examination of the iridocorneal angle (gonioscopy). Neither of these tests is part of a routine breed eye screening exam.

B. Distichiasis

Eyelashes abnormally located on the eyelid margin which may cause ocular irritation. Distichiasis may occur at any time in the life of a dog. It is difficult to make a strong recommendation with regard to breeding dogs with this entity. The hereditary basis has not been established although it seems probable due to the high incidence in some breeds. Reducing the incidence is a logical goal. When diagnosed, distichiasis should be recorded; breeding discretion is advised.

C. Entropion

A conformational defect resulting in an "in-rolling" of one or both of the eyelids which may cause ocular irritation. It is likely that entropion is influenced by several genes (polygenic), defining the skin and other structures which make up the eyelids, the amount and weight of the skin covering the head and face, the orbital contents, and the conformation of the skull. In the English Springer Spaniel this usually involves the lower lateral lid margin.

D. Corneal dystrophy - epithelial/stromal

A non-inflammatory corneal opacity (white to gray) present in one or more of the corneal layers. Corneal dystrophy implies a probable inherited basis and is usually bilateral.

E. Persistent pupillary membranes (PPM)

Persistent blood vessel remnants in the anterior chamber of the eye which fail to regress normally by 3 months of age. These strands may bridge from iris to iris, iris to cornea, iris to lens, or form sheets of tissue in the anterior chamber. The last three forms pose the greatest threat to vision and when severe, vision impairment or blindness may occur.

F. Cataract

Lens opacity which may affect one or both eyes and may involve the lens partially or completely. In cases where cataracts are complete and affect both eyes, blindness results. The prudent approach is to assume cataracts to be hereditary except in cases known to be associated with trauma, other causes of ocular inflammation, specific metabolic diseases, persistent pupillary membranes, persistent hyaloid or nutritional deficiencies.

Cataract in the English Springer Spaniel is reported to be a familial trait usually involving the

OCULAR DISORDERS REPORT

ENGLISH SPRINGER SPANIEL - 3

posterior subcapsular region of the lens that progresses slowly.

G. Persistent hyaloid artery (PHA)

Congenital defect resulting from abnormalities in the development and regression of the hyaloid artery. The blood vessel remnant can be present in the vitreous as a small patent vascular strand (PHA) or as a non-vascular strand that appears gray-white (persistent hyaloid remnant).

H. Vitreous degeneration

Liquefaction of the vitreous gel which may predispose to retinal detachment.

I. Retinal dysplasia - geographic, detached

Abnormal development of the retina present at birth.

Retinal dysplasia - geographic: Any irregularly shaped area of abnormal retinal development containing both areas of thinning and areas of elevation representing folds and retinal disorganization.

Retinal dysplasia - detached: Severe retinal disorganization associated with separation (detachment) of the retina.

These two forms are associated with vision impairment or blindness. Retinal dysplasia is known to be inherited in many breeds. The genetic relationship between the three forms of retinal dysplasia is not known for all breeds.

Retinal dysplasia with multiple ocular defects – A syndrome of retinal dysplasia in association with other ocular defects has been reported in English Springer Spaniels. Congenital lenticular abnormalities include colobomata, microphakia and subluxation. Glaucoma and buphthalmos are frequent. The prognosis for vision and comfort in affected eyes is guarded to poor.

J. Retinal atrophy - generalized

A degenerative disease of the retinal visual cells which progresses to blindness. This abnormality, also known as progressive retinal atrophy or PRA, may be detected by electroretinogram (not part of a routine eye screening examination) before it is apparent clinically. PRA is inherited as an autosomal recessive trait in most breeds.

PRA in the English Springer Spaniel has an onset of clinical signs at 2 to 9 years of age. For a short time it was argued there were two forms of PRA in the English Springer Spaniel. It is now agreed there is only one form which may be a variation of prcd. Pedigree analysis has shown PRA in the English Springer Spaniel to be an autosomal recessive trait. A DNA test is available.

K. Retinal atrophy - cord-1

©2014, American College of Veterinary Ophthalmologists

OCULAR DISORDERS REPORT

ENGLISH SPRINGER SPANIEL - 4

Cord1-PRA in the English Springer Spaniel has an onset of clinical signs at 2 to 9 years of age leading to blindness in most affected dogs. Cord 1-PRA in the English Springer Spaniel has been described as beginning with increased granularity of the fundus or tiny hyporeflective brown or grey patches in the far peripheral tapetum. Over time, these abnormalities become more diffuse with mottling over much of the tapetum. Vessel attenuation accompanies the more diffuse changes. In advanced cases, there is generalized tapetal hyperreflectivity and vessel attenuation. For a short time it was argued there were two forms of PRA in the English Springer Spaniel. It is now agreed there is only one form which may be a variation of prcd. Pedigree analysis has shown cord-1 in the English Springer Spaniel to be an autosomal recessive trait. A mutation in the RPGRIP1 gene in cone-rod dystrophy (cord1) was found through genetic testing to be associated with one form of PRA in English Springer Spaniels but not all clinically affected dogs have the RPGRIP1 mutation implying that other mutations have yet to be identified. A DNA test is available. The test is accurate only for this mutation and will not identify other forms of PRA. Not all dogs homozygous for the RPGRIP1 genotype demonstrate the phenotype clinically.

L. Retinal dysplasia - folds

Linear, triangular, curved or curvilinear foci of retinal folding that may be single or multiple. When seen in puppies, this condition may partially or completely resolve with maturity. Its significance to vision is unknown. There are two other forms of retinal dysplasia (geographic, detached) which are known to be inherited in other breeds and, in their most severe form, cause blindness. The genetic relationship between folds and more severe forms of retinal dysplasia is undetermined.

The relationship between folds and geographic/detached lesions has been a topic of dispute for many years. It is the consensus of the English Springer Spaniel Field Trial Association Heritable Defects Committee (the breed parent club in the United States) that none of the forms of retinal dysplasia are desirable in a breeding animal.

L. Refractive Myopia

A condition of the eye where the light that comes in does not directly focus on the retina but in front of it. In common terminology, "near-sighted". This condition has been shown to have a genetic component in English Springer Spaniels, although the exact mode of inheritance has not been determined.

References

1. ACVO Genetics Committee, 1999 and/or Data from CERF All-Breeds Report, 1991-1998.
2. ACVO Genetics Committee, 2002-2003 and/or Data from CERF All-Breeds Report, 2002-2003.
3. ACVO Genetics Committee, 2005 and/or Data from CERF All-Breeds Report 2003-2004.
4. ACVO Genetics Committee, 2006 and/or Data from CERF All-Breeds Report, 2001-2005.

©2014, American College of Veterinary Ophthalmologists

OCULAR DISORDERS REPORT

ENGLISH SPRINGER SPANIEL - 5

5. ACVO Genetics Committee, 2007 and/or Data from CERF All-Breeds Report 2002-2006.
6. ACVO Genetics Committee, 2013-2014 and Data from OFA All-Breeds Report, 2013-2014.
7. Dubielzig R, Swanson JF and Wenk EJ. Microphthalmia, cataract, lens luxation and ciliary body dysplasia in a litter of Springer spaniel pups. *Trans Am Coll Vet Ophthalmol* 1985;16.
8. Schmidt GM, et al. Inheritance of retinal dysplasia in the English Springer spaniel. *J Am Anim Hosp Assoc.* 1978;14.
9. Lavach JD, et al. Retinal dysplasia in the English Springer spaniel. *J Am Anim Hosp Assoc.* 1978;14:192.
10. O'Toole D, et al. Retinal dysplasia in English springer spaniel dogs: Light microscopy of the postnatal lesions. *Vet Pathol.* 1983;20.
11. Featherstone HF, Renwick PW, Heinrich CL, et al., editors. Syndrome of atypical multi-ocular defects in association with retinal dysplasia in the English Springer Spaniel. *Annual Meeting of the European College of Veterinary Ophthalmologists*; 2012 May 24 - 27; Trieste, Italy.
12. Barnett KC. Canine retinopathies III. The other breeds. *J Small Anim Pract.* 1965;6:185.
13. Koch S, editor. Retinopathy in the English springer spaniel: An aberrant form of PRA? *Proc Am Coll Vet Ophthalmol*; 1997.
14. Wheeler CA, editor. Inheritance of progressive retinal degeneration in the English Springer Spaniel. *Proc Am Coll Vet Ophthalmol*; 1998.
15. Narfstrom K, Jeong M, Hyman J, et al. Assessment of hereditary retinal degeneration in the English springer spaniel dog and disease relationship to an RPGRIP1 mutation. *Stem cells international.* 2012;2012:685901.
16. Kubai MA, Bentley E, Miller PE, et al. Refractive states of eyes and association between ametropia and breed in dogs. *Am J Vet Res.* 2008 Jul;69:946-951.
17. Kubai MA, Labelle AL, Hamor RE, et al. Heritability of lenticular myopia in English Springer spaniels. *Invest Ophthalmol Vis Sci.* 2013 Nov;54:7324-7328.

OCULAR DISORDERS REPORT ENGLISH SPRINGER SPANIEL

Diagnostic Name	TOTAL DOGS EXAMINED		1991-1999 15812		2000-2009 20017		2010-2013 7628		2014 1622	
	#	%	#	%	#	%	#	%	#	%
GLOBE										
0.110	microphthalmia	10	0.1%	13	0.1%	1	0.0%	1	0.1%	
10.000	glaucoma	3	0.0%	1	0.0%	1	0.0%	0		
EYELIDS										
20.110	eyelid dermoid	2	0.0%	0		0		0		
20.160	macropalpebral fissure	0		2	0.0%	1	0.0%	0		
21.000	entropion, unspecified	104	0.7%	117	0.6%	33	0.4%	9	0.6%	
22.000	ectropion, unspecified	31	0.2%	20	0.1%	5	0.1%	1	0.1%	
25.110	distichiasis	129	0.8%	170	0.8%	57	0.7%	9	0.6%	
NASOLACRIMAL										
32.110	imperforate lower nasolacrimal punctum	2	0.0%	0		0		0		
40.910	keratoconjunctivitis sicca	3	0.0%	4	0.0%	2	0.0%	1	0.1%	
NICTITANS										
52.110	prolapsed gland of the third eyelid	2	0.0%	2	0.0%	4	0.1%	0		
CORNEA										
70.210	corneal pannus	1	0.0%	3	0.0%	1	0.0%	0		
70.220	pigmentary keratitis	0		2	0.0%	1	0.0%	0		
70.700	corneal dystrophy	209	1.3%	228	1.1%	92	1.2%	12	0.7%	
70.730	corneal endothelial degeneration	4	0.0%	8	0.0%	0		0		
UVEA										
93.110	iris hypoplasia	0		3	0.0%	3	0.0%	3	0.2%	
93.120	iris cyst	0		11	0.1%	1	0.0%	1	0.1%	
93.140	corneal endothelial pigment without PPM	0		4	0.0%	0		0		
93.150	iris coloboma	10	0.1%	13	0.1%	4	0.1%	1	0.1%	
93.170	anterior chamber cyst	0		0		1	0.0%	0		
93.710	persistent pupillary membranes, iris to iris	881	5.6%	1691	8.4%	615	8.1%	133	8.2%	
93.720	persistent pupillary membranes, iris to lens	56	0.4%	38	0.2%	13	0.2%	4	0.2%	
93.730	persistent pupillary membranes, iris to cornea	47	0.3%	32	0.2%	8	0.1%	1	0.1%	
93.740	persistent pupillary membranes, iris sheets	21	0.1%	27	0.1%	0		0		
93.750	persistent pupillary membranes, lens pigment foci/no strands	0		4	0.0%	35	0.5%	8	0.5%	
93.760	persistent pupillary membranes, endothelial opacity/no strands	0		2	0.0%	14	0.2%	1	0.1%	
93.810	uveal melanoma	0		1	0.0%	1	0.0%	0		
LENS										
100.200	cataract, unspecified	97	0.6%	0		0		0		
100.210	cataract, significance unknown	286	1.8%	587	2.9%	199	2.6%	55	3.4%	
100.301	punctate cataract, anterior cortex	50	0.3%	57	0.3%	36	0.5%	4	0.2%	
100.302	punctate cataract, posterior cortex	33	0.2%	35	0.2%	19	0.2%	4	0.2%	
100.303	punctate cataract, equatorial cortex	15	0.1%	21	0.1%	9	0.1%	0		
100.304	punctate cataract, anterior sutures	5	0.0%	11	0.1%	2	0.0%	1	0.1%	
100.305	punctate cataract, posterior sutures	37	0.2%	31	0.2%	11	0.1%	3	0.2%	
100.306	punctate cataract, nucleus	9	0.1%	11	0.1%	16	0.2%	2	0.1%	
100.307	punctate cataract, capsular	3	0.0%	20	0.1%	11	0.1%	3	0.2%	
100.311	incipient cataract, anterior cortex	53	0.3%	96	0.5%	25	0.3%	4	0.2%	
100.312	incipient cataract, posterior cortex	55	0.3%	80	0.4%	37	0.5%	9	0.6%	

OCULAR DISORDERS REPORT ENGLISH SPRINGER SPANIEL

LENS CONTINUED	1991-1999	2000-2009	2010-2013	2014
100.313 incipient cataract, equatorial cortex	33 0.2%	37 0.2%	17 0.2%	4 0.2%
100.314 incipient cataract, anterior sutures	7 0.0%	12 0.1%	4 0.1%	0
100.315 incipient cataract, posterior sutures	20 0.1%	15 0.1%	6 0.1%	0
100.316 incipient cataract, nucleus	18 0.1%	29 0.1%	13 0.2%	0
100.317 incipient cataract, capsular	1 0.0%	20 0.1%	7 0.1%	0
100.321 incomplete cataract, anterior cortex	0	0	1 0.0%	2 0.1%
100.327 incomplete cataract, capsular	0	0	4 0.1%	0
100.330 generalized/complete cataract	33 0.2%	48 0.2%	3 0.0%	0
100.375 subluxation/luxation, unspecified	17 0.1%	7 0.0%	1 0.0%	2 0.1%
VITREOUS				
110.120 persistant hyaloid artery/remnant	89 0.6%	91 0.5%	33 0.4%	11 0.7%
110.135 PHPV/PTVL	12 0.1%	17 0.1%	9 0.1%	0
110.200 vitritis	0	0	1 0.0%	1 0.1%
110.320 vitreous degeneration syneresis	67 0.4%	62 0.3%	39 0.5%	16 1.0%
110.330 vitreous degeneration anterior chamber	0	4 0.0%	1 0.0%	0
FUNDUS				
97.110 choroidal hypoplasia	1 0.0%	3 0.0%	0	0
97.120 coloboma	3 0.0%	0	2 0.0%	0
RETINA				
120.170 retinal dysplasia, folds	789 5.0%	791 4.0%	192 2.5%	42 2.6%
120.180 retinal dysplasia, geographic	348 2.2%	270 1.3%	69 0.9%	10 0.6%
120.190 retinal dysplasia, detached	61 0.4%	47 0.2%	6 0.1%	3 0.2%
120.200 retinitis	0	0	0	3 0.2%
120.310 generalized progressive retinal atrophy (PRA)	165 1.0%	231 1.2%	67 0.9%	5 0.3%
120.400 retinal hemorrhage	3 0.0%	5 0.0%	0	0
120.910 retinal detachment without dialysis	34 0.2%	22 0.1%	1 0.0%	0
120.920 retinal detachment with dialysis	0	0	1 0.0%	0
120.960 retinopathy	0	0	10 0.1%	0
OPTIC NERVE				
130.110 micropapilla	0	1 0.0%	9 0.1%	1 0.1%
130.120 optic nerve hypoplasia	4 0.0%	2 0.0%	0	0
130.150 optic disc coloboma	5 0.0%	5 0.0%	3 0.0%	0
OTHER				
900.000 other, unspecified	0	98 0.5%	238 3.1%	0
900.100 other, not inherited	44 0.3%	666 3.3%	79 1.0%	58 3.6%
900.110 other, suspected as inherited	156 1.0%	47 0.2%	29 0.4%	3 0.2%
NORMAL				
0.000 normal globe	12771 80.8%	16766 83.8%	6699 87.8%	1435 88.5%

OCULAR DISORDERS REPORT

ENGLISH TOY SPANIEL - 1

ENGLISH TOY SPANIEL (King Charles, Prince Charles, Ruby, Blenheim)

	DISORDER	INHERITANCE	REFERENCE	BREEDING ADVICE
A.	Distichiasis	Not defined	1	Breeder option
B.	Entropion	Not defined	1	Breeder option
C.	Eury/Macroblepharon	Not defined	2	Breeder option
D.	Corneal dystrophy - epithelial/stromal	Not defined	1	Breeder option
E.	Exposure/Pigmentary keratitis	Not defined	3	Breeder option
F.	Persistent pupillary membranes - iris to iris	Not defined	4	Breeder option
G.	Cataract	Not defined	1	NO
H.	Persistent hyaloid artery	Not defined	1	Breeder option
I.	Persistent hyperplastic primary vitreous/Persistent hyperplastic tunica vasculosa lentis (PHPV/PHTVL)	Presumed dominant/ incomplete penetrance	1	NO
J.	Vitreous degeneration	Not defined	5	Breeder option
K.	Retinal dysplasia - folds	Presumed autosomal Recessive	1	Breeder option

OCULAR DISORDERS REPORT

ENGLISH TOY SPANIEL - 2

Description and Comments

A. Distichiasis

Eyelashes abnormally located on the eyelid margin, which may cause ocular irritation. Distichiasis may occur at any time in the life of a dog. It is difficult to make a strong recommendation with regard to breeding dogs with this entity. The hereditary basis has not been established, although it seems probable due to the high incidence in some breeds. Reducing the incidence is a logical goal. When diagnosed, distichiasis should be recorded; breeding discretion is advised.

B. Entropion

A conformational defect resulting in "in-rolling" of one or both of the eyelids which may cause ocular irritation. It is likely that entropion is influenced by several genes (polygenic), defining the skin and other structures, which make up the eyelids, the amount and weight of the skin covering the head and face, the orbital contents and the conformation of the skull.

C. Eury/Macroblepharon

Defined as an exceptionally large palpebral fissure, macroblepharon in conjunction with laxity of the lateral canthal structures may lead to lower lid ectropion and upper lid entropion. Either of these conditions may lead to severe ocular irritation.

D. Corneal dystrophy - epithelial/stromal

A non-inflammatory corneal opacity (white to gray) present in one or more of the corneal layers. Corneal dystrophy implies a probable inherited basis and is usually bilateral.

E. Persistent pupillary membranes (PPM)

Persistent blood vessel remnants in the anterior chamber of the eye which fail to regress normally by 3 months of age. These strands may bridge from iris to iris, iris to cornea, iris to lens, or form sheets of tissue in the anterior chamber. The last three forms pose the greatest threat to vision and when severe, vision impairment or blindness may occur.

F. Exposure/Pigmentary keratitis

A corneal disease involving all or part of the cornea, resulting from inadequate blinking. This results from a combination of anatomic features including shallow orbits, exophthalmos, macroblepharon and lagophthalmos.

G. Cataract

A partial or complete opacity of the lens and/or its capsule. In cases where cataracts are complete and affect both eyes, blindness results. The prudent approach is to assume cataracts to be hereditary except in cases known to be associated with trauma, other causes of ocular inflammation, specific metabolic diseases, persistent papillary membrane,

OCULAR DISORDERS REPORT

ENGLISH TOY SPANIEL - 3

persistent hyaloid or nutritional deficiencies. Cataracts may involve the lens completely (diffuse) or in a localized region.

Onset of cataract in the English Toy Spaniel is at an early age (less than 6 months), affecting the cortex and nucleus with rapid progression to complete cataract, resulting in blindness.

H. Persistent hyaloid artery (PHA)

A congenital defect resulting from abnormalities in the development and regression of the hyaloid artery. The blood vessel remnant can be present in the vitreous as a small vascular strand (PHA) or as a non-vascular strand that appears gray-white (persistent hyaloid remnant).

I. Persistent hyperplastic primary vitreous (PHPV)/Persistent hyperplastic tunica vasculosa lentis (PHTVL)

Persistent hyperplastic primary vitreous is a congenital defect resulting from abnormalities in the development and regression of the hyaloid artery (the primary vitreous) and the interaction of this blood vessel with the posterior lens capsule/cortex during embryogenesis. This condition is often associated with persistent hyperplastic tunica vasculosa lentis which results from failure of regression of the embryologic vascular network which surrounds the developing lens.

J. Vitreous degeneration

Liquefaction of the vitreous gel, which may predispose to retinal detachment

K. Retinal dysplasia - folds

Linear, triangular, curved or curvilinear foci of retinal folding that may be single or multiple. When seen in puppies, this condition may partially or completely resolve with maturity. Its significance to vision is unknown. There are two other forms of retinal dysplasia (geographic, detached) which are known to be inherited in other breeds and, in their most severe form, cause blindness. The genetic relationship between folds and more severe forms of retinal dysplasia is undetermined.

References

There are no references providing detailed descriptions of hereditary ocular conditions of the English Toy Spaniel breed. The conditions listed above are generally recognized to exist in the breed, as evidenced by identification on breed eye screening examinations and/or clinical experience of veterinary ophthalmologists.

1. ACVO Genetics Committee, 1999 and/or Data from CERF All-Breeds Report, 1991-1998.
2. ACVO Genetics Committee, 2008 and/or Data from CERF All-Breeds Report, 2003-2007.

OCULAR DISORDERS REPORT

ENGLISH TOY SPANIEL - 4

3. ACVO Genetics Committee, 2007 and/or Data from CERF All-Breeds Report 2002-2006.
4. ACVO Genetics Committee, 2013-2014 and Data from OFA All-Breeds Report, 2013-2014.
5. ACVO Genetics Committee, 2009 and/or Data from CERF All-Breeds Report, 2008.

OCULAR DISORDERS REPORT ENGLISH TOY SPANIEL

Diagnostic Name	TOTAL DOGS EXAMINED		1991-1999		2000-2009		2010-2013		2014	
	#	%	#	%	#	%	#	%	#	%
GLOBE										
0.110 microphthalmia	2	1.6%	1	0.2%	0		0		0	
EYELIDS										
20.140 ectopic cilia	0		0		1	0.3%	0		0	
20.160 macropalpebral fissure	3	2.4%	6	1.3%	1	0.3%	0		0	
21.000 entropion, unspecified	15	12.0%	33	7.4%	6	2.0%	1	0.8%		
22.000 ectropion, unspecified	3	2.4%	0		0		0		0	
25.110 distichiasis	9	7.2%	48	10.7%	38	12.8%	14	10.7%		
NASOLACRIMAL										
40.910 keratoconjunctivitis sicca	0		0		1	0.3%	0		0	
NICTITANS										
52.110 prolapsed gland of the third eyelid	1	0.8%	1	0.2%	0		0		0	
CORNEA										
70.210 corneal pannus	1	0.8%	0		0		0		0	
70.220 pigmentary keratitis	2	1.6%	9	2.0%	5	1.7%	2	1.5%		
70.700 corneal dystrophy	13	10.4%	50	11.2%	39	13.2%	19	14.5%		
70.730 corneal endothelial degeneration	0		2	0.4%	1	0.3%	1	0.8%		
UVEA										
93.710 persistent pupillary membranes, iris to iris	0		2	0.4%	4	1.4%	4	3.1%		
93.720 persistent pupillary membranes, iris to lens	0		0		0		1	0.8%		
93.730 persistent pupillary membranes, iris to cornea	0		0		1	0.3%	0			
93.750 persistent pupillary membranes, lens pigment foci/no strands	0		0		1	0.3%	2	1.5%		
LENS										
100.200 cataract, unspecified	10	8.0%	0		0		0		0	
100.210 cataract, significance unknown	6	4.8%	10	2.2%	23	7.8%	13	9.9%		
100.301 punctate cataract, anterior cortex	2	1.6%	0		0		3	2.3%		
100.302 punctate cataract, posterior cortex	5	4.0%	5	1.1%	3	1.0%	2	1.5%		
100.303 punctate cataract, equatorial cortex	0		1	0.2%	1	0.3%	1	0.8%		
100.305 punctate cataract, posterior sutures	1	0.8%	2	0.4%	0		0			
100.306 punctate cataract, nucleus	0		1	0.2%	1	0.3%	0			
100.307 punctate cataract, capsular	2	1.6%	4	0.9%	3	1.0%	3	2.3%		
100.311 incipient cataract, anterior cortex	7	5.6%	8	1.8%	4	1.4%	1	0.8%		
100.312 incipient cataract, posterior cortex	5	4.0%	11	2.5%	4	1.4%	2	1.5%		
100.313 incipient cataract, equatorial cortex	0		0		2	0.7%	0			
100.315 incipient cataract, posterior sutures	1	0.8%	0		0		0			
100.316 incipient cataract, nucleus	0		2	0.4%	6	2.0%	2	1.5%		
100.317 incipient cataract, capsular	0		10	2.2%	1	0.3%	2	1.5%		
100.321 incomplete cataract, anterior cortex	0		0		5	1.7%	0			
100.322 incomplete cataract, posterior cortex	0		0		2	0.7%	2	1.5%		
100.323 incomplete cataract, equatorial cortex	0		0		2	0.7%	0			
100.330 generalized/complete cataract	8	6.4%	8	1.8%	0		3	2.3%		
100.340 resorbing/hypermature cataract	0		0		0		2	1.5%		

OCULAR DISORDERS REPORT ENGLISH TOY SPANIEL

	1991-1999	2000-2009	2010-2013	2014
VITREOUS				
110.120 persistant hyaloid artery/remnant	15 12.0%	24 5.4%	5 1.7%	14 10.7%
110.135 PHPV/PTVL	1 0.8%	3 0.7%	5 1.7%	2 1.5%
110.320 vitreous degeneration syneresis	1 0.8%	9 2.0%	9 3.0%	2 1.5%
RETINA				
120.170 retinal dysplasia, folds	6 4.8%	38 8.5%	4 1.4%	4 3.1%
120.180 retinal dysplasia, geographic	0	3 0.7%	0	4 3.1%
120.190 retinal dysplasia, detached	0	1 0.2%	0	0
120.310 generalized progressive retinal atrophy (PRA)	0	5 1.1%	1 0.3%	0
OPTIC NERVE				
130.110 micropapilla	0	1 0.2%	0	0
130.150 optic disc coloboma	1 0.8%	0	0	0
OTHER				
900.000 other, unspecified	0	17 3.8%	38 12.8%	0
900.100 other, not inherited	0	32 7.1%	12 4.1%	14 10.7%
900.110 other, suspected as inherited	2 1.6%	9 2.0%	5 1.7%	2 1.5%
NORMAL				
0.000 normal globe	49 39.2%	271 60.5%	183 61.8%	84 64.1%

OCULAR DISORDERS REPORT

ENTLEBUCHER MOUNTAIN DOG - 1

ENTLEBUCHER MOUNTAIN DOG

	DISORDER	INHERITANCE	REFERENCE	BREEDING ADVICE
A.	Glaucoma	Not defined	1	NO
B.	Corneal dystrophy - epithelial/stromal	Not defined	2	Breeder option
C.	Persistent pupillary membranes - iris to iris	Not defined	3, 4	Breeder option
D.	Cataract	Presumed autosomal recessive	1, 5, 6	NO
E.	Retinal dysplasia - folds	Not defined	7	Breeder option
F.	Retinal atrophy - generalized (<i>prcd</i>) * a DNA test is available	Autosomal recessive	1, 6, 8, 9	NO

Description and Comments

A. Glaucoma

Glaucoma is an elevation of intraocular pressure (IOP) which, when sustained, causes intraocular damage resulting in blindness. The elevated IOP occurs because the fluid cannot leave through the iridocorneal angle. Diagnosis and classification of glaucoma requires measurement of IOP (tonometry) and examination of the iridocorneal angle (gonioscopy). Neither of these tests is part of a routine breed eye screening exam.

B. Corneal dystrophy - epithelial/stromal

A non-inflammatory corneal opacity (white to gray) present in one or more of the corneal layers; usually inherited and bilateral.

C. Persistent pupillary membranes (PPM)

Persistent blood vessel remnants in the anterior chamber of the eye which fail to regress normally by 3 months of age. These strands may bridge from iris to iris, iris to cornea, iris to

OCULAR DISORDERS REPORT

ENTLEBUCHER MOUNTAIN DOG – 2

lens, or form sheets of tissue in the anterior chamber. The last three forms pose the greatest threat to vision and when severe, vision impairment or blindness may occur.

D. Cataract

A partial or complete opacity of the lens and/or its capsule. In cases where cataracts are complete and affect both eyes, blindness results. The prudent approach is to assume cataracts to be hereditary except in cases known to be associated with trauma, other causes of ocular inflammation, specific metabolic diseases, persistent pupillary membrane, persistent hyaloid or nutritional deficiencies. Cataracts may involve the lens completely (diffuse) or in a localized region.

Cataracts in the Entlebucher generally become evident in young to middle-aged dogs (5.5 +/- 2.6 years). The opacities typically begin in the posterior subcapsular/capsular polar region along the suture lines as early as 1-2 years of age. Most dogs are affected with bilaterally symmetrical cataracts, which may or may not progress. Pedigree analysis suggests an autosomal recessive mode of inheritance.

E. Retinal dysplasia - folds

Linear, triangular, curved or curvilinear foci of retinal folding that may be single or multiple. When seen in puppies, this condition may partially or completely resolve with maturity. Its significance to vision is unknown. There are two other forms of retinal dysplasia (geographic, detached) which are known to be inherited in other breeds and, in their most severe form, cause blindness. The genetic relationship between folds and more severe forms of retinal dysplasia is undetermined.

F. Retinal atrophy - generalized (*prcd*)

A degenerative disease of the retinal visual cells which progresses to blindness. This abnormality, also known as Progressive Retinal Atrophy or PRA, may be detected by electroretinogram (not part of a routine eye screening examination) before it is apparent clinically. PRA is inherited as an autosomal recessive trait. A DNA test is available.

References

1. Spiess BM. [Inherited eye diseases in the Entlebucher mountain dog]. *Schweiz Arch Tierheilkd.* 1994;136:105-110.
2. ACVO Genetics Committee, 2009 and/or Data from CERF All-Breeds Report, 2008.
3. ACVO Genetics Committee, 2002-2003 and/or Data from CERF All-Breeds Report, 2002-2003.
4. ACVO Genetics Committee, 2005 and/or Data from CERF All-Breeds Report 2003-2004.
5. ACVO Genetics Committee, 1999 and/or Data from CERF All-Breeds Report, 1991-1998.

OCULAR DISORDERS REPORT

ENTLEBUCHER MOUNTAIN DOG - 3

6. Heitmann M, Hamann H, Brahm R, et al. Analysis of prevalence of presumed inherited eye diseases in Entlebucher Mountain Dogs. *Vet Ophthalmol.* 2005 May-Jun;8:145-151.
7. ACVO Genetics Committee, 2008 and/or Data from CERF All-Breeds Report, 2003-2007.
8. ACVO Genetics Committee, 2000-2002 and/or Data from CERF All-Breeds Report, 2000-2002.
9. Zangerl B, Goldstein O, Philp AR, et al. Identical mutation in a novel retinal gene causes progressive rod-cone degeneration in dogs and retinitis pigmentosa in humans. *Genomics.* 2006 Nov;88:551-563.

OCULAR DISORDERS REPORT ENTLEBUCHER

Diagnostic Name	TOTAL DOGS EXAMINED		1991-1999		2000-2009		2010-2013		2014	
	#	%	#	%	#	%	#	%	#	%
EYELIDS										
20.140	ectopic cilia	0		1	0.2%	0		0		0
21.000	entropion, unspecified	0		1	0.2%	0		0		0
25.110	distichiasis	5	3.6%	3	0.6%	3	1.5%	3	1.5%	0
NICTITANS										
52.110	prolapsed gland of the third eyelid	0		0		3	1.5%	3	1.5%	0
CORNEA										
70.700	corneal dystrophy	0		5	0.9%	0		0		0
UVEA										
93.120	iris cyst	0		1	0.2%	1	0.5%	1	0.5%	0
93.710	persistent pupillary membranes, iris to iris	4	2.9%	25	4.6%	14	6.8%	14	6.8%	4
93.720	persistent pupillary membranes, iris to lens	0		4	0.7%	0		0		0
93.730	persistent pupillary membranes, iris to cornea	0		2	0.4%	0		0		0
93.740	persistent pupillary membranes, iris sheets	0		1	0.2%	0		0		0
93.750	persistent pupillary membranes, lens pigment foci/no strands	0		1	0.2%	2	1.0%	2	1.0%	0
LENS										
100.210	cataract, significance unknown	2	1.5%	38	7.0%	10	4.9%	10	4.9%	3
100.301	punctate cataract, anterior cortex	1	0.7%	1	0.2%	1	0.5%	1	0.5%	0
100.302	punctate cataract, posterior cortex	5	3.6%	18	3.3%	6	2.9%	6	2.9%	1
100.303	punctate cataract, equatorial cortex	3	2.2%	2	0.4%	0		0		0
100.304	punctate cataract, anterior sutures	0		1	0.2%	0		0		0
100.305	punctate cataract, posterior sutures	2	1.5%	0		0		0		1
100.306	punctate cataract, nucleus	0		1	0.2%	2	1.0%	2	1.0%	0
100.307	punctate cataract, capsular	0		4	0.7%	1	0.5%	1	0.5%	0
100.311	incipient cataract, anterior cortex	1	0.7%	11	2.0%	0		0		0
100.312	incipient cataract, posterior cortex	10	7.3%	43	7.9%	12	5.9%	12	5.9%	1
100.313	incipient cataract, equatorial cortex	3	2.2%	6	1.1%	0		0		0
100.315	incipient cataract, posterior sutures	0		3	0.6%	1	0.5%	1	0.5%	0
100.316	incipient cataract, nucleus	0		4	0.7%	0		0		0
100.317	incipient cataract, capsular	0		9	1.7%	1	0.5%	1	0.5%	0
100.330	generalized/complete cataract	0		9	1.7%	0		0		0
100.375	subluxation/luxation, unspecified	0		1	0.2%	0		0		0
VITREOUS										
110.120	persistant hyaloid artery/remnant	1	0.7%	0		0		0		0
110.320	vitreous degeneration syneresis	0		3	0.6%	1	0.5%	1	0.5%	0
RETINA										
120.170	retinal dysplasia, folds	3	2.2%	13	2.4%	8	3.9%	8	3.9%	1
120.180	retinal dysplasia, geographic	1	0.7%	3	0.6%	2	1.0%	2	1.0%	1
120.190	retinal dysplasia, detached	0		1	0.2%	0		0		0
120.310	generalized progressive retinal atrophy (PRA)	6	4.4%	22	4.0%	2	1.0%	2	1.0%	0
120.960	retinopathy	0		0		2	1.0%	2	1.0%	0
OPTIC NERVE										
130.110	micropapilla	0		0		2	1.0%	2	1.0%	0
130.120	optic nerve hypoplasia	0		0		1	0.5%	1	0.5%	0

OCULAR DISORDERS REPORT ENTLEBUCHER

	1991-1999	2000-2009	2010-2013	2014
OTHER				
900.000 other, unspecified	0	10 1.8%	10 4.9%	0
900.100 other, not inherited	0	36 6.6%	3 1.5%	3 6.1%
900.110 other, suspected as inherited	5 3.6%	3 0.6%	0	3 6.1%
NORMAL				
0.000 normal globe	96 70.1%	410 75.4%	174 84.9%	36 73.5%

OCULAR DISORDERS REPORT

EURASIER - 1

EURASIER

	DISORDER	INHERITANCE	REFERENCE	BREEDING ADVICE
A.	Distichiasis	Not defined	1	Breeder option
B.	Glaucoma	Not defined	2	NO

Description and Comments

A. Distichiasis

Eyelashes abnormally located on the eyelid margin which may cause ocular irritation. Distichiasis may occur at any time in the life of a dog. It is difficult to make a strong recommendation with regard to breeding dogs with this entity. The hereditary basis has not been established although it seems probable due to the high incidence in some breeds. Reducing the incidence is a logical goal. When diagnosed, distichiasis should be recorded; breeding discretion is advised.

B. Glaucoma

Glaucoma is characterized by an elevation of intraocular pressure which, when sustained even for a brief period of time, causes intraocular damage resulting in blindness. The elevated intraocular pressure occurs because the fluid cannot leave through the iridocorneal angle. Diagnosis and classification of glaucoma requires measurement of IOP (tonometry) and examination of the iridocorneal angle (gonioscopy). Neither of these tests is part of a routine breed eye screening examination.

References

1. ACVO Genetics Committee, 2006 and/or Data from CERF All-Breeds Report, 2001-2005.
2. Strom AR, Hassig M, Iburg TM, et al. Epidemiology of canine glaucoma presented to University of Zurich from 1995 to 2009. Part 1: Congenital and primary glaucoma (4 and 123 cases). *Vet Ophthalmol.* 2011 Mar;14:121-126.

OCULAR DISORDERS REPORT EURASIER

Diagnostic Name	TOTAL DOGS EXAMINED	1991-1999		2000-2009		2010-2013		2014	
		#	%	#	%	#	%	#	%
EYELIDS									
25.110 distichiasis		1	33.3%	17	31.5%	12	40.0%	0	
CORNEA									
70.700 corneal dystrophy		1	33.3%	1	1.9%	0		0	
UVEA									
93.710 persistent pupillary membranes, iris to iris		0		0		1	3.3%	0	
LENS									
100.210 cataract, significance unknown		0		2	3.7%	2	6.7%	1	14.3%
100.302 punctate cataract, posterior cortex		0		0		0		1	14.3%
100.305 punctate cataract, posterior sutures		0		0		1	3.3%	0	
100.307 punctate cataract, capsular		0		0		0		1	14.3%
VITREOUS									
110.120 persistant hyaloid artery/remnant		0		0		0		1	14.3%
OTHER									
900.000 other, unspecified		0		2	3.7%	3	10.0%	0	
900.100 other, not inherited		1	33.3%	4	7.4%	0		2	28.6%
900.110 other, suspected as inherited		0		2	3.7%	0		0	
NORMAL									
0.000 normal globe		0		39	72.2%	19	63.3%	6	85.7%

OCULAR DISORDERS REPORT

FIELD SPANIEL - 1

FIELD SPANIEL

	DISORDER	INHERITANCE	REFERENCE	BREEDING ADVICE
A.	Distichiasis	Not defined	1	Breeder option
B.	Ectropion	Not defined	2	Breeder option
C.	Entropion	Not defined	2	Breeder option
D.	Eury/Macroblepharon	Not defined	3	Breeder option
E.	Persistent pupillary membranes - iris to iris	Not defined	4, 5	Breeder option
F.	Cataract	Not defined	1	NO
G.	Retinal dysplasia - folds	Not defined	1	Breeder option

Description and Comments

A. Distichiasis

Eyelashes abnormally located on the eyelid margin, which may cause ocular irritation. Distichiasis may occur at any time in the life of a dog. It is difficult to make a strong recommendation with regard to breeding dogs with this entity. The hereditary basis has not been established, although it seems probable due to the high incidence in some breeds. Reducing the incidence is a logical goal. When diagnosed, distichiasis should be recorded; breeding discretion is advised.

B. Ectropion

A conformational defect resulting in eversion of the eyelid(s), which may cause ocular irritation due to exposure. It is likely that ectropion is influenced by several genes (polygenic) defining the skin and other structures which make up the eyelids, the amount and weight of the skin covering the head and face, the orbital contents and the conformation of the skull.

OCULAR DISORDERS REPORT

FIELD SPANIEL - 2

C. Entropion

A conformational defect resulting in an "in-rolling" of one or both of the eyelids which may cause ocular irritation. It is likely that entropion is influenced by several genes (polygenic), defining the skin and other structures which make up the eyelids, the amount and weight of the skin covering the head and face, the orbital contents, and the conformation of the skull. Selection should be directed against entropion and toward a head conformation that reduces or eliminates the likelihood of the defect.

D. Eury/Macrolepharon

Defined as an exceptionally large palpebral fissure, macrolepharon in conjunction with laxity of the lateral canthal structures may lead to lower lid ectropion and upper lid entropion. Either of these conditions may lead to severe ocular irritation.

E. Persistent pupillary membranes (PPM)

Persistent blood vessel remnants in the anterior chamber of the eye which fail to regress normally by 3 months of age. These strands may bridge from iris to iris, iris to cornea, iris to lens, or form sheets of tissue in the anterior chamber. The last three forms pose the greatest threat to vision and when severe, vision impairment or blindness may occur.

F. Cataract

A partial or complete opacity of the lens and/or its capsule. In cases where cataracts are complete and affect both eyes, blindness results. The prudent approach is to assume cataracts to be hereditary except in cases known to be associated with trauma, other causes of ocular inflammation, specific metabolic diseases, persistent pupillary membrane, persistent hyaloid or nutritional deficiencies. Cataracts may involve the lens completely (diffuse) or in a localized region.

G. Retinal dysplasia - folds

Linear, triangular, curved or curvilinear foci of retinal folding that may be single or multiple. When seen in puppies, this condition may partially or completely resolve with maturity. Its significance to vision is unknown. There are two other forms of retinal dysplasia (geographic, detached) which are known to be inherited in other breeds and, in their most severe form, cause blindness. The genetic relationship between folds and more severe forms of retinal dysplasia is undetermined.

OCULAR DISORDERS REPORT

FIELD SPANIEL - 3

References

There are no references providing detailed descriptions of hereditary ocular conditions of the Field Spaniel breed. The conditions listed above are generally recognized to exist in this breed, as evidenced by identification on breed eye screening examinations and/or clinical experience of veterinary ophthalmologists.

1. ACVO Genetics Committee, 1999 and/or Data from CERF All-Breeds Report, 1991-1998.
2. ACVO Genetics Committee, 2007 and/or Data from CERF All-Breeds Report 2002-2006.
3. ACVO Genetics Committee, 2006 and/or Data from CERF All-Breeds Report, 2001-2005.
4. ACVO Genetics Committee, 2002-2003 and/or Data from CERF All-Breeds Report, 2002-2003.
5. ACVO Genetics Committee, 2005 and/or Data from CERF All-Breeds Report 2003-2004.

OCULAR DISORDERS REPORT

FIELD SPANIEL

Diagnostic Name	TOTAL DOGS EXAMINED		1991-1999		2000-2009		2010-2013		2014	
	#	%	#	%	#	%	#	%	#	%
EYELIDS										
20.160	macropalpebral fissure	0		6	0.5%	0		0		0
21.000	entropion, unspecified	0		10	0.9%	0		0		0
22.000	ectropion, unspecified	3	0.6%	7	0.6%	0		0		0
25.110	distichiasis	53	10.4%	64	5.7%	32	6.3%	8	4.6%	
NASOLACRIMAL										
32.110	imperforate lower nasolacrimal punctum	2	0.4%	0		2	0.4%	1	0.6%	
NICTITANS										
52.110	prolapsed gland of the third eyelid	0		0		1	0.2%	0		
CORNEA										
70.220	pigmentary keratitis	0		1	0.1%	0		0		0
70.700	corneal dystrophy	2	0.4%	5	0.4%	5	1.0%	6	3.4%	
70.730	corneal endothelial degeneration	0		1	0.1%	0		0		0
UVEA										
93.710	persistent pupillary membranes, iris to iris	7	1.4%	76	6.7%	40	7.9%	10	5.7%	
93.720	persistent pupillary membranes, iris to lens	1	0.2%	5	0.4%	0		0		
93.730	persistent pupillary membranes, iris to cornea	2	0.4%	3	0.3%	2	0.4%	0		
93.750	persistent pupillary membranes, lens pigment foci/no strands	0		3	0.3%	7	1.4%	5	2.9%	
93.760	persistent pupillary membranes, endothelial opacity/no strands	0		0		3	0.6%	0		
LENS										
100.200	cataract, unspecified	3	0.6%	0		0		0		0
100.210	cataract, significance unknown	31	6.1%	64	5.7%	12	2.4%	9	5.1%	
100.301	punctate cataract, anterior cortex	6	1.2%	5	0.4%	2	0.4%	1	0.6%	
100.302	punctate cataract, posterior cortex	1	0.2%	1	0.1%	1	0.2%	0		
100.304	punctate cataract, anterior sutures	1	0.2%	0		1	0.2%	0		
100.305	punctate cataract, posterior sutures	0		0		1	0.2%	0		
100.306	punctate cataract, nucleus	0		1	0.1%	1	0.2%	0		
100.307	punctate cataract, capsular	0		5	0.4%	3	0.6%	0		
100.311	incipient cataract, anterior cortex	1	0.2%	11	1.0%	2	0.4%	1	0.6%	
100.312	incipient cataract, posterior cortex	0		4	0.4%	1	0.2%	0		
100.313	incipient cataract, equatorial cortex	0		1	0.1%	0		0		
100.314	incipient cataract, anterior sutures	0		2	0.2%	0		0		
100.315	incipient cataract, posterior sutures	0		3	0.3%	1	0.2%	0		
100.316	incipient cataract, nucleus	1	0.2%	4	0.4%	2	0.4%	0		
100.317	incipient cataract, capsular	0		3	0.3%	0		0		
100.330	generalized/complete cataract	2	0.4%	0		0		0		
VITREOUS										
110.120	persistant hyaloid artery/remnant	1	0.2%	1	0.1%	0		0		0
110.135	PHPV/PTVL	0		0		2	0.4%	1	0.6%	
110.320	vitreous degeneration syneresis	0		0		0		1	0.6%	
FUNDUS										
97.120	coloboma	0		1	0.1%	0		0		0

OCULAR DISORDERS REPORT FIELD SPANIEL

	1991-1999	2000-2009	2010-2013	2014
RETINA				
120.170 retinal dysplasia, folds	65 12.7%	112 9.9%	48 9.5%	18 10.3%
120.180 retinal dysplasia, geographic	2 0.4%	5 0.4%	2 0.4%	0
120.310 generalized progressive retinal atrophy (PRA)	1 0.2%	2 0.2%	0	0
120.400 retinal hemorrhage	1 0.2%	3 0.3%	0	0
120.910 retinal detachment without dialysis	0	1 0.1%	0	0
OTHER				
900.000 other, unspecified	0	16 1.4%	31 6.1%	0
900.100 other, not inherited	0	60 5.3%	12 2.4%	14 8.0%
900.110 other, suspected as inherited	6 1.2%	3 0.3%	0	2 1.1%
NORMAL				
0.000 normal globe	355 69.3%	876 77.6%	404 79.7%	124 70.9%

OCULAR DISORDERS REPORT

FINNISH LAPPHUND - 1

FINNISH LAPPHUND

	DISORDER	INHERITANCE	REFERENCE	BREEDING ADVICE
A.	Persistent pupillary membranes - iris to iris	Not defined	1	Breeder option
B.	Cataract	Not defined	2	NO
C.	Retinal atrophy - generalized * a DNA test is available	Autosomal recessive	1, 3, 4	NO

Description and Comments

A. Persistent pupillary membranes (PPM)

Persistent blood vessel remnants in the anterior chamber of the eye which fail to regress normally by 3 months of age. These strands may bridge from iris to iris, iris to cornea, iris to lens, or form sheets of tissue in the anterior chamber. The last three forms pose the greatest threat to vision and when severe, vision impairment or blindness may occur.

B. Cataract

A partial or complete opacity of the lens and/or its capsule. In cases where cataracts are complete and affect both eyes, blindness results. The prudent approach is to assume cataracts to be hereditary except in cases known to be associated with trauma, other causes of ocular inflammation, specific metabolic diseases, persistent pupillary membrane, persistent hyaloid or nutritional deficiencies. Cataracts may involve the lens completely (diffuse) or in a localized region.

C. Retinal atrophy - generalized

A degenerative disease of the retinal visual cells which progresses to blindness. This abnormality, also known as progressive retinal atrophy or PRA, may be detected by electroretinogram (not part of a routine eye screening examination) before it is apparent clinically. PRA is inherited as an autosomal recessive trait in most breeds. A DNA test is available.

This photoreceptor degeneration is characterized by slow death of visual cells following their normal development. The disease begins clinically with signs of night blindness followed by day blindness. Early fundus abnormalities usually appear after 4 years of age. The ERG

OCULAR DISORDERS REPORT

FINNISH LAPPHUND - 2

(electroretinogram) shows marked functional abnormalities indicative of a progressive rod-cone degeneration after 18 months of age.

References

1. ACVO Genetics Committee, 2006 and/or Data from CERF All-Breeds Report, 2001-2005.
2. ACVO Genetics Committee, 2011 and/or Data from CERF All-Breeds Report, 2009.
3. Zangerl B, Goldstein O, Philp AR, et al. Identical mutation in a novel retinal gene causes progressive rod-cone degeneration in dogs and retinitis pigmentosa in humans. *Genomics*. 2006 Nov;88:551-563.
4. Aguirre-Hernandez J, Wickstrom K, Sargan DR. The Finnish lapphund retinal atrophy locus maps to the centromeric region of CFA9. *BMC veterinary research*. 2007;3:14.

OCULAR DISORDERS REPORT FINNISH LAPPHUND

Diagnostic Name	TOTAL DOGS EXAMINED		1991-1999		2000-2009		2010-2013		2014	
	#	%	#	%	#	%	#	%	#	%
EYELIDS										
25.110 distichiasis	1	3.4%	0		0		0		0	
CORNEA										
70.220 pigmentary keratitis	1	3.4%	0		0		0		0	
UVEA										
93.710 persistent pupillary membranes, iris to iris	3	10.3%	16	7.1%	25	14.0%	4	9.8%		
93.720 persistent pupillary membranes, iris to lens	0		0		1	0.6%	0			
93.730 persistent pupillary membranes, iris to cornea	0		5	2.2%	1	0.6%	0			
93.750 persistent pupillary membranes, lens pigment foci/no strands	0		0		1	0.6%	0			
LENS										
100.210 cataract, significance unknown	2	6.9%	18	8.0%	7	3.9%	4	9.8%		
100.301 punctate cataract, anterior cortex	0		0		0		1	2.4%		
100.302 punctate cataract, posterior cortex	0		1	0.4%	4	2.2%	2	4.9%		
100.305 punctate cataract, posterior sutures	1	3.4%	0		1	0.6%	0			
100.306 punctate cataract, nucleus	0		0		2	1.1%	0			
100.311 incipient cataract, anterior cortex	0		0		2	1.1%	0			
100.312 incipient cataract, posterior cortex	0		0		1	0.6%	0			
100.313 incipient cataract, equatorial cortex	0		0		1	0.6%	1	2.4%		
100.330 generalized/complete cataract	0		1	0.4%	0		0			
RETINA										
120.170 retinal dysplasia, folds	1	3.4%	6	2.7%	2	1.1%	0			
120.310 generalized progressive retinal atrophy (PRA)	0		0		0		1	2.4%		
OTHER										
900.000 other, unspecified	0		1	0.4%	9	5.0%	0			
900.100 other, not inherited	1	3.4%	12	5.3%	0		3	7.3%		
900.110 other, suspected as inherited	2	6.9%	2	0.9%	0		0			
NORMAL										
0.000 normal globe	20	69.0%	194	85.8%	155	86.6%	33	80.5%		

OCULAR DISORDERS REPORT

FINNISH SPITZ - 1

FINNISH SPITZ

	DISORDER	INHERITANCE	REFERENCE	BREEDING ADVICE
A.	Cataract	Not defined	1	NO

Description and Comments

A. Cataract

A partial or complete opacity of the lens and/or its capsule. In cases where cataracts are complete and affect both eyes, blindness results. The prudent approach is to assume cataracts to be hereditary except in cases known to be associated with trauma, other causes of ocular inflammation, specific metabolic diseases, persistent pupillary membrane, persistent hyaloid or nutritional deficiencies. Cataracts may involve the lens completely (diffuse) or in a localized region.

References

There are no references providing detailed descriptions of hereditary ocular conditions of the Finnish Spitz breed. The conditions listed above are generally recognized to exist in this breed, as evidenced by identification on breed eye screening examinations and/or clinical experience of veterinary ophthalmologists.

1. ACVO Genetics Committee, 1999 and/or Data from CERF All-Breeds Report, 1991-1998.

OCULAR DISORDERS REPORT FINNISH SPITZ

Diagnostic Name	TOTAL DOGS EXAMINED		1991-1999		2000-2009		2010-2013		2014	
	#	%	#	%	#	%	#	%	#	%
EYELIDS										
20.140 ectopic cilia	1	0.6%	0		0		0		0	
CORNEA										
70.700 corneal dystrophy	2	1.3%	0		0		0		0	
UVEA										
93.710 persistent pupillary membranes, iris to iris	0		2	2.9%	0		0		0	
93.750 persistent pupillary membranes, lens pigment foci/no strands	0		0		1	5.9%	0		0	
LENS										
100.200 cataract, unspecified	1	0.6%	0		0		0		0	
100.210 cataract, significance unknown	23	14.6%	9	13.2%	1	5.9%	0		0	
100.301 punctate cataract, anterior cortex	2	1.3%	0		0		0		0	
100.302 punctate cataract, posterior cortex	1	0.6%	0		0		0		0	
100.304 punctate cataract, anterior sutures	1	0.6%	0		0		0		0	
100.307 punctate cataract, capsular	1	0.6%	1	1.5%	0		0		0	
100.311 incipient cataract, anterior cortex	1	0.6%	0		0		0		0	
100.312 incipient cataract, posterior cortex	1	0.6%	0		0		0		0	
VITREOUS										
110.120 persistent hyaloid artery/remnant	2	1.3%	2	2.9%	0		0		0	
110.320 vitreous degeneration syneresis	3	1.9%	0		0		0		0	
RETINA										
120.170 retinal dysplasia, folds	1	0.6%	1	1.5%	0		0		0	
120.310 generalized progressive retinal atrophy (PRA)	0		4	5.9%	2	11.8%	0		0	
OTHER										
900.000 other, unspecified	0		1	1.5%	2	11.8%	0		0	
900.100 other, not inherited	0		8	11.8%	0		0		0	
900.110 other, suspected as inherited	1	0.6%	1	1.5%	0		0		0	
NORMAL										
0.000 normal globe	126	80.3%	52	76.5%	13	76.5%	3	100.0%		

OCULAR DISORDERS REPORT

FLAT-COATED RETRIEVER - 1

FLAT-COATED RETRIEVER

	DISORDER	INHERITANCE	REFERENCE	BREEDING ADVICE
A.	Glaucoma	Not defined	1, 2	NO
B.	Distichiasis	Not defined	3	Breeder option
C.	Entropion	Not defined	3	Breeder option
D.	Corneal dystrophy - epithelial/stromal	Not defined	4	Breeder option
E.	Persistent pupillary membranes - iris to iris	Not defined	4	Breeder option
F.	Cataract	Not defined	3	NO

Description and Comments

A. Glaucoma [with pectinate ligament dysplasia]

Glaucoma is characterized by an elevation of intraocular pressure (IOP) which, when sustained, causes intraocular damage resulting in blindness. The elevated IOP occurs because the fluid cannot leave through the iridocorneal angle. Diagnosis and classification of glaucoma requires measurement of the intraocular pressure (tonometry) and examination of the iridocorneal angle (gonioscopy). Neither of these tests is part of a routine breed eye screening exam.

Flat Coated Retrievers have been shown to have a higher prevalence of pectinate ligament dysplasia compared with other breeds. There is a significant association between pectinate ligament dysplasia and glaucoma in this breed. The heritability of pectinate ligament dysplasia in Flat Coated Retrievers is estimated at 0.7. Since glaucoma and pectinate ligament dysplasia are closely associated, glaucoma may also be heritable.

B. Distichiasis

Eyelashes abnormally located on the eyelid margin, which may cause ocular irritation. Distichiasis may occur at any time in the life of a dog. It is difficult to make a strong recommendation with regard to breeding dogs with this entity. The hereditary basis has not been established, although it seems probable due to the high incidence in some breeds. Reducing the incidence is a logical goal. When diagnosed, distichiasis should be recorded; breeding discretion is advised.

OCULAR DISORDERS REPORT

FLAT-COATED RETRIEVER - 2

C. Entropion

A conformational defect resulting in an "in-rolling" of one or both of the eyelids which may cause ocular irritation. It is likely that entropion is influenced by several genes (polygenic), defining the skin and other structures which make up the eyelids, the amount and weight of the skin covering the head and face, the orbital contents, and the conformation of the skull. Selection should be directed against entropion and toward head conformation that minimizes or eliminates the likelihood of the defect.

D. Corneal Dystrophy - epithelial/stromal

A non-inflammatory corneal opacity (white to gray) present in one or more of the corneal layers. Corneal dystrophy implies a probable inherited basis and is usually bilateral.

E. Persistent pupillary membranes (PPM)

Persistent blood vessel remnants in the anterior chamber of the eye which fail to regress normally by 3 months of age. These strands may bridge from iris to iris, iris to cornea, iris to lens, or form sheets of tissue in the anterior chamber. The last three forms pose the greatest threat to vision and when severe, vision impairment or blindness may occur.

F. Cataract

A partial or complete opacity of the lens and/or its capsule. In cases where cataracts are complete and affect both eyes, blindness results. The prudent approach is to assume cataracts to be hereditary except in cases known to be associated with trauma, other causes of ocular inflammation, specific metabolic diseases, persistent pupillary membrane, persistent hyaloid or nutritional deficiencies. Cataracts may involve the lens completely (diffuse) or in a localized region. The exact frequency and significance of cataracts in the breed is not known.

References

There are few references providing detailed descriptions of hereditary ocular conditions of the Flat-Coated Retriever breed. The conditions listed above are generally recognized to exist in this breed, as evidenced by identification on breed eye screening examinations and/or clinical experience of veterinary ophthalmologists.

1. Read RA, Wood JL, Lakhani KH, Read RA. Pectinate ligament dysplasia (PLD) and glaucoma in Flat Coated Retrievers. I. Objectives, technique and results of a PLD survey. *Vet Ophthalmol.* 1998;1:85-90.
2. Read RA, Wood JL, Lakhani KH, Read RA. Pectinate ligament dysplasia (PLD) and glaucoma in Flat Coated Retrievers. II. Assessment of prevalence and heritability. *Vet Ophthalmol.* 1998;1:91-99.
3. ACVO Genetics Committee, 1999 and/or Data from CERF All-Breeds Report, 1991-1998.

©2014, American College of Veterinary Ophthalmologists

OCULAR DISORDERS REPORT

FLAT-COATED RETRIEVER - 3

4. ACVO Genetics Committee, 2002-2003 and/or Data from CERF All-Breeds Report, 2002-2003.

OCULAR DISORDERS REPORT FLAT-COATED RETRIEVER

Diagnostic Name	TOTAL DOGS EXAMINED	1991-1999 2598		2000-2009 3681		2010-2013 1762		2014 404	
		#	%	#	%	#	%	#	%
GLOBE									
0.110	microphthalmia	0		2	0.1%	0		0	
10.000	glaucoma	2	0.1%	0		0		0	
EYELIDS									
20.140	ectopic cilia	3	0.1%	3	0.1%	2	0.1%	0	
20.160	macropalpebral fissure	1	0.0%	1	0.0%	0		0	
21.000	entropion, unspecified	6	0.2%	9	0.2%	0		1	0.2%
22.000	ectropion, unspecified	15	0.6%	15	0.4%	2	0.1%	1	0.2%
25.110	distichiasis	324	12.5%	424	11.5%	282	16.0%	47	11.6%
NICTITANS									
50.210	pannus of third eyelid	0		0		1	0.1%	0	
52.110	prolapsed gland of the third eyelid	0		0		4	0.2%	0	
CORNEA									
70.220	pigmentary keratitis	0		0		2	0.1%	0	
70.700	corneal dystrophy	21	0.8%	17	0.5%	8	0.5%	3	0.7%
70.730	corneal endothelial degeneration	2	0.1%	1	0.0%	1	0.1%	0	
UVEA									
93.110	iris hypoplasia	0		1	0.0%	1	0.1%	0	
93.120	iris cyst	3	0.1%	12	0.3%	10	0.6%	0	
93.140	corneal endothelial pigment without PPM	0		0		1	0.1%	0	
93.170	anterior chamber cyst	0		0		1	0.1%	0	
93.710	persistent pupillary membranes, iris to iris	40	1.5%	86	2.3%	52	3.0%	15	3.7%
93.720	persistent pupillary membranes, iris to lens	3	0.1%	11	0.3%	0		0	
93.740	persistent pupillary membranes, iris sheets	1	0.0%	2	0.1%	0		0	
93.750	persistent pupillary membranes, lens pigment foci/no strands	0		1	0.0%	31	1.8%	16	4.0%
93.760	persistent pupillary membranes, endothelial opacity/no strands	0		0		5	0.3%	0	
93.810	uveal melanoma	0		1	0.0%	0		0	
LENS									
100.200	cataract, unspecified	16	0.6%	0		0		0	
100.210	cataract, significance unknown	158	6.1%	439	11.9%	270	15.3%	70	17.3%
100.301	punctate cataract, anterior cortex	20	0.8%	31	0.8%	53	3.0%	0	
100.302	punctate cataract, posterior cortex	3	0.1%	6	0.2%	10	0.6%	0	
100.303	punctate cataract, equatorial cortex	1	0.0%	2	0.1%	3	0.2%	1	0.2%
100.304	punctate cataract, anterior sutures	3	0.1%	14	0.4%	9	0.5%	0	
100.305	punctate cataract, posterior sutures	0		5	0.1%	16	0.9%	1	0.2%
100.306	punctate cataract, nucleus	0		6	0.2%	5	0.3%	0	
100.307	punctate cataract, capsular	0		6	0.2%	9	0.5%	0	
100.311	incipient cataract, anterior cortex	10	0.4%	18	0.5%	9	0.5%	1	0.2%
100.312	incipient cataract, posterior cortex	8	0.3%	7	0.2%	5	0.3%	1	0.2%
100.313	incipient cataract, equatorial cortex	5	0.2%	11	0.3%	0		0	
100.314	incipient cataract, anterior sutures	2	0.1%	2	0.1%	3	0.2%	0	
100.315	incipient cataract, posterior sutures	3	0.1%	5	0.1%	1	0.1%	0	
100.316	incipient cataract, nucleus	0		3	0.1%	3	0.2%	0	
100.317	incipient cataract, capsular	0		2	0.1%	3	0.2%	0	
100.321	incomplete cataract, anterior cortex	0		0		1	0.1%	0	

OCULAR DISORDERS REPORT FLAT-COATED RETRIEVER

LENS CONTINUED	1991-1999	2000-2009	2010-2013	2014
100.323 incomplete cataract, equatorial cortex	0	0	2 0.1%	0
100.330 generalized/complete cataract	2 0.1%	3 0.1%	1 0.1%	0
100.375 subluxation/luxation, unspecified	0	2 0.1%	2 0.1%	0
VITREOUS				
110.120 persistent hyaloid artery/remnant	6 0.2%	4 0.1%	2 0.1%	1 0.2%
110.130 PHPV/PTVL	0	0	1 0.1%	0
110.135 PHPV/PTVL	1 0.0%	3 0.1%	1 0.1%	0
110.320 vitreous degeneration syneresis	0	1 0.0%	0	0
FUNDUS				
97.110 choroidal hypoplasia	0	0	1 0.1%	0
97.120 coloboma	0	1 0.0%	0	0
RETINA				
120.170 retinal dysplasia, folds	4 0.2%	11 0.3%	2 0.1%	1 0.2%
120.180 retinal dysplasia, geographic	2 0.1%	9 0.2%	0	0
120.200 retinitis	0	0	0	3 0.7%
120.310 generalized progressive retinal atrophy (PRA)	8 0.3%	29 0.8%	13 0.7%	0
120.910 retinal detachment without dialysis	0	0	1 0.1%	0
120.960 retinopathy	0	0	3 0.2%	0
OPTIC NERVE				
130.110 micropapilla	0	0	5 0.3%	0
130.120 optic nerve hypoplasia	2 0.1%	1 0.0%	0	0
130.150 optic disc coloboma	10 0.4%	1 0.0%	10 0.6%	0
OTHER				
900.000 other, unspecified	0	48 1.3%	112 6.4%	0
900.100 other, not inherited	22 0.8%	240 6.5%	29 1.6%	27 6.7%
900.110 other, suspected as inherited	30 1.2%	23 0.6%	14 0.8%	1 0.2%
NORMAL				
0.000 normal globe	2003 77.1%	2892 78.6%	1411 80.1%	334 82.7%

OCULAR DISORDERS REPORT

FRENCH BULLDOG - 1

FRENCH BULLDOG

	DISORDER	INHERITANCE	REFERENCE	BREEDING ADVICE
A.	Distichiasis	Not defined	1	Breeder option
B.	Entropion	Not defined	2	Breeder option
C.	Prolapsed gland of the third eyelid	Not defined	3	Breeder option
D.	Corneal dystrophy - epithelial/stromal	Not defined	4	Breeder option
E.	Persistent pupillary membranes			
	- iris to iris	Not defined	2,5	Breeder option
	- iris to lens	Not defined	2	NO
	- iris to cornea	Not defined	6	NO
	- all other forms	Not defined	2	NO
F.	Cataract * a DNA test is available	Not defined	1,7,8	NO
G.	Retinal dysplasia - folds	Not defined	1	Breeder option

Description and Comments

A. Distichiasis

Eyelashes abnormally located on the eyelid margin which may cause ocular irritation. Distichiasis may occur at any time in the life of the dog. It is difficult to make a strong recommendation with regards to breeding dogs with this entity. The hereditary basis has not been established although it seems probable due to the high incidence in some breeds. Reducing the incidence is a logical goal. When diagnosed, distichiasis should be recorded and breeding discretion is advised.

B. Entropion

A conformational defect resulting in an "in-rolling" of one or both of the eyelids which may cause ocular irritation. It is likely that entropion is influenced by several genes (polygenic), defining the skin and other structures which make up the eyelids, the amount and weight of the skin covering the head and face, the orbital contents, and the conformation of the skull.

OCULAR DISORDERS REPORT

FRENCH BULLDOG - 2

C. Prolapsed gland of the third eyelid

Protrusion of the tear gland associated with the third eyelid. The mode of inheritance of this disorder is unknown. The exposed gland may become irritated. Commonly referred to as "cherry eye".

French Bulldogs were overrepresented in a study of prolapsed gland of the third eyelid. In the study, 100% of the prolapsed glands in French bulldogs occurred before 1 year of age. French bulldogs were also more likely to develop bilateral prolapsed glands that occurred either simultaneously with the first prolapse or with a short time interval between prolapses.

D. Corneal dystrophy - epithelial/stromal

A non-inflammatory corneal opacity (white to gray) present in one or more of the corneal layers. Corneal dystrophy implies a probable inherited basis and is usually bilateral.

E. Persistent pupillary membranes (PPM)

Persistent blood vessel remnants in the anterior chamber of the eye which fail to regress normally by 3 months of age. These strands may bridge from iris to iris, iris to cornea, iris to lens, or form sheets of tissue in the anterior chamber. The last three forms pose the greatest threat to vision and when severe, vision impairment or blindness may occur.

F. Cataract

Lens opacity which may affect one or both eyes and may involve the lens partially or completely. In cases where cataracts are complete and affect both eyes, blindness results. The prudent approach is to assume cataracts to be hereditary except in cases known to be associated with trauma, other causes of ocular inflammation, specific metabolic diseases, persistent pupillary membranes, persistent hyaloid or nutritional deficiencies.

Inherited cataracts in the French Bulldog appear in young dogs (6 mo-3 yr) as bilateral, but not always symmetrical equatorial and/or cortical opacities and are progressive. The condition is inherited as an autosomal recessive mutation in the HSF4 gene (HSF4-1).

G. Retinal dysplasia - folds

Linear, triangular, curved or curvilinear foci of retinal folding that may be single or multiple. When seen in puppies, this condition may partially or completely resolve with maturity. Its significance to vision is unknown. There are two other forms of retinal dysplasia (geographic, detached) which are known to be inherited in other breeds and, in their most severe form, cause blindness. The genetic relationship between folds and more severe forms of retinal dysplasia is undetermined.

OCULAR DISORDERS REPORT

FRENCH BULLDOG - 3

References

1. ACVO Genetics Committee, 1999 and/or Data from CERF All-Breeds Report, 1991-1998.
2. ACVO Genetics Committee, 2003-2004 and/or Data from CERF All-Breeds Report, 2005.
3. Mazzucchelli S, Vaillant MD, Weverberg F, et al. Retrospective study of 155 cases of prolapse of the nictitating membrane gland in dogs. *Vet Rec.* 2012;170:443.
4. ACVO Genetics Committee, 2013-2014 and Data from OFA All-Breeds Report, 2013-2014.
5. ACVO Genetics Committee, 2000-2002 and/or Data from CERF All-Breeds Report, 2000-2002.
6. ACVO Genetics Committee, 2009 and/or Data from CERF All-Breeds Report, 2008.
7. Chaudidu G, Pilorge PH, Chahory S, et al. Primary cataract in the french bulldog: a preliminary report. Annual Meeting of the European College of Veterinary Ophthalmologists 2011.
8. Mellersh CS, Pettitt L, Forman OP, et al. Identification of mutations in HSF4 in dogs of three different breeds with hereditary cataracts. *Vet Ophthalmol.* 2006;9:369-378.

OCULAR DISORDERS REPORT FRENCH BULLDOG

Diagnostic Name	TOTAL DOGS EXAMINED		1991-1999 482		2000-2009 1654		2010-2013 1192		2014 301	
	#	%	#	%	#	%	#	%	#	%
GLOBE										
0.110 microphthalmia	0		1	0.1%	0		0		0	
EYELIDS										
20.140 ectopic cilia	0		0		1	0.1%	0		0	
20.160 macropalpebral fissure	0		3	0.2%	0		0		0	
21.000 entropion, unspecified	0		19	1.1%	17	1.4%	1	0.3%	1	0.3%
22.000 ectropion, unspecified	0		2	0.1%	3	0.3%	1	0.3%	1	0.3%
25.110 distichiasis	31	6.4%	100	6.0%	103	8.6%	18	6.0%	18	6.0%
NASOLACRIMAL										
32.110 imperforate lower nasolacrimal punctum	0		5	0.3%	4	0.3%	3	1.0%	3	1.0%
40.910 keratoconjunctivitis sicca	0		1	0.1%	0		1	0.3%	1	0.3%
NICTITANS										
50.210 pannus of third eyelid	0		0		1	0.1%	0		0	
52.110 prolapsed gland of the third eyelid	2	0.4%	1	0.1%	3	0.3%	0		0	
CORNEA										
70.210 corneal pannus	3	0.6%	1	0.1%	0		0		0	
70.220 pigmentary keratitis	2	0.4%	2	0.1%	10	0.8%	3	1.0%	3	1.0%
70.700 corneal dystrophy	4	0.8%	8	0.5%	14	1.2%	2	0.7%	2	0.7%
70.730 corneal endothelial degeneration	0		2	0.1%	4	0.3%	1	0.3%	1	0.3%
UVEA										
93.120 iris cyst	1	0.2%	5	0.3%	3	0.3%	0		0	
93.150 iris coloboma	0		0		1	0.1%	0		0	
93.710 persistent pupillary membranes, iris to iris	6	1.2%	35	2.1%	34	2.9%	6	2.0%	6	2.0%
93.720 persistent pupillary membranes, iris to lens	0		4	0.2%	1	0.1%	0		0	
93.730 persistent pupillary membranes, iris to cornea	4	0.8%	28	1.7%	17	1.4%	3	1.0%	3	1.0%
93.740 persistent pupillary membranes, iris sheets	0		3	0.2%	0		0		0	
93.750 persistent pupillary membranes, lens pigment foci/no strands	0		0		5	0.4%	2	0.7%	2	0.7%
93.760 persistent pupillary membranes, endothelial opacity/no strands	0		1	0.1%	22	1.8%	8	2.7%	8	2.7%
97.150 chorioretinal coloboma, congenital	0		0		0		1	0.3%	1	0.3%
LENS										
100.210 cataract, significance unknown	1	0.2%	37	2.2%	39	3.3%	6	2.0%	6	2.0%
100.301 punctate cataract, anterior cortex	0		6	0.4%	3	0.3%	0		0	
100.302 punctate cataract, posterior cortex	1	0.2%	2	0.1%	1	0.1%	0		0	
100.303 punctate cataract, equatorial cortex	2	0.4%	1	0.1%	4	0.3%	0		0	
100.304 punctate cataract, anterior sutures	0		0		1	0.1%	0		0	
100.305 punctate cataract, posterior sutures	2	0.4%	0		0		0		0	
100.306 punctate cataract, nucleus	0		0		2	0.2%	0		0	
100.307 punctate cataract, capsular	0		1	0.1%	1	0.1%	0		0	
100.311 incipient cataract, anterior cortex	7	1.5%	20	1.2%	8	0.7%	1	0.3%	1	0.3%
100.312 incipient cataract, posterior cortex	7	1.5%	6	0.4%	1	0.1%	0		0	
100.313 incipient cataract, equatorial cortex	6	1.2%	3	0.2%	4	0.3%	1	0.3%	1	0.3%
100.314 incipient cataract, anterior sutures	0		3	0.2%	0		0		0	
100.315 incipient cataract, posterior sutures	1	0.2%	3	0.2%	0		0		0	
100.316 incipient cataract, nucleus	1	0.2%	6	0.4%	0		1	0.3%	1	0.3%

OCULAR DISORDERS REPORT FRENCH BULLDOG

LENS CONTINUED	1991-1999	2000-2009	2010-2013	2014
100.317 incipient cataract, capsular	0	2 0.1%	3 0.3%	0
100.321 incomplete cataract, anterior cortex	0	0	1 0.1%	0
100.322 incomplete cataract, posterior cortex	0	0	0	1 0.3%
100.330 generalized/complete cataract	5 1.0%	11 0.7%	2 0.2%	0
VITREOUS				
110.120 persistent hyaloid artery/remnant	0	6 0.4%	6 0.5%	1 0.3%
110.135 PHPV/PTVL	0	0	1 0.1%	0
110.320 vitreous degeneration syneresis	0	3 0.2%	4 0.3%	0
RETINA				
120.170 retinal dysplasia, folds	15 3.1%	43 2.6%	16 1.3%	10 3.3%
120.180 retinal dysplasia, geographic	0	7 0.4%	1 0.1%	2 0.7%
120.310 generalized progressive retinal atrophy (PRA)	0	1 0.1%	0	0
120.400 retinal hemorrhage	0	1 0.1%	0	0
120.910 retinal detachment without dialysis	0	1 0.1%	0	0
120.920 retinal detachment with dialysis	0	0	0	1 0.3%
120.960 retinopathy	0	0	2 0.2%	0
OTHER				
900.000 other, unspecified	0	14 0.8%	51 4.3%	0
900.100 other, not inherited	5 1.0%	81 4.9%	12 1.0%	10 3.3%
900.110 other, suspected as inherited	2 0.4%	9 0.5%	6 0.5%	1 0.3%
NORMAL				
0.000 normal globe	403 83.6%	1402 84.8%	1042 87.4%	269 89.4%

OCULAR DISORDERS REPORT

GERMAN PINSCHER - 1

GERMAN PINSCHER

	DISORDER	INHERITANCE	REFERENCE	BREEDING ADVICE
A.	Corneal dystrophy - epithelial/stromal	Not defined	1	Breeder option
B.	Persistent pupillary membranes - iris to lens	Not defined	2	NO
C.	Cataract	Not defined	1, 3-5	NO
D.	Persistent hyperplastic tunica vasculosa lentis (PHTVL)	Not defined	4, 5	NO
E.	Vitreous degeneration	Not defined	3	Breeder option
F.	Optic nerve hypoplasia	Not defined	6, 7	NO
G.	Micropapilla	Not defined	6, 7	Breeder option

Description and Comments

A. Corneal dystrophy - epithelial/stromal

A non-inflammatory corneal opacity (white to gray) present in one or more of the corneal layers. Corneal dystrophy implies a probable inherited basis and is usually bilateral.

B. Persistent pupillary membranes (PPM)

Persistent blood vessel remnants in the anterior chamber of the eye which fail to regress normally by 3 months of age. These strands may bridge from iris to iris, iris to cornea, iris to lens, or form sheets of tissue in the anterior chamber. The last three forms pose the greatest threat to vision and when severe, vision impairment or blindness may occur.

C. Cataract

A partial or complete opacity of the lens and/or its capsule. In cases where cataracts are complete and affect both eyes, blindness results. The prudent approach is to assume

OCULAR DISORDERS REPORT

GERMAN PINSCHER - 2

cataracts to be hereditary except in cases known to be associated with trauma, other causes of ocular inflammation, specific metabolic diseases, persistent pupillary membrane, persistent hyaloid or nutritional deficiencies. A pedigree analysis suggested autosomal recessive or incomplete dominant inheritance (4). Cataracts may involve the lens completely (diffuse) or in a localized region.

D. Persistent hyperplastic tunica vasculosa lentis (PHTVL)

Persistent tunica vasculosa lentis results from the failure of regression of the embryologic vascular network which surrounds the developing lens. This disorder has been observed in German Pinschers in Finland. A pedigree analysis suggested recessive or incomplete dominant inheritance (4).

E. Vitreous degeneration

Liquefaction of the vitreous gel which may predispose to retinal detachment.

F. Optic nerve hypoplasia

A congenital defect of the optic nerve which causes blindness and abnormal pupil response in the affected eye. May be unable to differentiate from micropapilla on a routine (dilated) screening ophthalmoscopic exam.

G. Micropapilla

Micropapilla refers to a small optic disc which is not associated with vision impairment. Optic nerve hypoplasia refers to a congenital defect of the optic nerve which causes blindness and abnormal pupil response in the affected eye. It may be difficult to differentiate between micropapilla and optic nerve hypoplasia on a routine (dilated) screening ophthalmoscopic exam.

References

There are no references providing detailed descriptions of hereditary ocular conditions of the German Pinscher breed. The conditions listed above are generally recognized to exist in this breed, as evidenced by identification on breed eye screening examinations and/or clinical experience of veterinary ophthalmologists.

1. ACVO Genetics Committee, 1999 and/or Data from CERF All-Breeds Report, 1991-1998.
2. ACVO Genetics Committee, 2006 and/or Data from CERF All-Breeds Report, 2001-2005.
3. ACVO Genetics Committee, 2000-2002 and/or Data from CERF All-Breeds Report, 2000-2002.
4. Leppanen M, Martenson J and Maki K. Results of ophthalmologic screening examinations of German Pinschers in Finland--a retrospective study. *Vet Ophthalmol.* 2001 Sep;4:165-169.

OCULAR DISORDERS REPORT

GERMAN PINSCHER - 3

5. Pfahler S, Menzel J, Brahm R, et al. Prevalence and formation of primary cataracts and persistent hyperplastic tunica vasculosa lentis in the German Pinscher population in Germany. *Vet Ophthalmol.* 2014 Mar 27.
6. ACVO Genetics Committee, 2002-2003 and/or Data from CERF All-Breeds Report, 2002-2003.
7. ACVO Genetics Committee, 2005 and/or Data from CERF All-Breeds Report 2003-2004.

OCULAR DISORDERS REPORT GERMAN PINSCHER

Diagnostic Name	TOTAL DOGS EXAMINED	1991-1999		2000-2009		2010-2013		2014	
		#	%	#	%	#	%	#	%
EYELIDS									
25.110	distichiasis	0		2	0.4%	1	0.2%	1	1.1%
NICTITANS									
52.110	prolapsed gland of the third eyelid	0		0		1	0.2%	0	
CORNEA									
70.700	corneal dystrophy	3	2.9%	9	1.9%	5	1.2%	0	
UVEA									
93.710	persistent pupillary membranes, iris to iris	0		3	0.6%	3	0.7%	0	
93.720	persistent pupillary membranes, iris to lens	0		5	1.1%	0		0	
93.750	persistent pupillary membranes, lens pigment foci/no strands	0		0		4	1.0%	2	2.2%
LENS									
100.210	cataract, significance unknown	5	4.8%	32	6.9%	24	5.8%	4	4.5%
100.301	punctate cataract, anterior cortex	1	1.0%	7	1.5%	7	1.7%	1	1.1%
100.302	punctate cataract, posterior cortex	5	4.8%	11	2.4%	7	1.7%	1	1.1%
100.304	punctate cataract, anterior sutures	1	1.0%	3	0.6%	4	1.0%	0	
100.305	punctate cataract, posterior sutures	1	1.0%	6	1.3%	1	0.2%	1	1.1%
100.306	punctate cataract, nucleus	0		0		2	0.5%	0	
100.307	punctate cataract, capsular	1	1.0%	4	0.9%	1	0.2%	0	
100.311	incipient cataract, anterior cortex	3	2.9%	10	2.2%	4	1.0%	1	1.1%
100.312	incipient cataract, posterior cortex	4	3.8%	19	4.1%	10	2.4%	2	2.2%
100.313	incipient cataract, equatorial cortex	0		5	1.1%	1	0.2%	0	
100.314	incipient cataract, anterior sutures	1	1.0%	4	0.9%	0		1	1.1%
100.315	incipient cataract, posterior sutures	0		8	1.7%	0		0	
100.316	incipient cataract, nucleus	1	1.0%	1	0.2%	3	0.7%	0	
100.317	incipient cataract, capsular	0		7	1.5%	1	0.2%	0	
100.330	generalized/complete cataract	4	3.8%	4	0.9%	0		0	
VITREOUS									
110.120	persistant hyaloid artery/remnant	1	1.0%	1	0.2%	0		0	
110.135	PHPV/PTVL	1	1.0%	2	0.4%	1	0.2%	0	
110.320	vitreous degeneration syneresis	2	1.9%	6	1.3%	4	1.0%	0	
RETINA									
120.170	retinal dysplasia, folds	0		1	0.2%	1	0.2%	0	
120.180	retinal dysplasia, geographic	0		1	0.2%	0		0	
120.400	retinal hemorrhage	1	1.0%	0		0		0	
120.960	retinopathy	0		0		1	0.2%	0	
OPTIC NERVE									
130.110	micropapilla	0		3	0.6%	11	2.7%	0	
130.120	optic nerve hypoplasia	5	4.8%	0		1	0.2%	0	
OTHER									
900.000	other, unspecified	0		9	1.9%	17	4.1%	0	
900.100	other, not inherited	4	3.8%	27	5.8%	5	1.2%	5	5.6%
900.110	other, suspected as inherited	2	1.9%	1	0.2%	1	0.2%	0	

OCULAR DISORDERS REPORT GERMAN PINSCHER

	1991-1999	2000-2009	2010-2013	2014
NORMAL 0.000 normal globe	76 73.1%	379 82.0%	360 87.2%	82 92.1%

OCULAR DISORDERS REPORT

GERMAN SHEPHERD - 1

GERMAN SHEPHERD

	DISORDER	INHERITANCE	REFERENCE	BREEDING ADVICE
A.	Distichiasis	Not defined	1	Breeder option
B.	Plasmoma/Atypical pannus	Not defined	2	NO
C.	Chronic superficial keratitis/pannus	Not defined	3-12	NO
D.	Corneal dystrophy - epithelial/stromal	Not defined	3, 13	Breeder option
E.	Persistent pupillary membranes - iris to iris	Not defined	14, 15	Breeder option
F.	Cataract			
	1. Congenital	Presumed autosomal dominant	3, 16, 17	NO
	2. Cortical	Presumed autosomal recessive	3, 18	NO
G.	Retinal atrophy - generalized	Not defined	3, 19-21	NO
H.	Retinal dysplasia - folds	Not defined	3	Breeder option
I.	Optic nerve hypoplasia	Not defined	3	NO
J.	Micropapilla	Not defined	22	Breeder option
K.	Limbal melanoma	Not defined	23, 24	NO

OCULAR DISORDERS REPORT

GERMAN SHEPHERD - 2

Description and Comments

A. Distichiasis

Eyelashes abnormally located on the eyelid margin which may cause ocular irritation. Distichiasis may occur at any time in the life of a dog. It is difficult to make a strong recommendation with regard to breeding dogs with this entity. The hereditary basis has not been established although it seems probable due to the high incidence in some breeds. Reducing the incidence is a logical goal. When diagnosed, distichiasis should be recorded; breeding discretion is advised.

B. Plasmoma/Atypical Pannus

Bilateral lymphocytic/plasmocytic infiltration of the nictitating membranes which may occur independent of corneal Pannus.

C. Chronic superficial keratitis/pannus

A bilateral inflammatory disease of the cornea which usually starts as a grayish haze to the ventral or ventrolateral cornea, followed by the formation of a vascularized subepithelial growth that begins to spread toward the central cornea; pigmentation follows the vascularization. If severe, vision impairment occurs. Pannus may be associated with plasma cell infiltration of the nictitans which may also occur independent of corneal disease.

The German Shepherd Dog has a higher incidence of pannus than any other breed. The MHC class II risk haplotype has been shown to be associated with canine chronic superficial keratitis (CSK) in German Shepherd Dogs. Although there are likely several other genes and environmental factors that contribute to CSK, a recent paper suggested that MHC class II is a major genetic risk factor. Dogs with the risk haplotype were 2.7 times more likely to develop CSK. Homozygosity of the risk haplotype increased the risk of CSK to over eightfold.

D. Corneal dystrophy - epithelial/stromal

A non-inflammatory corneal opacity (white to gray) present in one or more of the corneal layers; usually inherited and bilateral.

E. Persistent pupillary membranes (PPM)

Persistent blood vessel remnants in the anterior chamber of the eye which fail to regress normally by 3 months of age. These strands may bridge from iris to iris, iris to cornea, iris to lens, or form sheets of tissue in the anterior chamber. The last three forms pose the greatest threat to vision and when severe, vision impairment or blindness may occur.

F. Cataract

A partial or complete opacity of the lens and/or its capsule. In cases where cataracts are

OCULAR DISORDERS REPORT

GERMAN SHEPHERD - 3

complete and affect both eyes, blindness results. The prudent approach is to assume cataracts to be hereditary except in cases known to be associated with trauma, other causes of ocular inflammation, specific metabolic diseases, persistent pupillary membrane, persistent hyaloid or nutritional deficiencies. Cataracts may involve the lens completely (diffuse) or in a localized region.

1. Congenital:

Reported by von Hippel in Germany in 1930, these cataracts are present at birth and visible when the eyes open. They are usually non-progressive. Test breedings indicate an autosomal dominant mode of transmission. The occurrence is rare.

2. Cortical:

Reported by Barnett in Great Britain, opacities are first apparent at 8-12 weeks of age, in the posterior cortex and progress to involve the Y-sutures and nucleus. The equatorial subcapsular cortex is unaffected. No progression is noted after 1-2 years of age. Test breeding suggests an autosomal recessive mode of inheritance.

G. Retinal atrophy - generalized

A degenerative disease of the retinal visual cells which progresses to blindness. This abnormality, also known as progressive retinal atrophy or PRA, may be detected by electroretinogram (not part of a routine eye screening examination) before it is apparent clinically. Except for X-linked PRA in the Siberian Husky, in all breeds studied to date, PRA is inherited as an autosomal recessive trait.

H. Retinal dysplasia - folds

Linear, triangular, curved or curvilinear foci of retinal folding that may be single or multiple. When seen in puppies, this condition may partially or completely resolve with maturity. Its significance to vision is unknown. There are two other forms of retinal dysplasia (geographic, detached) which are known to be inherited in other breeds and, in their most severe form, cause blindness. The genetic relationship between folds and more severe forms of retinal dysplasia is undetermined.

I. Optic nerve hypoplasia

A congenital defect of the optic nerve which causes blindness and abnormal pupil response in the affected eye. May be unable to differentiate from micropapilla on a routine (dilated) screening ophthalmoscopic exam.

J. Micropapilla

Micropapilla refers to a small optic disc which is not associated with vision impairment. Optic nerve hypoplasia refers to a congenital defect of the optic nerve which causes blindness and abnormal pupil response in the affected eye. It may be difficult to differentiate between micropapilla and optic nerve hypoplasia on a routine (dilated) screening ophthalmoscopic exam.

OCULAR DISORDERS REPORT

GERMAN SHEPHERD - 4

K. Limbal melanoma

Most limbal melanomas are really epibulbar melanocytomas, but there is a possibility of an extension of an intraocular melanoma extending outward and presenting as a limbal melanoma. An epibulbar melanocytoma originates from the superficial pigment lining the limbus and the lesion may eventually extend into the eye. Metastasis has not been documented and the mass is characterized by large epithelioid cells. The lesion presents as a subconjunctival smooth mass most commonly in the dorsolateral limbal region and extends later into the cornea and posterior on the sclera. Breed predisposition have been noted in the German Shepherd, Labrador and Golden Retriever.

References

1. ACVO Genetics Committee, 2000-2002 and/or Data from CERF All-Breeds Report, 2000-2002.
2. ACVO Genetics Committee, 2013-2014 and Data from OFA All-Breeds Report, 2013-2014.
3. ACVO Genetics Committee, 1999 and/or Data from CERF All-Breeds Report, 1991-1998.
4. Campbell LH, Okuda HK, Lipton DE, et al. Chronic superficial keratitis in dogs: detection of cellular hypersensitivity. *Am J Vet Res.* 1975 May;36:669-671.
5. Slatter DH, Lavach LD, Severin GA, et al. Uberreiter's syndrome (chronic superficial keratitis) in dogs in the Rocky Mountain area--a study of 463 cases. *J Small Anim Pract.* 1977 Dec;18:757-772.
6. Krahenmann A, editor. Effect of UV light on the cornea of German Shepherd Dogs. *Proc World Veterinary Congress; 1975.*
7. Uberreiter O. A particular form of keratitis [chronic superficial keratitis] in dogs. *Wien Tierarztl Mschr.* 1961;48:65.
8. French JR, Clerc B, Isseautier MN. Chronic superficial keratitis in the German Shepherd Dog. An attempt to prove an immunologic process. *Trans Am Coll Vet Ophthalmol.* 1986;27:3.
9. Drahenmann A. Auto-immune phenomenon in chronic superficial keratitis (Uberreiter) in shepherd dogs. In: Roper IT, editor. *The Cornea in Health and Disease. London: The Royal Society of Medicine, Academic Press, Grune & Stratton; 1981. p. 261.*
10. Bedford PG, Longstaffe JA. Corneal pannus (chronic superficial keratitis) in the German Shepherd Dog. *J Small Anim Pract.* 1979 Jan;20:41-56.
11. Eichenbaum JD, Lavach JD, Gould DH, et al. Immunohistochemical staining patterns of canine eyes affected with chronic superficial keratitis. *Am J Vet Res.* 1986 Sep;47:1952-1955.

OCULAR DISORDERS REPORT

GERMAN SHEPHERD - 5

12. Jokinen P, Rusanen EM, Kennedy LJ, et al. MHC class II risk haplotype associated with canine chronic superficial keratitis in German Shepherd Dogs. *Veterinary immunology and immunopathology*. 2011 Mar 15;140:37-41.
13. Crispin SM, Barnett KC. Dystrophy, degeneration and infiltration of the canine cornea. *J Small Anim Pract*. 1983;24:63.
14. ACVO Genetics Committee, 2002-2003 and/or Data from CERF All-Breeds Report, 2002-2003.
15. ACVO Genetics Committee, 2005 and/or Data from CERF All-Breeds Report 2003-2004.
16. Barnett KC. The diagnosis and differential diagnosis of cataract in the dog. *J Small Anim Pract*. 1985;26:305.
17. von Hippel E. Embryological investigation of hereditary congenital cataract, of lamellar cataract in dogs as well as a peculiar form of capsular cataract. *Graefes Arch Ophthal*. 1930;124:300.
18. Barnett KC. Hereditary cataract in the German Shepherd Dog. *J Small Anim Pract*. 1986;27:387.
19. Barnett KC. Canine retinopathies III. The other breeds. *J Small Anim Pract*. 1965;6:185.
20. Hodgman SFJ. Abnormalities and defects in pedigree dogs: I. An investigation into the existence of abnormalities in pedigree dogs in British Isles. *J Small Anim Pract*. 1963;4:447.
21. Priester W. Canine progressive retinal atrophy: Occurrence by age, breed, and sex. *American Journal of Veterinary Research*. 1974;35:571-574.
22. ACVO Genetics Committee, 2009 and/or Data from CERF All-Breeds Report, 2008.
23. ACVO Genetics Committee, 2007 and/or Data from CERF All-Breeds Report 2002-2006.
24. Martin CL. Canine epibulbar melanoma. *J Am Anim Hosp Assoc*. 1981;17:83-90.

OCULAR DISORDERS REPORT GERMAN SHEPHERD

Diagnostic Name	TOTAL DOGS EXAMINED	1991-1999 1973		2000-2009 1725		2010-2013 703		2014 156		
		#	%	#	%	#	%	#	%	
GLOBE										
0.110	microphthalmia	5	0.3%	2	0.1%	0		0		
10.000	glaucoma	3	0.2%	0		0		0		
EYELIDS										
20.140	ectopic cilia	0		1	0.1%	0		0		
20.160	macropalpebral fissure	1	0.1%	0		0		0		
21.000	entropion, unspecified	1	0.1%	1	0.1%	1	0.1%	0		
22.000	ectropion, unspecified	3	0.2%	1	0.1%	0		0		
25.110	distichiasis	36	1.8%	13	0.8%	2	0.3%	0		
NASOLACRIMAL										
32.110	imperforate lower nasolacrimal punctum	1	0.1%	0		0		0		
40.910	keratoconjunctivitis sicca	2	0.1%	1	0.1%	0		0		
NICTITANS										
50.210	pannus of third eyelid	0		0		9	1.3%	4	2.6%	
51.100	third eyelid cartilage anomaly	1	0.1%	2	0.1%	0		0		
52.110	prolapsed gland of the third eyelid	0		0		1	0.1%	0		
CORNEA										
70.210	corneal pannus	30	1.5%	58	3.4%	16	2.3%	6	3.8%	
70.220	pigmentary keratitis	0		0		0		1	0.6%	
70.700	corneal dystrophy	90	4.6%	95	5.5%	23	3.3%	6	3.8%	
70.730	corneal endothelial degeneration	1	0.1%	1	0.1%	0		0		
UVEA										
93.120	iris cyst	6	0.3%	11	0.6%	4	0.6%	0		
93.170	anterior chamber cyst	0		0		1	0.1%	0		
93.710	persistent pupillary membranes, iris to iris	19	1.0%	26	1.5%	6	0.9%	3	1.9%	
93.720	persistent pupillary membranes, iris to lens	3	0.2%	11	0.6%	2	0.3%	0		
93.730	persistent pupillary membranes, iris to cornea	0		8	0.5%	0		0		
93.740	persistent pupillary membranes, iris sheets	0		2	0.1%	0		0		
93.750	persistent pupillary membranes, lens pigment foci/no strands	0		0		3	0.4%	5	3.2%	
93.760	persistent pupillary membranes, endothelial opacity/no strands	0		0		1	0.1%	0		
93.810	uveal melanoma	0		1	0.1%	0		0		
LENS										
100.200	cataract, unspecified	28	1.4%	0		0		0		
100.210	cataract, significance unknown	73	3.7%	99	5.7%	54	7.7%	12	7.7%	
100.301	punctate cataract, anterior cortex	7	0.4%	11	0.6%	12	1.7%	1	0.6%	
100.302	punctate cataract, posterior cortex	7	0.4%	5	0.3%	2	0.3%	0		
100.303	punctate cataract, equatorial cortex	2	0.1%	8	0.5%	2	0.3%	0		
100.304	punctate cataract, anterior sutures	1	0.1%	0		0		0		
100.305	punctate cataract, posterior sutures	6	0.3%	4	0.2%	3	0.4%	1	0.6%	
100.306	punctate cataract, nucleus	10	0.5%	11	0.6%	12	1.7%	1	0.6%	
100.307	punctate cataract, capsular	2	0.1%	3	0.2%	5	0.7%	0		
100.311	incipient cataract, anterior cortex	9	0.5%	20	1.2%	5	0.7%	0		
100.312	incipient cataract, posterior cortex	17	0.9%	9	0.5%	4	0.6%	0		
100.313	incipient cataract, equatorial cortex	4	0.2%	16	0.9%	0		0		

OCULAR DISORDERS REPORT GERMAN SHEPHERD

LENS CONTINUED	1991-1999	2000-2009	2010-2013	2014
100.314 incipient cataract, anterior sutures	2 0.1%	1 0.1%	0	0
100.315 incipient cataract, posterior sutures	2 0.1%	3 0.2%	0	0
100.316 incipient cataract, nucleus	24 1.2%	21 1.2%	8 1.1%	2 1.3%
100.317 incipient cataract, capsular	0	2 0.1%	0	0
100.322 incomplete cataract, posterior cortex	0	0	0	1 0.6%
100.326 incomplete cataract, nucleus	0	0	0	1 0.6%
100.330 generalized/complete cataract	14 0.7%	7 0.4%	0	0
100.375 subluxation/luxation, unspecified	2 0.1%	4 0.2%	0	2 1.3%
VITREOUS				
110.120 persistent hyaloid artery/remnant	3 0.2%	0	1 0.1%	0
110.135 PHPV/PTVL	2 0.1%	1 0.1%	0	0
110.320 vitreous degeneration syneresis	6 0.3%	2 0.1%	2 0.3%	0
110.330 vitreous degeneration anterior chamber	0	2 0.1%	1 0.1%	0
FUNDUS				
97.110 choroidal hypoplasia	1 0.1%	0	0	0
RETINA				
120.170 retinal dysplasia, folds	38 1.9%	39 2.3%	7 1.0%	3 1.9%
120.180 retinal dysplasia, geographic	8 0.4%	6 0.3%	3 0.4%	0
120.310 generalized progressive retinal atrophy (PRA)	8 0.4%	8 0.5%	3 0.4%	0
120.910 retinal detachment without dialysis	2 0.1%	2 0.1%	0	0
120.920 retinal detachment with dialysis	0	0	1 0.1%	0
120.960 retinopathy	0	0	1 0.1%	0
OPTIC NERVE				
130.110 micropapilla	0	20 1.2%	4 0.6%	0
130.120 optic nerve hypoplasia	27 1.4%	6 0.3%	0	1 0.6%
130.150 optic disc coloboma	2 0.1%	0	1 0.1%	0
OTHER				
900.000 other, unspecified	0	13 0.8%	45 6.4%	0
900.100 other, not inherited	7 0.4%	133 7.7%	8 1.1%	14 9.0%
900.110 other, suspected as inherited	22 1.1%	15 0.9%	6 0.9%	2 1.3%
NORMAL				
0.000 normal globe	1545 78.3%	1294 75.0%	600 85.3%	120 76.9%

OCULAR DISORDERS REPORT

GERMAN SHORTHAIRED POINTER - 1

GERMAN SHORTHAIRED POINTER

	DISORDER	INHERITANCE	REFERENCE	BREEDING ADVICE
A.	Distichiasis	Not defined	1	Breeder option
B.	Nictitans cartilage anomaly/eversion	Not defined	1, 2	Breeder option
C.	Persistent pupillary membranes - iris to iris - all other forms	Not defined Not defined	1, 3 3	Breeder option NO
D.	Cataract	Not defined	1	NO
E.	Persistent hyperplastic primary vitreous/ persistent hyperplastic tunica vasculosa lentis (PHPV/PHTVL)	Not defined	1, 4	NO
F.	Retinal atrophy - generalized	Not defined	1, 5	NO
G.	Retinal dysplasia - folds	Not defined	1	Breeder option
H.	Cone degeneration - (achromatopsia) * a DNA test is available	Autosomal recessive	6	NO

Description and Comments

A. Distichiasis

Eyelashes abnormally located on the eyelid margin which may cause ocular irritation. Distichiasis may occur at any time in the life of a dog. It is difficult to make a strong recommendation with regard to breeding dogs with this entity. The hereditary basis has not been established, although it seems probable due to the high incidence in some breeds. Reducing the incidence is a logical goal. When diagnosed, distichiasis should be recorded; breeding discretion is advised.

OCULAR DISORDERS REPORT

GERMAN SHORTHAIRED POINTER - 2

B. Nictitans cartilage anomaly/eversion

A scroll-like curling of the cartilage of the third eyelid, usually everting the margin. This condition may occur in one or both eyes and may cause mild ocular irritation.

C. Persistent pupillary membranes (PPM)

Persistent blood vessel remnants in the anterior chamber of the eye which fail to regress normally by 3 months of age. These strands may bridge from iris to iris, iris to cornea, iris to lens, or form sheets of tissue in the anterior chamber. The last three forms pose the greatest threat to vision and when severe, vision impairment or blindness may occur.

D. Cataract

A partial or complete opacity of the lens and/or its capsule. In cases where cataracts are complete and affect both eyes, blindness results. The prudent approach is to assume cataracts to be hereditary except in cases known to be associated with trauma, other causes of ocular inflammation, specific metabolic diseases, persistent pupillary membrane, persistent hyaloid or nutritional deficiencies. Cataracts may involve the lens completely (diffuse) or in a localized region.

E. Persistent hyperplastic primary vitreous (PHPV)/Persistent hyperplastic tunica vasculosa lentis (PHTVL)

A congenital defect resulting from abnormalities in the development and regression of the hyaloid artery (the primary vitreous) and the interaction of this blood vessel with the posterior lens capsule/cortex during embryogenesis. This condition is often associated with **persistent hyperplastic tunica vasculosa lentis (PHTVL)** which results from failure of regression of the embryologic vascular network which surrounds the developing lens.

The majority of affected dogs have a retrolental fibrovascular plaque and variable lenticular defects which include posterior lenticonus/globus, colobomata, intralenticular hemorrhage and/or secondary cataracts. Vision impairment may result.

F. Retinal atrophy - generalized

A degenerative disease of the retinal visual cells which progresses to blindness. This abnormality, also known as progressive retinal atrophy or PRA, may be detected by electroretinogram (not part of a routine eye screening examination) before it is apparent clinically. Except for X-linked PRA in the Siberian Husky, in all breeds studied to date, PRA is inherited as an autosomal recessive trait.

OCULAR DISORDERS REPORT

GERMAN SHORTHAIRED POINTER - 3

G. Retinal dysplasia - folds

Linear, triangular, curved or curvilinear foci of retinal folding that may be single or multiple. When seen in puppies, this condition may partially or completely resolve with maturity. Its significance to vision is unknown. There are two other forms of retinal dysplasia (geographic, detached) which are known to be inherited in other breeds and, in their most severe form, cause blindness. The genetic relationship between folds and more severe forms of retinal dysplasia is undetermined.

H. Cone degeneration - hemeralopia/achromatopsia

Autosomal recessively inherited early degeneration of the cone photoreceptors. Afflicted puppies develop day-blindness, colorblindness, and photophobia between 8 and 12 weeks of age. Afflicted dogs remain ophthalmoscopically normal their entire life. Electroretinography is required to definitively diagnose the disorder. A DNA test is available.

References

1. ACVO Genetics Committee, 1999 and/or Data from CERF All-Breeds Report, 1991-1998.
2. Martin CL. Everted membrana nictitans in German Shorthaired Pointers. *J Am Vet Med Assoc.* 1970 Nov 1;157:1229-1232.
3. ACVO Genetics Committee, 2005 and/or Data from CERF All-Breeds Report 2003-2004.
4. Berger SL. Persistent hyperplastic tunica vasculosa lentis/persistent hyperplastic primary vitreous in the German shorthaired pointer. *Proc Am Coll Vet Ophthalmol.* 1995;26:42.
5. Priester W. Canine progressive retinal atrophy: Occurrence by age, breed, and sex. *American Journal of Veterinary Research.* 1974;35:571-574.
6. Sidjanin DJ, Lowe JK, McElwee JL, et al. Canine CNGB3 mutations establish cone degeneration as orthologous to the human achromatopsia locus ACHM3. *Human Molecular Genetics.* 2002;11:1823-1833.

OCULAR DISORDERS REPORT GERMAN SHORTHAIRED POINTER

Diagnostic Name	TOTAL DOGS EXAMINED	1991-1999 1286		2000-2009 2698		2010-2013 1448		2014 381	
		#	%	#	%	#	%	#	%
GLOBE									
10.000 glaucoma		0		1	0.0%	0		0	
EYELIDS									
20.160 macropalpebral fissure		1	0.1%	0		0		0	
21.000 entropion, unspecified		4	0.3%	5	0.2%	1	0.1%	0	
22.000 ectropion, unspecified		2	0.2%	0		1	0.1%	1	0.3%
25.110 distichiasis		41	3.2%	91	3.4%	61	4.2%	16	4.2%
NASOLACRIMAL									
40.910 keratoconjunctivitis sicca		1	0.1%	0		0		0	
NICTITANS									
51.100 third eyelid cartilage anomaly		0		0		1	0.1%	1	0.3%
52.110 prolapsed gland of the third eyelid		0		0		0		1	0.3%
CORNEA									
70.210 corneal pannus		0		0		1	0.1%	0	
70.700 corneal dystrophy		3	0.2%	8	0.3%	4	0.3%	1	0.3%
70.730 corneal endothelial degeneration		1	0.1%	0		0		0	
UVEA									
93.110 iris hypoplasia		0		0		1	0.1%	0	
93.120 iris cyst		0		6	0.2%	0		0	
93.140 corneal endothelial pigment without PPM		0		0		1	0.1%	0	
93.150 iris coloboma		1	0.1%	1	0.0%	0		0	
93.710 persistent pupillary membranes, iris to iris		48	3.7%	198	7.3%	133	9.2%	17	4.5%
93.720 persistent pupillary membranes, iris to lens		6	0.5%	9	0.3%	1	0.1%	1	0.3%
93.730 persistent pupillary membranes, iris to cornea		3	0.2%	1	0.0%	1	0.1%	0	
93.740 persistent pupillary membranes, iris sheets		1	0.1%	0		0		0	
93.750 persistent pupillary membranes, lens pigment foci/no strands		0		2	0.1%	8	0.6%	4	1.0%
93.760 persistent pupillary membranes, endothelial opacity/no strands		0		0		3	0.2%	0	
93.810 uveal melanoma		0		0		1	0.1%	0	
LENS									
100.200 cataract, unspecified		9	0.7%	0		0		0	
100.210 cataract, significance unknown		58	4.5%	139	5.2%	84	5.8%	22	5.8%
100.301 punctate cataract, anterior cortex		9	0.7%	9	0.3%	10	0.7%	0	
100.302 punctate cataract, posterior cortex		11	0.9%	21	0.8%	17	1.2%	1	0.3%
100.303 punctate cataract, equatorial cortex		3	0.2%	7	0.3%	2	0.1%	1	0.3%
100.304 punctate cataract, anterior sutures		0		1	0.0%	2	0.1%	0	
100.305 punctate cataract, posterior sutures		6	0.5%	1	0.0%	6	0.4%	0	
100.306 punctate cataract, nucleus		2	0.2%	7	0.3%	9	0.6%	0	
100.307 punctate cataract, capsular		3	0.2%	4	0.1%	2	0.1%	0	
100.311 incipient cataract, anterior cortex		4	0.3%	8	0.3%	6	0.4%	1	0.3%
100.312 incipient cataract, posterior cortex		26	2.0%	44	1.6%	14	1.0%	3	0.8%
100.313 incipient cataract, equatorial cortex		6	0.5%	12	0.4%	2	0.1%	0	
100.314 incipient cataract, anterior sutures		0		1	0.0%	2	0.1%	0	
100.315 incipient cataract, posterior sutures		5	0.4%	9	0.3%	1	0.1%	0	
100.316 incipient cataract, nucleus		2	0.2%	10	0.4%	5	0.3%	0	

OCULAR DISORDERS REPORT GERMAN SHORTHAIRED POINTER

LENS CONTINUED	1991-1999	2000-2009	2010-2013	2014
100.317 incipient cataract, capsular	1 0.1%	7 0.3%	1 0.1%	0
100.321 incomplete cataract, anterior cortex	0	0	0	1 0.3%
100.322 incomplete cataract, posterior cortex	0	0	3 0.2%	3 0.8%
100.325 incomplete cataract, posterior sutures	0	0	0	1 0.3%
100.330 generalized/complete cataract	13 1.0%	1 0.0%	0	0
100.375 subluxation/luxation, unspecified	2 0.2%	0	0	0
VITREOUS				
110.120 persistent hyaloid artery/remnant	0	2 0.1%	0	2 0.5%
110.135 PHPV/PTVL	4 0.3%	2 0.1%	2 0.1%	2 0.5%
110.200 vitritis	0	0	2 0.1%	0
110.320 vitreous degeneration syneresis	1 0.1%	11 0.4%	6 0.4%	1 0.3%
110.330 vitreous degeneration anterior chamber	0	1 0.0%	1 0.1%	0
FUNDUS				
97.110 choroidal hypoplasia	0	1 0.0%	0	0
RETINA				
120.170 retinal dysplasia, folds	34 2.6%	57 2.1%	21 1.5%	4 1.0%
120.180 retinal dysplasia, geographic	4 0.3%	12 0.4%	8 0.6%	0
120.200 retinitis	0	0	0	3 0.8%
120.310 generalized progressive retinal atrophy (PRA)	4 0.3%	3 0.1%	1 0.1%	1 0.3%
120.920 retinal detachment with dialysis	0	0	1 0.1%	0
120.960 retinopathy	0	0	1 0.1%	0
OPTIC NERVE				
130.110 micropapilla	0	3 0.1%	0	0
130.120 optic nerve hypoplasia	0	4 0.1%	0	0
130.150 optic disc coloboma	1 0.1%	0	0	0
OTHER				
900.000 other, unspecified	0	19 0.7%	80 5.5%	0
900.100 other, not inherited	8 0.6%	125 4.6%	12 0.8%	14 3.7%
900.110 other, suspected as inherited	13 1.0%	4 0.1%	5 0.3%	0
NORMAL				
0.000 normal globe	1014 78.8%	2246 83.2%	1245 86.0%	332 87.1%

OCULAR DISORDERS REPORT

GERMAN WIREHAired POINTER - 1

GERMAN WIREHAired POINTER (Drahtaar)

	DISORDER	INHERITANCE	REFERENCE	BREEDING ADVICE
A.	Cataract	Not defined	1	NO
B.	Retinal dysplasia - folds	Not defined	2	Breeder option

Description and Comments

A. Cataract

A partial or complete opacity of the lens and/or its capsule. In cases where cataracts are complete and affect both eyes, blindness results. The prudent approach is to assume cataracts to be hereditary except in cases known to be associated with trauma, other causes of ocular inflammation, specific metabolic diseases, persistent pupillary membrane, persistent hyaloid or nutritional deficiencies. Cataracts may involve the lens completely (diffuse) or in a localized region.

B. Retinal dysplasia - folds

Linear, triangular, curved or curvilinear foci of retinal folding that may be single or multiple. When seen in puppies, this condition may partially or completely resolve with maturity. Its significance to vision is unknown. There are two other forms of retinal dysplasia (geographic, detached), which are known to be inherited in other breeds and, in their most severe form, cause blindness. The genetic relationship between folds and more severe forms of retinal dysplasia is undetermined.

References

There are no references providing detailed descriptions of hereditary ocular conditions of the German Wirehaired Pointer breed. The conditions listed above are generally recognized to exist in this breed, as evidenced by identification on breed eye screening examinations and/or clinical experience of veterinary ophthalmologists.

1. ACVO Genetics Committee, 1999 and/or Data from CERF All-Breeds Report, 1991-1998.
2. ACVO Genetics Committee, 2002-2003 and/or Data from CERF All-Breeds Report, 2002-2003.

OCULAR DISORDERS REPORT GERMAN WIREHAIED POINTER

Diagnostic Name	TOTAL DOGS EXAMINED	1991-1999		2000-2009		2010-2013		2014	
		#	%	#	%	#	%	#	%
EYELIDS									
20.160	macropalpebral fissure	1	0.6%	0		0		0	
25.110	distichiasis	4	2.5%	1	0.5%	1	0.5%	2	2.9%
UVEA									
93.710	persistent pupillary membranes, iris to iris	2	1.3%	2	1.1%	4	1.9%	0	
LENS									
100.200	cataract, unspecified	5	3.2%	0		0		0	
100.210	cataract, significance unknown	4	2.5%	4	2.2%	3	1.4%	2	2.9%
100.301	punctate cataract, anterior cortex	0		2	1.1%	0		0	
100.302	punctate cataract, posterior cortex	2	1.3%	1	0.5%	2	1.0%	0	
100.305	punctate cataract, posterior sutures	1	0.6%	0		0		0	
100.312	incipient cataract, posterior cortex	1	0.6%	3	1.6%	5	2.4%	1	1.4%
100.315	incipient cataract, posterior sutures	0		1	0.5%	0		0	
100.317	incipient cataract, capsular	0		1	0.5%	1	0.5%	0	
100.330	generalized/complete cataract	1	0.6%	1	0.5%	0		0	
VITREOUS									
110.120	persistant hyaloid artery/remnant	1	0.6%	0		2	1.0%	0	
110.320	vitreous degeneration syneresis	1	0.6%	0		1	0.5%	0	
RETINA									
120.170	retinal dysplasia, folds	3	1.9%	0		0		0	
120.190	retinal dysplasia, detached	0		0		0		1	1.4%
120.910	retinal detachment without dialysis	1	0.6%	0		0		0	
OTHER									
900.000	other, unspecified	0		1	0.5%	8	3.8%	0	
900.100	other, not inherited	0		8	4.4%	1	0.5%	2	2.9%
900.110	other, suspected as inherited	3	1.9%	1	0.5%	0		0	
NORMAL									
0.000	normal globe	132	83.5%	170	92.9%	192	92.3%	64	92.8%

OCULAR DISORDERS REPORT

GIANT SCHNAUZER - 1

GIANT SCHNAUZER

	DISORDER	INHERITANCE	REFERENCE	BREEDING ADVICE
A.	Nictitans cartilage anomaly/eversion	Not defined	1	Breeder option
B.	Persistent pupillary membranes - iris to iris	Not defined	2	Breeder option
C.	Cataract	Not defined	1	NO
D.	Retinal atrophy generalized (<i>prcd</i>) * a DNA test is available	Autosomal recessive	*	NO
E.	Retinal dysplasia - folds	Not defined	2	Breeder option

Description and Comments

A. Nictitans cartilage anomaly/eversion

A scroll-like curling of the cartilage of the third eyelid, usually everting the margin. This condition may occur in one or both eyes and may cause mild ocular irritation.

B. Persistent pupillary membranes (PPM)

Persistent blood vessel remnants in the anterior chamber of the eye which fail to regress normally by 3 months of age. These strands may bridge from iris to iris, iris to cornea, iris to lens, or form sheets of tissue in the anterior chamber. The last three forms pose the greatest threat to vision and when severe, vision impairment or blindness may occur.

C. Cataract

A partial or complete opacity of the lens and/or its capsule. In cases where cataracts are complete and affect both eyes, blindness results. The prudent approach is to assume cataracts to be hereditary except in cases known to be associated with trauma, other causes of ocular inflammation, specific metabolic diseases, persistent pupillary membrane, persistent hyaloid or nutritional deficiencies. Cataracts may involve the lens completely (diffuse) or in a localized region.

©2014, American College of Veterinary Ophthalmologists

OCULAR DISORDERS REPORT

GIANT SCHNAUZER –2

D. Retinal atrophy - generalized (*prcd*)

A degenerative disease of the retinal visual cells which progresses to blindness. This abnormality, also known as progressive retinal atrophy or PRA, may be detected by electroretinogram (not part of a routine eye screening examination) before it is apparent clinically. This photoreceptor degeneration is characterized by slow death of visual cells following their normal development. The disease begins clinically with signs of night blindness followed by day blindness.

E. Retinal dysplasia - folds

Linear, triangular, curved or curvilinear foci of retinal folding that may be single or multiple. When seen in puppies, this condition may partially or completely resolve with maturity. Its significance to vision is unknown. There are two other forms of retinal dysplasia (geographic, detached) which are known to be inherited in other breeds and, in their most severe form, cause blindness. The genetic relationship between folds and more severe forms of retinal dysplasia is undetermined.

References

There are no references providing detailed descriptions of hereditary ocular conditions of the Giant Schnauzer breed. The conditions listed above are generally recognized to exist in this breed, as evidenced by identification on breed eye screening examinations and/or clinical experience of veterinary ophthalmologists.

1. ACVO Genetics Committee, 1999 and/or Data from CERF All-Breeds Report, 1991-1998.
2. ACVO Genetics Committee, 2005 and/or Data from CERF All-Breeds Report 2003-2004.

OCULAR DISORDERS REPORT

GIANT SCHNAUZER

Diagnostic Name	TOTAL DOGS EXAMINED	1991-1999		2000-2009		2010-2013		2014	
		#	%	#	%	#	%	#	%
GLOBE									
0.110 microphthalmia		0		1	0.2%	0		0	
EYELIDS									
25.110 distichiasis		1	0.4%	2	0.4%	0		1	1.5%
NICTITANS									
51.100 third eyelid cartilage anomaly		2	0.8%	5	1.0%	1	0.4%	1	1.5%
52.110 prolapsed gland of the third eyelid		0		0		2	0.9%	0	
CORNEA									
70.700 corneal dystrophy		0		1	0.2%	0		0	
70.730 corneal endothelial degeneration		1	0.4%	0		0		0	
UVEA									
93.120 iris cyst		0		0		2	0.9%	0	
93.710 persistent pupillary membranes, iris to iris		8	3.1%	26	5.0%	12	5.2%	4	6.1%
93.720 persistent pupillary membranes, iris to lens		1	0.4%	3	0.6%	0		0	
93.730 persistent pupillary membranes, iris to cornea		5	1.9%	1	0.2%	0		0	
93.750 persistent pupillary membranes, lens pigment foci/no strands		0		0		5	2.2%	1	1.5%
93.760 persistent pupillary membranes, endothelial opacity/no strands		0		0		0		1	1.5%
LENS									
100.200 cataract, unspecified		5	1.9%	0		0		0	
100.210 cataract, significance unknown		9	3.5%	31	6.0%	12	5.2%	4	6.1%
100.301 punctate cataract, anterior cortex		0		2	0.4%	4	1.7%	0	
100.302 punctate cataract, posterior cortex		2	0.8%	3	0.6%	3	1.3%	0	
100.304 punctate cataract, anterior sutures		0		0		2	0.9%	0	
100.305 punctate cataract, posterior sutures		1	0.4%	1	0.2%	0		0	
100.306 punctate cataract, nucleus		0		1	0.2%	0		0	
100.307 punctate cataract, capsular		1	0.4%	2	0.4%	4	1.7%	0	
100.311 incipient cataract, anterior cortex		0		2	0.4%	1	0.4%	0	
100.312 incipient cataract, posterior cortex		5	1.9%	15	2.9%	2	0.9%	0	
100.313 incipient cataract, equatorial cortex		0		5	1.0%	2	0.9%	1	1.5%
100.315 incipient cataract, posterior sutures		1	0.4%	2	0.4%	1	0.4%	0	
100.316 incipient cataract, nucleus		0		2	0.4%	0		0	
100.317 incipient cataract, capsular		0		1	0.2%	0		1	1.5%
100.330 generalized/complete cataract		2	0.8%	0		0		0	
100.375 subluxation/luxation, unspecified		0		2	0.4%	0		0	
VITREOUS									
110.120 persistent hyaloid artery/remnant		3	1.2%	1	0.2%	1	0.4%	0	
110.135 PHPV/PTVL		1	0.4%	1	0.2%	3	1.3%	0	
110.320 vitreous degeneration syneresis		1	0.4%	0		1	0.4%	0	
RETINA									
120.170 retinal dysplasia, folds		6	2.3%	15	2.9%	3	1.3%	0	
120.180 retinal dysplasia, geographic		0		1	0.2%	0		0	
120.310 generalized progressive retinal atrophy (PRA)		4	1.5%	4	0.8%	0		0	
120.960 retinopathy		0		0		1	0.4%	0	

OCULAR DISORDERS REPORT GIANT SCHNAUZER

	1991-1999	2000-2009	2010-2013	2014
OTHER				
900.000 other, unspecified	0	5 1.0%	21 9.1%	0
900.100 other, not inherited	0	19 3.7%	5 2.2%	1 1.5%
900.110 other, suspected as inherited	3 1.2%	0	4 1.7%	0
NORMAL				
0.000 normal globe	214 82.3%	444 85.9%	205 88.4%	64 97.0%

OCULAR DISORDERS REPORT

GLEN OF IMAAL TERRIER - 1

GLEN OF IMAAL TERRIER

	DISORDER	INHERITANCE	REFERENCE	BREEDING ADVICE
A.	Distichiasis	Not defined	1	Breeder option
B.	Optic nerve coloboma	Not defined	1	NO
C.	Cataract	Not defined	2	NO
D.	Retinal atrophy - generalized	Not defined	1-3	NO
E.	Cone rod dystrophy (crd3) * a DNA test is available	Autosomal recessive	4	NO

Description and Comments

A. Distichiasis

Eyelashes abnormally located on the eyelid margin which may cause ocular irritation. Distichiasis may occur at any time in the life of a dog. It is difficult to make a strong recommendation with regard to breeding dogs with this entity. The hereditary basis has not been established although it seems probable due to the high incidence in some breeds. Reducing the incidence is a logical goal. When diagnosed, distichiasis should be recorded; breeding discretion is advised.

B. Optic nerve coloboma

A congenital cavity in the optic nerve which, if large, may cause blindness or vision impairment.

C. Cataract

A partial or complete opacity of the lens and/or its capsule. In cases where cataracts are complete and affect both eyes, blindness results. The prudent approach is to assume cataracts to be hereditary except in cases known to be associated with trauma, other causes of ocular inflammation, specific metabolic diseases, persistent pupillary membrane, persistent hyaloid or nutritional deficiencies. Cataracts may involve the lens completely (diffuse) or in a localized region.

OCULAR DISORDERS REPORT

GLEN OF IMAAL TERRIER - 2

D. Retinal atrophy-generalized

A degenerative disease of the retinal visual cells which progresses to blindness. This abnormality, also known as Progressive Retinal Atrophy or PRA, may be detected by electroretinogram (not part of a routine eye screening examination) before it is apparent clinically. Except for X-linked PRA in the Siberian Husky, in all breeds studied to date, PRA is inherited as an autosomal recessive trait.

E. Cone rod dystrophy

A form of late-onset PRA identified in Glen of Imaal Terriers. Ophthalmoscopic lesions are typically diagnosed by 5 years of age, however lesions may be present as early as 3 years of age in affected dogs. Two distinct phenotypes are observed in affected Glen of Imaal Terriers. The most common phenotype is subtle but generalized tapetal hyperreflectivity and retinal vascular attenuation that progresses over 1 – 2 years after initial examination. The less common phenotype is a focal mid-temporal (area centralis) area of distinct tapetal hyperreflectivity without generalized retinal disease. This lesion may remain unchanged for over a year but will progress to generalized retinal atrophy by 2 – 4 years after initial examination. ERG dysfunction can be observed as early as 15 weeks of age. The disorder is caused by a mutation present in the ADAM9 gene. A DNA test is available that will unequivocally identify normal, affected, and carrier dogs. The test is accurate only for this mutation and will not identify other forms of PRA.

References

1. ACVO Genetics Committee, 2002-2003 and/or Data from CERF All-Breeds Report, 2002-2003.
2. ACVO Genetics Committee, 2003-2004 and/or Data from CERF All-Breeds Report, 2005.
3. Kijas JW, Zanger B, Miller B, et al. Cloning of the canine ABCA4 gene and evaluation in canine cone-rod dystrophies and progressive retinal atrophies. *Mol Vis.* 2004;10:223-232.
4. Goldstein O, Mezey JG, Boyko AR, et al. An *ADAM9* mutation in canine cone-rod dystrophy 3 establishes homology with human cone-rod dystrophy 9. *Molecular Vision.* 2010;16:1549-1569.

OCULAR DISORDERS REPORT

GLEN OF IMAAL TERRIER

Diagnostic Name	TOTAL DOGS EXAMINED	1991-1999		2000-2009		2010-2013		2014	
		#	%	#	%	#	%	#	%
GLOBE									
0.110 microphthalmia		0		1	0.3%	0		0	
EYELIDS									
21.000 entropion, unspecified		0		2	0.6%	0		0	
25.110 distichiasis		2	2.7%	9	2.8%	10	5.6%	2	5.6%
UVEA									
93.120 iris cyst		0		0		2	1.1%	0	
93.720 persistent pupillary membranes, iris to lens		0		1	0.3%	0		0	
LENS									
100.210 cataract, significance unknown		14	19.2%	25	7.8%	12	6.7%	3	8.3%
100.301 punctate cataract, anterior cortex		1	1.4%	2	0.6%	0		0	
100.302 punctate cataract, posterior cortex		1	1.4%	0		0		0	
100.303 punctate cataract, equatorial cortex		2	2.7%	1	0.3%	1	0.6%	0	
100.305 punctate cataract, posterior sutures		0		0		1	0.6%	0	
100.306 punctate cataract, nucleus		0		2	0.6%	0		0	
100.307 punctate cataract, capsular		0		2	0.6%	2	1.1%	0	
100.311 incipient cataract, anterior cortex		0		3	0.9%	0		0	
100.313 incipient cataract, equatorial cortex		0		2	0.6%	5	2.8%	0	
100.314 incipient cataract, anterior sutures		0		1	0.3%	0		0	
100.315 incipient cataract, posterior sutures		0		2	0.6%	0		0	
100.316 incipient cataract, nucleus		0		1	0.3%	0		0	
100.321 incomplete cataract, anterior cortex		0		0		0		1	2.8%
100.322 incomplete cataract, posterior cortex		0		0		0		1	2.8%
100.330 generalized/complete cataract		0		0		1	0.6%	0	
100.375 subluxation/luxation, unspecified		2	2.7%	1	0.3%	0		0	
VITREOUS									
110.120 persistent hyaloid artery/remnant		1	1.4%	0		0		0	
110.320 vitreous degeneration syneresis		0		2	0.6%	0		0	
RETINA									
120.170 retinal dysplasia, folds		0		4	1.2%	1	0.6%	1	2.8%
120.180 retinal dysplasia, geographic		0		3	0.9%	0		1	2.8%
120.310 generalized progressive retinal atrophy (PRA)		1	1.4%	15	4.7%	6	3.3%	2	5.6%
OPTIC NERVE									
130.120 optic nerve hypoplasia		0		0		0		1	2.8%
130.150 optic disc coloboma		3	4.1%	1	0.3%	0		0	
OTHER									
900.000 other, unspecified		0		3	0.9%	9	5.0%	0	
900.100 other, not inherited		0		12	3.7%	10	5.6%	1	2.8%
900.110 other, suspected as inherited		13	17.8%	1	0.3%	0		0	
NORMAL									
0.000 normal globe		52	71.2%	271	84.2%	152	84.4%	30	83.3%

OCULAR DISORDERS REPORT

GOLDEN RETRIEVER - 1

GOLDEN RETRIEVER

	DISORDER	INHERITANCE	REFERENCE	BREEDING ADVICE
A.	Distichiasis	Not defined	1	Breeder option
B.	Entropion	Not defined	1	Breeder option
C.	Corneal dystrophy - epithelial/stromal	Not defined	1	Breeder option
D.	Uveal cysts	Not defined	1, 2	Breeder option
E.	Glaucoma	Not defined	1	NO
F.	Pigmentary uveitis	Not defined	1-4	NO
G.	Persistent pupillary membranes - iris to iris - all other forms	Not defined Not defined	1, 5 5	Breeder option NO
H.	Cataract	Not defined	1, 6-13	NO
I.	Retinal atrophy - generalized * two different DNA tests are available	Autosomal recessive	1, 16, 17	NO
J.	Retinal dysplasia - geographic/ detached	Not defined	1, 14, 15	NO
K.	Retinal dysplasia - folds	Not defined	1, 14	Breeder option
L.	Central progressive retinal atrophy	Not defined	1, 18, 19	NO
M.	Limbal melanoma	Not defined	20	NO

OCULAR DISORDERS REPORT

GOLDEN RETRIEVER - 2

Description and Comments

A. Distichiasis

Eyelashes abnormally located on the eyelid margin which may cause ocular irritation. Distichiasis may occur at any time in the life of a dog. It is difficult to make a strong recommendation with regard to breeding dogs with this entity. The hereditary basis has not been established although it seems probable due to the high incidence in some breeds. Reducing the incidence is a logical goal. When diagnosed, distichiasis should be recorded; breeding discretion is advised.

B. Entropion

A conformational defect resulting in an "in-rolling" of one or both of the eyelids which may cause ocular irritation. It is likely that entropion is influenced by several genes (polygenic), defining the skin and other structures which make up the eyelids, the amount and weight of the skin covering the head and face, the orbital contents, and the conformation of the skull. Selection should be directed against entropion and toward a head conformation that reduces or eliminates the likelihood of the defect.

C. Corneal dystrophy - epithelial/stromal

A non-inflammatory corneal opacity (white to gray) present in one or more of the corneal layers; usually inherited and bilateral.

D. Uveal cysts

Fluid filled sacs arising from the posterior surface of the iris, to which they may remain attached or break free and float into the anterior chamber. Usually occur in mature dogs.

This disorder may be observed in any breed but retriever breeds tend to be predisposed. There is usually no effect on vision unless the cysts are heavily clustered and impinge on the pupillary area. Less frequently, the cysts may rupture and adhere to the cornea or anterior lens capsule. Multiple cysts may occlude the iridocorneal angle and cause glaucoma.

E. Glaucoma

Glaucoma is characterized by an elevation of intraocular pressure (IOP) which, when sustained, causes intraocular damage resulting in blindness. The elevated intraocular pressure occurs because the fluid cannot leave through the iridocorneal angle. Diagnosis and classification of glaucoma requires measurement of the IOP (tonometry) and examination of the iridocorneal angle (gonioscopy). Neither of these tests is part of a routine screening exam for certification.

OCULAR DISORDERS REPORT

GOLDEN RETRIEVER - 3

F. Pigmentary uveitis

A unique uveitis observed in the Golden Retriever that is not associated with other ocular or systemic disorders. Adhesions develop between iris and lens and the peripheral iris and cornea. Pigment dispersion (exfoliation) occurs across the anterior lens capsule from the pigmented cells of the posterior iris. Other complications include secondary cataract and obstructive glaucoma. Onset is usually between 5-10 years of age.

G. Persistent pupillary membranes (PPM)

Persistent blood vessel remnants in the anterior chamber of the eye which fail to regress normally by 3 months of age. These strands may bridge from iris to iris, iris to cornea, iris to lens, or form sheets of tissue in the anterior chamber. The last three forms pose the greatest threat to vision and when severe, vision impairment or blindness may occur.

H. Cataract

A partial or complete opacity of the lens and/or its capsule. In cases where cataracts are complete and affect both eyes, blindness results. The prudent approach is to assume cataracts to be hereditary except in cases known to be associated with trauma, other causes of ocular inflammation, specific metabolic diseases, persistent pupillary membrane, persistent hyaloid or nutritional deficiencies. Cataracts may involve the lens completely (diffuse) or in a localized region.

The most common cataract reported in the Golden Retriever is a posterior polar (posterior cortical) cataract. These are generally bilateral, although an occasional unilateral affliction may be observed. These focal opacities will occasionally remain stationary. These cataracts are usually observed between 9 months and 3 years of age. A more generalized cataract is also observed in this breed and is not always associated with the previously mentioned polar cataract. There are also cataract changes involving the Y sutures which may or may not progress.

The existence of cataracts in the Golden Retriever, often with limited clinical significance, presents problems with breeder recognition as the majority of these dogs do not evidence visual impairment. It is strongly recommended that all Golden retrievers that are used in breeding programs be examined annually as cataract changes have been observed in multiple locations of the lens and variable age of onset.

I. Retinal atrophy - generalized

A degenerative disease of the retinal visual cells which progresses to blindness. This abnormality, also known as progressive retinal atrophy or PRA, may be detected by electroretinogram (not part of a routine eye screening examination) before it is apparent clinically. Except for X-linked PRA in the Siberian Husky, in all breeds studied to date, PRA is inherited as an autosomal recessive trait.

It appears that in this breed that retinal atrophy is caused by more than one genetic

OCULAR DISORDERS REPORT

GOLDEN RETRIEVER - 4

mutation (genetically heterogenous). Two different DNA tests are available.

J. Retinal dysplasia - geographic, detached

Abnormal development of the retina present at birth; however, in the Golden Retriever, Labrador Retriever, and German Shepherd it has been demonstrated that the geographic form of retinal dysplasia may not be apparent before dogs are 10 weeks of age.

Retinal dysplasia - geographic: Any irregularly shaped area of abnormal retinal development containing both areas of thinning and areas of elevation representing folds and retinal disorganization.

Retinal dysplasia - detached: Severe retinal disorganization associated with separation (detachment) of the retina.

These two forms are associated with vision impairment or blindness. Retinal dysplasia is known to be inherited in many breeds. The genetic relationship between the three forms of retinal dysplasia is not known for all breeds.

K. Retinal dysplasia - folds

Linear, triangular, curved or curvilinear foci of retinal folding that may be single or multiple. When seen in puppies, this condition may partially or completely resolve with maturity. Its significance to vision is unknown. There are two other forms of retinal dysplasia (geographic, detached) which are known to be inherited in other breeds and, in their most severe form, cause blindness. The genetic relationship between folds and more severe forms of retinal dysplasia is undetermined.

L. Central Progressive Retinal Atrophy (CPRA)

A progressive retinal degeneration in which photoreceptor death occurs secondary to disease of the underlying pigment epithelium. Progression is slow and some animals never lose vision. CPRA occurs in England, but is uncommon elsewhere. In some breeds, retinal lesions of CPRA have been related to an underlying abnormal metabolism of Vitamin E resulting in a systemic deficiency.

OCULAR DISORDERS REPORT

GOLDEN RETRIEVER - 5

M. Limbal melanoma

Most limbal melanomas are really epibulbar melanocytomas, but there is a possibility of an extension of an intraocular melanoma extending outward and presenting as a limbal melanoma. An epibulbar melanocytoma originates from the superficial pigment lining the limbus and the lesion may eventually extend into the eye. Metastasis has not been documented and the mass is characterized by large epithelioid cells. The lesion presents as a subconjunctival smooth mass most commonly in the dorsolateral limbal region and extends later into the cornea and posterior on the sclera. Breed predisposition have been noted in the German Shepherd, Labrador and Golden Retriever.

References

1. ACVO Genetics Committee, 1999 and/or Data from CERF All-Breeds Report, 1991-1998.
2. Townsend WM, Gornik K, Prevalence of pigmentary uveitis and uveal cysts in Golden Retrievers in three Midwestern states. *J Am Vet Med Assoc.* 2013 Nov 1;1298-1301.
3. ACVO Genetics Committee, 2000-2002 and/or Data from CERF All-Breeds Report, 2000-2002.
4. Sapienza JS, Simo FJ and Prades-Sapienza A. Golden Retriever uveitis: 75 cases (1994-1999). *Vet Ophthalmol.* 2000;3:241-246.
5. ACVO Genetics Committee, 2003-2004 and/or Data from CERF All-Breeds Report, 2005.
6. Deehr AJ and Dubielzig RR. A histopathological study of iridociliary cysts and glaucoma in Golden Retrievers. *Vet Ophthalmol.* 1998;1:153-158.
7. Bona A. Eine populationgenetische Untersuchung zur Zuchtsituation und zu erblich determinierten Erkankun- insbesondere Augen- und Gelenkserkrankungen- beim Golden und Labrador Retriever. (A population genetic study of the breeding situation and inherited diseases, particularly eye and joint diseases, in the Golden and Labrador retrievers.). Tierärztliche Hochschule Hannover: Hannover Germany. 1995.
8. Gelatt KN. Cataracts in the Golden Retriever dog. *Vet Med Small Anim Clin.* 1972 Oct;67:1113-1115.
9. Rubin LF. Cataract in Golden Retrievers. *J Am Vet Med Assoc.* 1974 Sep 1;165:457-458.
10. Barnett KC. Hereditary cataract in the dog. *J Small Anim Pract.* 1978 Feb;19:109-120.
11. Barnett KC. Cataract in the golden retriever. *Vet Rec.* 1980;111:315.

OCULAR DISORDERS REPORT

GOLDEN RETRIEVER - 6

12. Barnett KC. The diagnosis and differential diagnosis of cataract in the dog. *J Small Anim Pract.* 1985;26:305.
13. Curtis R. Hereditary cataract in Golden and Labrador retrievers in the United Kingdom. *Trans Am Coll Vet Ophthalmol.* 1986;17:23.
14. Long SE and Crispin SM. Inheritance of multifocal retinal dysplasia in the golden retriever in the UK. *Vet Rec.* 1999 Dec 11;145:702-704.
15. Holle DM, Stankovics ME, Sarna CS, et al. The geographic form of retinal dysplasia in dogs is not always a congenital abnormality. *Vet Ophthalmol.* 1999;2:61-66.
16. Gelatt KN. Description and diagnosis of progressive retinal atrophy. *Norden News.* 1974;24.
17. Downs LM, Wallin-Hakansson B, Boursnell M, et al. A frameshift mutation in golden retriever dogs with progressive retinal atrophy endorses SLC4A3 as a candidate gene for human retinal degenerations. *PLoS One.* 2011;6:e21452.
18. Barnett KC. Canine retinopathies III. The other breeds. *J Small Anim Pract.* 1965;6:185.
19. Parry HB. Degenerations of the dog retina VI. CPRA with pigment epithelial dystrophy. *Br J Ophthalmol.* 1954;38.
20. Donaldson D, Sansom J, Scase T, et al. Canine limbal melanoma: 30 cases (1992-2004). Part 1. Signalment, clinical and histological features and pedigree analysis. *Vet Ophthalmol.* 2006 Mar-Apr;9:115-119.

OCULAR DISORDERS REPORT GOLDEN RETRIEVER

Diagnostic Name	TOTAL DOGS EXAMINED		1991-1999 50489		2000-2009 62695		2010-2013 31174		2014 7539	
	#	%	#	%	#	%	#	%	#	%
GLOBE										
0.110 microphthalmia	31	0.1%	13	0.0%	3	0.0%	2	0.0%		
10.000 glaucoma	26	0.1%	4	0.0%	1	0.0%	0			
EYELIDS										
20.110 eyelid dermoid	3	0.0%	0		0		0		0	
20.140 ectopic cilia	24	0.0%	20	0.0%	5	0.0%	1	0.0%		
20.160 macropalpebral fissure	4	0.0%	16	0.0%	2	0.0%	0			
21.000 entropion, unspecified	171	0.3%	136	0.2%	43	0.1%	12	0.2%		
22.000 ectropion, unspecified	43	0.1%	43	0.1%	10	0.0%	5	0.1%		
25.110 distichiasis	5979	11.8%	6624	10.6%	3148	10.1%	704	9.3%		
NASOLACRIMAL										
32.110 imperforate lower nasolacrimal punctum	9	0.0%	0		11	0.0%	4	0.1%		
40.910 keratoconjunctivitis sicca	1	0.0%	0		2	0.0%	1	0.0%		
NICTITANS										
51.100 third eyelid cartilage anomaly	3	0.0%	2	0.0%	7	0.0%	1	0.0%		
52.110 prolapsed gland of the third eyelid	1	0.0%	2	0.0%	36	0.1%	2	0.0%		
CORNEA										
70.210 corneal pannus	8	0.0%	2	0.0%	0		1	0.0%		
70.220 pigmentary keratitis	2	0.0%	4	0.0%	4	0.0%	2	0.0%		
70.700 corneal dystrophy	207	0.4%	247	0.4%	118	0.4%	38	0.5%		
70.730 corneal endothelial degeneration	23	0.0%	9	0.0%	3	0.0%	1	0.0%		
UVEA										
90.200 uveitis	0		0		43	0.1%	0			
90.250 pigmentary uveitis	0		211	0.3%	483	1.5%	140	1.9%		
93.110 iris hypoplasia	0		0		3	0.0%	1	0.0%		
93.120 iris cyst	1255	2.5%	3137	5.0%	1753	5.6%	227	3.0%		
93.140 corneal endothelial pigment without PPM	0		8	0.0%	9	0.0%	0			
93.150 iris coloboma	4	0.0%	11	0.0%	4	0.0%	1	0.0%		
93.170 anterior chamber cyst	0		0		191	0.6%	147	1.9%		
93.710 persistent pupillary membranes, iris to iris	621	1.2%	1520	2.4%	862	2.8%	209	2.8%		
93.720 persistent pupillary membranes, iris to lens	53	0.1%	52	0.1%	6	0.0%	2	0.0%		
93.730 persistent pupillary membranes, iris to cornea	34	0.1%	35	0.1%	9	0.0%	3	0.0%		
93.740 persistent pupillary membranes, iris sheets	43	0.1%	65	0.1%	1	0.0%	2	0.0%		
93.750 persistent pupillary membranes, lens pigment foci/no strands	0		13	0.0%	238	0.8%	87	1.2%		
93.760 persistent pupillary membranes, endothelial opacity/no strands	0		5	0.0%	35	0.1%	1	0.0%		
93.810 uveal melanoma	0		4	0.0%	10	0.0%	7	0.1%		
95.120 ciliary body cyst	0		0		290	0.9%	229	3.0%		
LENS										
100.200 cataract, unspecified	951	1.9%	0		1	0.0%	0			
100.210 cataract, significance unknown	1942	3.8%	3995	6.4%	2325	7.5%	648	8.6%		
100.301 punctate cataract, anterior cortex	167	0.3%	262	0.4%	310	1.0%	45	0.6%		
100.302 punctate cataract, posterior cortex	722	1.4%	914	1.5%	481	1.5%	87	1.2%		
100.303 punctate cataract, equatorial cortex	118	0.2%	177	0.3%	180	0.6%	25	0.3%		
100.304 punctate cataract, anterior sutures	41	0.1%	32	0.1%	29	0.1%	4	0.1%		

OCULAR DISORDERS REPORT GOLDEN RETRIEVER

LENS CONTINUED	1991-1999		2000-2009		2010-2013		2014	
100.305 punctate cataract, posterior sutures	334	0.7%	302	0.5%	128	0.4%	18	0.2%
100.306 punctate cataract, nucleus	62	0.1%	77	0.1%	90	0.3%	18	0.2%
100.307 punctate cataract, capsular	25	0.0%	172	0.3%	104	0.3%	29	0.4%
100.311 incipient cataract, anterior cortex	195	0.4%	369	0.6%	213	0.7%	46	0.6%
100.312 incipient cataract, posterior cortex	1008	2.0%	1370	2.2%	506	1.6%	135	1.8%
100.313 incipient cataract, equatorial cortex	194	0.4%	416	0.7%	222	0.7%	53	0.7%
100.314 incipient cataract, anterior sutures	20	0.0%	30	0.0%	12	0.0%	0	
100.315 incipient cataract, posterior sutures	280	0.6%	310	0.5%	100	0.3%	21	0.3%
100.316 incipient cataract, nucleus	89	0.2%	123	0.2%	73	0.2%	21	0.3%
100.317 incipient cataract, capsular	19	0.0%	136	0.2%	73	0.2%	28	0.4%
100.321 incomplete cataract, anterior cortex	0		0		6	0.0%	12	0.2%
100.322 incomplete cataract, posterior cortex	0		0		16	0.1%	21	0.3%
100.323 incomplete cataract, equatorial cortex	0		0		4	0.0%	4	0.1%
100.324 incomplete cataract, anterior sutures	0		0		2	0.0%	0	
100.325 incomplete cataract, posterior sutures	0		0		1	0.0%	2	0.0%
100.326 incomplete cataract, nucleus	0		0		4	0.0%	8	0.1%
100.327 incomplete cataract, capsular	0		0		2	0.0%	5	0.1%
100.330 generalized/complete cataract	158	0.3%	127	0.2%	52	0.2%	5	0.1%
100.375 subluxation/luxation, unspecified	12	0.0%	16	0.0%	1	0.0%	1	0.0%
VITREOUS								
110.120 persistent hyaloid artery/remnant	52	0.1%	54	0.1%	11	0.0%	11	0.1%
110.130 PHPV/PTVL	0		0		1	0.0%	0	
110.135 PHPV/PTVL	15	0.0%	13	0.0%	8	0.0%	0	
110.200 vitritis	0		0		5	0.0%	1	0.0%
110.320 vitreous degeneration syneresis	49	0.1%	112	0.2%	68	0.2%	18	0.2%
110.330 vitreous degeneration anterior chamber	0		7	0.0%	7	0.0%	0	
FUNDUS								
97.110 choroidal hypoplasia	6	0.0%	3	0.0%	0		0	
97.120 coloboma	7	0.0%	1	0.0%	0		0	
RETINA								
120.170 retinal dysplasia, folds	481	1.0%	950	1.5%	358	1.1%	81	1.1%
120.180 retinal dysplasia, geographic	153	0.3%	382	0.6%	168	0.5%	45	0.6%
120.190 retinal dysplasia, detached	10	0.0%	21	0.0%	7	0.0%	1	0.0%
120.200 retinitis	0		0		2	0.0%	16	0.2%
120.310 generalized progressive retinal atrophy (PRA)	77	0.2%	72	0.1%	14	0.0%	1	0.0%
120.400 retinal hemorrhage	14	0.0%	4	0.0%	0		0	
120.910 retinal detachment without dialysis	17	0.0%	8	0.0%	3	0.0%	0	
120.920 retinal detachment with dialysis	0		0		0		1	0.0%
120.960 retinopathy	0		0		12	0.0%	0	
OPTIC NERVE								
130.110 micropapilla	1	0.0%	3	0.0%	4	0.0%	1	0.0%
130.120 optic nerve hypoplasia	27	0.1%	7	0.0%	2	0.0%	0	
130.150 optic disc coloboma	33	0.1%	18	0.0%	5	0.0%	0	
OTHER								
900.000 other, unspecified	0		464	0.7%	1319	4.2%	0	
900.100 other, not inherited	217	0.4%	2738	4.4%	388	1.2%	370	4.9%
900.110 other, suspected as inherited	498	1.0%	328	0.5%	174	0.6%	25	0.3%

OCULAR DISORDERS REPORT GOLDEN RETRIEVER

	1991-1999	2000-2009	2010-2013	2014
NORMAL 0.000 normal globe	37879 75.0%	49346 78.7%	25650 82.3%	6054 80.3%

OCULAR DISORDERS REPORT

GORDON SETTER - 1

GORDON SETTER

	DISORDER	INHERITANCE	REFERENCE	BREEDING ADVICE
A.	Ectropion	Not defined	1	Breeder option
B.	Entropion	Not defined	1	Breeder option
C.	Distichiasis	Not defined	2	Breeder option
D.	Uveal cysts	Not defined	2	Breeder option
E.	Persistent pupillary membranes			
	- iris to iris	Not defined	1, 2	Breeder option
	- all other forms	Not defined	3	NO
F.	Cataract	Not defined	1	NO
G.	Persistent hyaloid artery	Not defined	2	Breeder option
H.	Retinal atrophy - generalized	Not defined	4-6	NO
I.	Retinal atrophy - rod-cone dysplasia type 4 (<i>rcd4</i>) * a DNA test is available	Autosomal Recessive	7	NO
J.	Retinal dysplasia - folds	Not defined	1	Breeder option

Description and Comments

A. Ectropion

A conformational defect resulting in eversion of the eyelids which may cause ocular irritation. It is likely that ectropion is influenced by several genes (polygenic) defining the skin and other structures which make up the eyelids, the amount and weight of the skin covering the head and face, the orbital contents and the conformation of the skull.

OCULAR DISORDERS REPORT

GORDON SETTER - 2

B. Entropion

A conformational defect resulting in an "in-rolling" of one or both of the eyelids which may cause ocular irritation. It is likely that entropion is influenced by several genes (polygenic), defining the skin and other structures which make up the eyelids, the amount and weight of the skin covering the head and face, the orbital contents, and the conformation of the skull.

In the Gordon Setter, entropion may be associated with an exceptionally large palpebral fissure and laxity of the canthal structures. Central lower lid ectropion is then associated with entropion of the adjacent lid. This may cause severe ocular irritation.

C. Distichiasis

Eyelashes abnormally located on the eyelid margin which may cause ocular irritation. Distichiasis may occur at any time in the life of a dog. It is difficult to make a strong recommendation with regard to breeding dogs with this entity. The hereditary basis has not been established although it seems probable due to the high incidence in some breeds. Reducing the incidence is a logical goal. When diagnosed, distichiasis should be recorded; breeding discretion is advised.

D. Uveal cysts

Fluid filled sacs arising from the posterior surface of the iris, to which they may remain attached or break free and float into the anterior chamber. Usually occur in mature dogs.

E. Persistent pupillary membranes (PPM)

Persistent blood vessel remnants in the anterior chamber of the eye which fail to regress normally by 3 months of age. These strands may bridge from iris to iris, iris to cornea, iris to lens, or form sheets of tissue in the anterior chamber. The last three forms pose the greatest threat to vision and when severe, vision impairment or blindness may occur.

F. Cataract

A partial or complete opacity of the lens and/or its capsule. In cases where cataracts are complete and affect both eyes, blindness results. The prudent approach is to assume cataracts to be hereditary except in cases known to be associated with trauma, other causes of ocular inflammation, specific metabolic diseases, persistent pupillary membrane, persistent hyaloid or nutritional deficiencies. Cataracts may involve the lens completely (diffuse) or in a localized region.

OCULAR DISORDERS REPORT

GORDON SETTER - 3

G. Persistent hyaloid artery (PHA)

Congenital defect resulting from abnormalities in the development and regression of the hyaloid artery. The blood vessel remnant can be present in the vitreous as a small patent vascular strand (PHA) or as a non-vascular strand that appears gray-white (persistent hyaloid remnant).

H. Retinal atrophy - generalized

A degenerative disease of the retinal visual cells which progresses to blindness. This abnormality, also known as progressive retinal atrophy or PRA, may be detected by electroretinogram (not part of a routine eye screening examination) before it is apparent clinically. Except for X-linked PRA in the Siberian Husky, in all breeds studied to date, PRA is inherited as an autosomal recessive trait.

I. Rod-cone dysplasia, type 4 (*rcd4*)

A form of PRA identified in the Gordon and Irish Setter breeds. Clinical night blindness is observed on average as late as 10 years of age and progresses to total blindness. This form of PRA has been referred to as late-onset PRA (LOPRA). The disorder is caused by a mutation present in the *C2orf71* gene. A DNA test is now available that will unequivocally identify genetically normal, affected and carrier dogs. The test is accurate only for this mutation and will not identify other forms of PRA.

J. Retinal dysplasia - folds

Linear, triangular, curved or curvilinear foci of retinal folding that may be single or multiple. When seen in puppies, this condition may partially or completely resolve with maturity. Its significance to vision is unknown. There are two other forms of retinal dysplasia (geographic, detached) which are known to be inherited in other breeds and, in their most severe form, cause blindness. The genetic relationship between folds and more severe forms of retinal dysplasia is undetermined.

References

1. ACVO Genetics Committee, 1999 and/or Data from CERF All-Breeds Report, 1991-1998.
2. ACVO Genetics Committee, 2000-2002 and/or Data from CERF All-Breeds Report, 2000-2002.
3. ACVO Genetics Committee, 2005 and/or Data from CERF All-Breeds Report 2003-2004.
4. Magnusson H. Om nattblindhet hos hund sasom foljd afslaktkapsafvel (On night blindness in the dog following inbreeding). *Svensk Vet Tidsskr.* 1909; 14: 462.
5. Magnusson H. Uber retinites pigmentosa und konsanguinitat beim hunde (On retinitis

©2014, American College of Veterinary Ophthalmologists

OCULAR DISORDERS REPORT

GORDON SETTER - 4

pigmentosa and consanguinity in dogs). *Arch Vergl Ophthalmol.* 1911; 2: 147.

6. Magnusson H. Noch ein fall von nachtblindheit beim hunde (Another case of night blindness in the dog). *Graefes Arch Ophthal.* 1917; 93: 404.
7. Downs LM, Bell JS, Freeman J, et al. Late-onset progressive retinal atrophy in the Gordon and Irish Setter breeds is associated with a frameshift mutation in C2orf71. *Anim Genet.* 2012.

OCULAR DISORDERS REPORT GORDON SETTER

Diagnostic Name	TOTAL DOGS EXAMINED	1991-1999		2000-2009		2010-2013		2014	
		#	%	#	%	#	%	#	%
GLOBE									
0.110 microphthalmia		1	0.1%	0		0		0	
EYELIDS									
20.140 ectopic cilia		1	0.1%	0		0		0	
20.160 macropalpebral fissure		3	0.4%	5	0.6%	1	0.2%	0	
21.000 entropion, unspecified		5	0.7%	6	0.7%	2	0.5%	1	0.9%
22.000 ectropion, unspecified		27	3.7%	13	1.4%	8	2.0%	3	2.7%
25.110 distichiasis		9	1.2%	24	2.7%	8	2.0%	2	1.8%
NASOLACRIMAL									
40.910 keratoconjunctivitis sicca		0		1	0.1%	0		0	
NICTITANS									
51.100 third eyelid cartilage anomaly		0		0		1	0.2%	0	
CORNEA									
70.210 corneal pannus		1	0.1%	0		2	0.5%	0	
70.700 corneal dystrophy		4	0.5%	2	0.2%	2	0.5%	0	
UVEA									
93.120 iris cyst		1	0.1%	15	1.7%	3	0.8%	0	
93.710 persistent pupillary membranes, iris to iris		26	3.5%	53	5.9%	20	5.0%	10	9.0%
93.720 persistent pupillary membranes, iris to lens		5	0.7%	1	0.1%	1	0.2%	0	
93.730 persistent pupillary membranes, iris to cornea		2	0.3%	2	0.2%	0		0	
93.740 persistent pupillary membranes, iris sheets		1	0.1%	1	0.1%	0		0	
93.750 persistent pupillary membranes, lens pigment foci/no strands		0		1	0.1%	5	1.2%	5	4.5%
93.760 persistent pupillary membranes, endothelial opacity/no strands		0		1	0.1%	1	0.2%	1	0.9%
LENS									
100.200 cataract, unspecified		9	1.2%	0		0		0	
100.210 cataract, significance unknown		24	3.3%	29	3.2%	15	3.8%	6	5.4%
100.301 punctate cataract, anterior cortex		1	0.1%	2	0.2%	3	0.8%	0	
100.302 punctate cataract, posterior cortex		1	0.1%	3	0.3%	2	0.5%	1	0.9%
100.303 punctate cataract, equatorial cortex		0		2	0.2%	1	0.2%	0	
100.305 punctate cataract, posterior sutures		0		1	0.1%	1	0.2%	0	
100.306 punctate cataract, nucleus		1	0.1%	4	0.4%	1	0.2%	0	
100.307 punctate cataract, capsular		0		0		1	0.2%	0	
100.311 incipient cataract, anterior cortex		0		6	0.7%	0		0	
100.312 incipient cataract, posterior cortex		3	0.4%	7	0.8%	3	0.8%	0	
100.313 incipient cataract, equatorial cortex		2	0.3%	2	0.2%	0		2	1.8%
100.316 incipient cataract, nucleus		1	0.1%	2	0.2%	0		0	
100.317 incipient cataract, capsular		0		3	0.3%	0		0	
100.327 incomplete cataract, capsular		0		0		0		1	0.9%
100.330 generalized/complete cataract		6	0.8%	3	0.3%	1	0.2%	0	
VITREOUS									
110.120 persistent hyaloid artery/remnant		6	0.8%	3	0.3%	0		0	
110.135 PHPV/PTVL		0		5	0.6%	0		0	
110.320 vitreous degeneration syneresis		0		4	0.4%	1	0.2%	0	

OCULAR DISORDERS REPORT

GORDON SETTER

	1991-1999	2000-2009	2010-2013	2014
RETINA				
120.170 retinal dysplasia, folds	14 1.9%	12 1.3%	3 0.8%	2 1.8%
120.180 retinal dysplasia, geographic	3 0.4%	0	0	1 0.9%
120.190 retinal dysplasia, detached	1 0.1%	0	0	0
120.310 generalized progressive retinal atrophy (PRA)	13 1.8%	3 0.3%	1 0.2%	0
120.910 retinal detachment without dialysis	2 0.3%	0	0	0
OPTIC NERVE				
130.110 micropapilla	2 0.3%	5 0.6%	1 0.2%	0
130.120 optic nerve hypoplasia	7 1.0%	1 0.1%	0	0
130.150 optic disc coloboma	0	1 0.1%	0	0
OTHER				
900.000 other, unspecified	0	13 1.4%	27 6.8%	0
900.100 other, not inherited	2 0.3%	55 6.1%	7 1.8%	9 8.1%
900.110 other, suspected as inherited	6 0.8%	4 0.4%	1 0.2%	1 0.9%
NORMAL				
0.000 normal globe	596 81.1%	759 83.9%	347 86.8%	88 79.3%

OCULAR DISORDERS REPORT

GREAT DANE - 1

GREAT DANE

	DISORDER	INHERITANCE	REFERENCE	BREEDING ADVICE
A.	Microphthalmia with multiple ocular defects associated with partial albinism	Presumed autosomal dominant	1,2	NO
B.	Glaucoma	Not defined	1,3,4	NO
C.	Distichiasis	Not defined	1	Breeder option
D.	Ectropion	Not defined	1	Breeder option
E.	Entropion	Not defined	1	Breeder option
F.	Eury/Macroblepharon	Not defined	5	Breeder option
G.	Nictitans cartilage anomaly/eversion	Not defined	1	Breeder option
H.	Prolapsed gland of the third eyelid	Not defined	6	Breeder option
I.	Ciliary body cysts	Not defined	7	Breeder option
J.	Persistent pupillary membranes - iris to iris	Not defined	5	Breeder option
K.	Uveal cysts	Not defined	5	Breeder option
L.	Cataract	Not defined	1	NO
M.	Retinal atrophy - generalized	Not defined	1	NO

OCULAR DISORDERS REPORT

GREAT DANE - 2

Description and Comments

A. Microphthalmia with multiple ocular defects associated with partial albinism

Multiple ocular defects are seen associated with partial albinism (white or light coat color) and deafness in Great Danes. The abnormalities are thought to stem from a common developmental defect. Ocular defects are anterior segment dysgenesis, equatorial staphylomas, microphthalmia, cortical cataracts, lens luxation, spherophakia, iris coloboma, and blue irides. An autosomal dominant mode of inheritance is suspected. The hearing loss is attributable to cochlea-saccular degeneration.

B. Glaucoma

Glaucoma is characterized by an elevation of intraocular pressure (IOP) which, when sustained, causes intraocular damage resulting in blindness. The elevated intraocular pressure occurs because the fluid cannot leave through the iridocorneal angle. Diagnosis and classification of glaucoma requires measurement of the IOP (tonometry) and examination of the iridocorneal angle (gonioscopy). Neither of these tests is part of a routine screening exam for certification.

C. Distichiasis

Eyelashes abnormally located on the eyelid margin which may cause ocular irritation. Distichiasis may occur at any time in the life of a dog. It is difficult to make a strong recommendation with regard to breeding dogs with this entity. The hereditary basis has not been established, although it seems probable due to the high incidence in some breeds. Reducing the incidence is a logical goal. When diagnosed, distichiasis should be recorded; breeding discretion is advised.

D. Ectropion

A conformational defect resulting in eversion of the eyelids which may cause ocular irritation. It is likely that ectropion is influenced by several genes (polygenic) defining the skin and other structures which make up the eyelids, the amount and weight of the skin covering the head and face, the orbital contents and the conformation of the skull.

E. Entropion

A conformational defect resulting in an "in-rolling" of one or both of the eyelids which may cause ocular irritation. It is likely that entropion is influenced by several genes (polygenic), defining the skin and other structures which make up the eyelids, the amount and weight of the skin covering the head and face, the orbital contents, and the conformation of the skull. Entropion and ectropion often occur together in this breed, associated with an abnormally large palpebral fissure.

F. Eury/Macroblepharon

Defined as an exceptionally large palpebral fissure, macroblepharon in conjunction with

OCULAR DISORDERS REPORT

GREAT DANE - 3

laxity of the lateral canthal structures may lead to lower lid ectropion and upper lid entropion. Either of these conditions may lead to severe ocular irritation.

G. Nictitans cartilage anomaly/eversion

A scroll-like curling of the cartilage of the third eyelid, usually everting the margin. This condition may occur in one or both eyes and may cause mild ocular irritation.

H. Prolapsed gland of the third eyelid

Protrusion of the tear gland associated with the third eyelid. The mode of inheritance of this disorder is unknown. The exposed gland may become irritated. Commonly referred to as "cherry eye".

Great Danes were overrepresented in a study of prolapsed gland of the third eyelid. In the study, 83% of the prolapsed glands in Great Danes occurred before 1 year of age. Great Danes were also more likely to develop bilateral prolapsed glands that occurred either simultaneously with the first prolapse or with a short time interval between prolapses.

I. Ciliary body cysts

Pigmented cysts arise from pigmented epithelial cells of the ciliary body. Ciliary body cysts may predispose to glaucoma in the Great Dane.

J. Persistent pupillary membranes (PPM)

Persistent blood vessel remnants in the anterior chamber of the eye which fail to regress normally during by 3 months of age. These strands may bridge from iris to iris, iris to cornea, iris to lens, or form sheets of tissue in the anterior chamber. The last three forms pose the greatest threat to vision and when severe, vision impairment or blindness may occur.

K. Uveal cysts

Fluid filled sacs arising from the posterior surface of the iris, to which they may remain attached or break free and float into the anterior chamber. Usually occur in mature dogs.

L. Cataract

A partial or complete opacity of the lens and/or its capsule. In cases where cataracts are complete and affect both eyes, blindness results. The prudent approach is to assume cataracts to be hereditary except in cases known to be associated with trauma, other causes of ocular inflammation, specific metabolic diseases, persistent pupillary membrane, persistent hyaloid or nutritional deficiencies. Cataracts may involve the lens completely (diffuse) or in a localized region. The mode of inheritance in this breed has not been determined.

OCULAR DISORDERS REPORT

GREAT DANE - 4

M. Retinal atrophy - generalized

A degenerative disease of the retinal visual cells which progresses to blindness. This abnormality, also known as progressive retinal atrophy or PRA, may be detected by electroretinogram (not part of a routine eye screening examination) before it is apparent clinically. Except for X-linked PRA in the Siberian Husky, in all breeds studied to date, PRA is inherited as an autosomal recessive trait.

References

There are few references providing detailed descriptions of hereditary ocular conditions of the Great Dane breed. The conditions listed above are generally recognized to exist in this breed, as evidenced by identification on breed eye screening examinations and/or clinical experience of veterinary ophthalmologists.

1. ACVO Genetics Committee, 1999 and/or Data from CERF All-Breeds Report, 1991-1998.
2. Gwin RM, Wyman M, Lim DJ, et al. Multiple ocular defects associated with partial albinism and deafness in the dog. *J Am Anim Hosp Assoc.* 1981;17.
3. Wood JL, Lakhani KH, Mason IK, et al. Relationship of the degree of goniodysgenesis and other ocular measurements to glaucoma in Great Danes. *Am J Vet Res.* 2001;62:1493-1499.
4. Barnett KC, Mason IK. Primary glaucoma in the Great Dane. *Proc Am Coll Vet Ophthalmol.* 1993;24.
5. ACVO Genetics Committee, 2005 and/or Data from CERF All-Breeds Report 2003-2004.
6. Mazzucchelli S, Vaillant MD, Weverberg F, et al. Retrospective study of 155 cases of prolapse of the nictitating membrane gland in dogs. *Vet Rec.* 2012;170:443.
7. Spiess BM, Bolliger JO, Guscetti F, et al. Multiple ciliary body cysts and secondary glaucoma in the Great Dane: a report of nine cases. *Vet Ophthalmol.* 1998;1:41-45.

OCULAR DISORDERS REPORT GREAT DANE

Diagnostic Name	TOTAL DOGS EXAMINED	1991-1999 1010		2000-2009 3263		2010-2013 1637		2014 470		
		#	%	#	%	#	%	#	%	
GLOBE										
0.110	microphthalmia	10	1.0%	12	0.4%	0		1	0.2%	
10.000	glaucoma	0		2	0.1%	0		0		
EYELIDS										
20.160	macropalpebral fissure	5	0.5%	91	2.8%	28	1.7%	0		
21.000	entropion, unspecified	22	2.2%	81	2.5%	39	2.4%	14	3.0%	
22.000	ectropion, unspecified	22	2.2%	154	4.7%	56	3.4%	17	3.6%	
25.110	distichiasis	54	5.3%	172	5.3%	92	5.6%	23	4.9%	
NASOLACRIMAL										
32.110	imperforate lower nasolacrimal punctum	0		0		1	0.1%	0		
40.910	keratoconjunctivitis sicca	0		1	0.0%	0		0		
NICTITANS										
51.100	third eyelid cartilage anomaly	4	0.4%	57	1.7%	40	2.4%	11	2.3%	
52.110	prolapsed gland of the third eyelid	1	0.1%	5	0.2%	7	0.4%	1	0.2%	
CORNEA										
70.210	corneal pannus	1	0.1%	1	0.0%	0		0		
70.220	pigmentary keratitis	0		1	0.0%	1	0.1%	1	0.2%	
70.700	corneal dystrophy	5	0.5%	15	0.5%	4	0.2%	4	0.9%	
UVEA										
90.250	pigmentary uveitis	0		1	0.0%	0		0		
93.110	iris hypoplasia	0		3	0.1%	3	0.2%	1	0.2%	
93.120	iris cyst	5	0.5%	41	1.3%	19	1.2%	4	0.9%	
93.140	corneal endothelial pigment without PPM	0		1	0.0%	1	0.1%	0		
93.150	iris coloboma	6	0.6%	8	0.2%	3	0.2%	1	0.2%	
93.170	anterior chamber cyst	0		0		3	0.2%	2	0.4%	
93.710	persistent pupillary membranes, iris to iris	22	2.2%	33	1.0%	9	0.5%	3	0.6%	
93.720	persistent pupillary membranes, iris to lens	3	0.3%	9	0.3%	4	0.2%	0		
93.730	persistent pupillary membranes, iris to cornea	3	0.3%	4	0.1%	1	0.1%	0		
93.740	persistent pupillary membranes, iris sheets	0		4	0.1%	0		0		
93.750	persistent pupillary membranes, lens pigment foci/no strands	0		0		13	0.8%	4	0.9%	
93.760	persistent pupillary membranes, endothelial opacity/no strands	0		0		1	0.1%	0		
93.810	uveal melanoma	0		2	0.1%	2	0.1%	0		
95.120	ciliary body cyst	0		0		1	0.1%	5	1.1%	
LENS										
100.200	cataract, unspecified	15	1.5%	0		0		0		
100.210	cataract, significance unknown	20	2.0%	143	4.4%	42	2.6%	14	3.0%	
100.301	punctate cataract, anterior cortex	6	0.6%	12	0.4%	6	0.4%	2	0.4%	
100.302	punctate cataract, posterior cortex	15	1.5%	37	1.1%	13	0.8%	1	0.2%	
100.303	punctate cataract, equatorial cortex	3	0.3%	5	0.2%	7	0.4%	2	0.4%	
100.304	punctate cataract, anterior sutures	1	0.1%	1	0.0%	2	0.1%	0		
100.305	punctate cataract, posterior sutures	6	0.6%	13	0.4%	5	0.3%	1	0.2%	
100.306	punctate cataract, nucleus	3	0.3%	7	0.2%	4	0.2%	0		
100.307	punctate cataract, capsular	0		9	0.3%	5	0.3%	0		
100.311	incipient cataract, anterior cortex	13	1.3%	35	1.1%	15	0.9%	1	0.2%	

OCULAR DISORDERS REPORT GREAT DANE

LENS CONTINUED	1991-1999	2000-2009	2010-2013	2014
100.312 incipient cataract, posterior cortex	40 4.0%	72 2.2%	24 1.5%	4 0.9%
100.313 incipient cataract, equatorial cortex	8 0.8%	26 0.8%	7 0.4%	0
100.314 incipient cataract, anterior sutures	1 0.1%	5 0.2%	0	0
100.315 incipient cataract, posterior sutures	6 0.6%	10 0.3%	3 0.2%	0
100.316 incipient cataract, nucleus	8 0.8%	23 0.7%	1 0.1%	0
100.317 incipient cataract, capsular	1 0.1%	14 0.4%	5 0.3%	1 0.2%
100.321 incomplete cataract, anterior cortex	0	0	4 0.2%	1 0.2%
100.322 incomplete cataract, posterior cortex	0	0	1 0.1%	2 0.4%
100.327 incomplete cataract, capsular	0	0	2 0.1%	1 0.2%
100.330 generalized/complete cataract	25 2.5%	22 0.7%	1 0.1%	3 0.6%
100.375 subluxation/luxation, unspecified	4 0.4%	3 0.1%	0	1 0.2%
VITREOUS				
110.120 persistant hyaloid artery/remnant	1 0.1%	4 0.1%	5 0.3%	2 0.4%
110.135 PHPV/PTVL	3 0.3%	4 0.1%	3 0.2%	5 1.1%
110.200 vitritis	0	0	2 0.1%	1 0.2%
110.320 vitreous degeneration syneresis	3 0.3%	16 0.5%	8 0.5%	0
110.330 vitreous degeneration anterior chamber	0	7 0.2%	3 0.2%	0
FUNDUS				
97.110 choroidal hypoplasia	0	1 0.0%	0	0
97.120 coloboma	2 0.2%	0	0	0
RETINA				
120.170 retinal dysplasia, folds	10 1.0%	10 0.3%	0	1 0.2%
120.180 retinal dysplasia, geographic	0	2 0.1%	1 0.1%	0
120.190 retinal dysplasia, detached	0	0	0	2 0.4%
120.310 generalized progressive retinal atrophy (PRA)	4 0.4%	3 0.1%	0	0
120.910 retinal detachment without dialysis	0	1 0.0%	0	0
120.920 retinal detachment with dialysis	0	0	1 0.1%	0
120.960 retinopathy	0	0	2 0.1%	0
OPTIC NERVE				
130.110 micropapilla	0	1 0.0%	0	0
130.120 optic nerve hypoplasia	1 0.1%	2 0.1%	0	0
130.150 optic disc coloboma	1 0.1%	0	1 0.1%	0
OTHER				
900.000 other, unspecified	0	16 0.5%	44 2.7%	0
900.100 other, not inherited	1 0.1%	126 3.9%	22 1.3%	12 2.6%
900.110 other, suspected as inherited	14 1.4%	19 0.6%	7 0.4%	5 1.1%
NORMAL				
0.000 normal globe	745 73.8%	2620 80.3%	1390 84.9%	398 84.7%

OCULAR DISORDERS REPORT

GREAT PYRENEES - 1

GREAT PYRENEES

	DISORDER	INHERITANCE	REFERENCE	BREEDING ADVICE
A.	Distichiasis	Not defined	1	Breeder option
B.	Entropion	Not defined	2, 3	Breeder option
C.	Corneal dystrophy - epithelial/stromal	Not defined	4	Breeder option
D.	Persistent pupillary membranes			
	- iris to iris	Not defined	1, 3, 5	Breeder option
	- iris to lens	Not defined	6	NO
	- all other forms	Not defined	1	NO
E.	Cataract	Not defined	3, 5	NO
F.	Retinal atrophy - generalized	Presumed autosomal recessive	2, 3	NO
G.	Retinal dysplasia - folds	Presumed autosomal recessive	2, 3	Breeder option
H.	Retinal dysplasia - geographic/ detached	Not defined	1, 7	NO
I.	Multifocal retinopathy - cmr1 * a DNA test is available	Autosomal recessive	8, 9	Breeder option
J.	Micropapilla	Not defined	4	Breeder option

OCULAR DISORDERS REPORT

GREAT PYRENEES - 2

Description and Comments

A. Distichiasis

Eyelashes abnormally located on the eyelid margin which may cause ocular irritation. Distichiasis may occur at any time. It is difficult to make a strong recommendation with regards to breeding dogs with this entity. The hereditary basis has not been established although it seems probable due to the high incidence in some breeds. Reducing the incidence is a logical goal. When diagnosed, distichiasis should be recorded and breeding discretion is advised.

B. Corneal dystrophy - epithelial/stromal

A non-inflammatory corneal opacity (white to gray) present in one or more of the corneal layers; usually inherited and bilateral. In these dogs, lesions are circular or semicircular central crystalline deposits in the anterior corneal stroma that appear between 2 and 5 years of age. It may be associated with exophthalmos and lagophthalmos common in these dogs.

C. Entropion

A conformational defect resulting in an "in-rolling" of one or both of the eyelids which may cause ocular irritation. It is likely that entropion is influenced by several genes (polygenic) defining the skin and other structures which make up the eyelids, the amount and weight of the skin covering the head and face, the orbital contents and the conformation of the skull.

D. Persistent pupillary membranes (PPM)

Persistent blood vessel remnants in the anterior chamber of the eye which fail to regress normally by 3 months of age. These strands may bridge from iris to iris, iris to cornea, iris to lens, or form sheets of tissue in the anterior chamber. The last three forms pose the greatest threat to vision and when severe, vision impairment or blindness may occur.

E. Cataract

A partial or complete opacity of the lens and/or its capsule. In cases where cataracts are complete and affect both eyes, blindness results. The prudent approach is to assume cataracts to be hereditary except in cases known to be associated with trauma, other causes of ocular inflammation, specific metabolic diseases, persistent pupillary membrane, persistent hyaloid or nutritional deficiencies. Cataracts may involve the lens completely (diffuse) or in a localized region.

OCULAR DISORDERS REPORT

GREAT PYRENEES - 3

F. Retinal atrophy - generalized

A degenerative disease of the retinal visual cells which progresses to blindness. This abnormality, also known as progressive retinal atrophy or PRA, may be detected by electroretinogram (not part of a routine eye screening examination) before it is apparent clinically. Except for X-linked PRA in the Siberian Husky, in all breeds studied to date, PRA is inherited as an autosomal recessive trait.

G. Retinal dysplasia - folds

Linear, triangular, curved or curvilinear foci of retinal folding that may be single or multiple. When seen in puppies, this condition may partially or completely resolve with maturity. It's significance to vision is unknown. There are two other forms of retinal dysplasia (geographic, detached) which are known to be inherited in other breeds and, in their most severe form, cause blindness. The genetic relationship between folds and the more severe forms of retinal dysplasia is undetermined.

H. Retinal dysplasia - geographic, detached

Abnormal development of the retina present at birth.

Retinal dysplasia - geographic: Any irregularly shaped area of abnormal retinal development containing both areas of thinning and areas of elevation representing folds and retinal disorganization.

Retinal dysplasia - detached: Severe retinal disorganization associated with separation (detachment) of the retina.

These two forms are associated with vision impairment or blindness. Retinal dysplasia is known to be inherited in many breeds. The genetic relationship between the three forms of retinal dysplasia is not known for all breeds.

I. Multifocal retinopathy

Canine Multi-focal Retinopathy type 1 (cmr1) is characterized by numerous distinct (i.e. multi-focal), roughly circular patches of elevated retina (multifocal bullous retinal detachments). There may be a serous subretinal fluid, or accumulation of subretinal material that produces gray-tan-pink colored lesions. These lesions, looking somewhat like blisters, vary in location and size, although typically they are present in both eyes of the affected dog.

The disease generally develops in young dogs between 11-20 weeks of age and there is minimal progression after 1 year of age. The lesions may flatten, leaving areas of retinal thinning and RPE hypertrophy, hyperplasia, and pigmentation. Discrete areas of tapetal hyper-reflectivity may be seen in areas of previous retinal and RPE detachments. Most dogs exhibit no noticeable problem with vision or electroretinographic abnormalities despite their abnormal appearing retinas.

OCULAR DISORDERS REPORT

GREAT PYRENEES - 4

Canine Multi-focal Retinopathy type 1 is caused by a mutation in the Bestrophin 1 gene (BEST1) and is described to be recessively inherited in the Great Pyrenees, Dogue de Bordeaux, Bullmastiff, and Mastiff. A DNA test is available.

J. Micropapilla

Micropapilla refers to a small optic disc which is not associated with vision impairment. Optic nerve hypoplasia refers to a congenital defect of the optic nerve which causes blindness and abnormal pupil response in the affected eye. It may be difficult to differentiate between micropapilla and optic nerve hypoplasia on a routine (dilated) screening ophthalmoscopic exam.

References

There are few references providing detailed descriptions of hereditary ocular conditions of the Great Pyrenees breed. The conditions listed above are generally recognized to exist in this breed, as evidenced by identification on breed eye screening examinations and/or clinical experience of veterinary ophthalmologists.

1. ACVO Genetics Committee, 2003-2004 and/or Data from CERF All-Breeds Report, 2005.
2. ACVO Genetics Committee, 2001 and/or Data from CERF All-Breeds Report, 2001.
3. ACVO Genetics Committee, 2000-2002 and/or Data from CERF All-Breeds Report, 2000-2002.
4. ACVO Genetics Committee, 2008 and/or Data from CERF All-Breeds Report, 2003-2007.
5. ACVO Genetics Committee, 1999 and/or Data from CERF All-Breeds Report, 1991-1998.
6. ACVO Genetics Committee, 2009 and/or Data from CERF All-Breeds Report, 2008.
7. Grahn BH and Cullen CL. Retinopathy of Great Pyrenees dogs: fluorescein angiography, light microscopy and transmitting and scanning electron microscopy. *Vet Ophthalmol.* 2001 Sep;4:191-199.
8. Guziewicz KE, Zangerl B, Lindauer SJ, et al. Bestrophin gene mutations cause canine multifocal retinopathy: a novel animal model for best disease. *Invest Ophthalmol Vis Sci.* 2007 May;48:1959-1967.
9. Grahn BH, Philibert H, Cullen CL, et al. Multifocal retinopathy of Great Pyrenees dogs. *Vet Ophthalmol.* 1998;1:211-221.

OCULAR DISORDERS REPORT GREAT PYRENEES

Diagnostic Name	TOTAL DOGS EXAMINED		1991-1999		2000-2009		2010-2013		2014	
	#	%	#	%	#	%	#	%	#	%
GLOBE										
0.110 microphthalmia	0		2	0.3%	0		0		0	
EYELIDS										
20.160 macropalpebral fissure	0		3	0.4%	0		0		0	
21.000 entropion, unspecified	7	2.3%	7	1.0%	0		0		0	
22.000 ectropion, unspecified	0		3	0.4%	0		0		0	
25.110 distichiasis	5	1.6%	11	1.5%	0		0		0	
CORNEA										
70.700 corneal dystrophy	2	0.6%	9	1.2%	1	0.7%	1	0.7%	1	6.7%
70.730 corneal endothelial degeneration	0		3	0.4%	0		0		0	
UVEA										
93.110 iris hypoplasia	0		0		1	0.7%	0		0	
93.120 iris cyst	1	0.3%	2	0.3%	3	2.2%	0		0	
93.150 iris coloboma	0		0		1	0.7%	0		0	
93.710 persistent pupillary membranes, iris to iris	73	23.7%	185	25.2%	42	30.7%	1	6.7%	0	
93.720 persistent pupillary membranes, iris to lens	2	0.6%	6	0.8%	1	0.7%	0		0	
93.730 persistent pupillary membranes, iris to cornea	2	0.6%	4	0.5%	1	0.7%	0		0	
93.760 persistent pupillary membranes, endothelial opacity/no strands	0		0		1	0.7%	0		0	
93.810 uveal melanoma	0		0		1	0.7%	0		0	
LENS										
100.200 cataract, unspecified	3	1.0%	0		0		0		0	
100.210 cataract, significance unknown	15	4.9%	25	3.4%	8	5.8%	1	6.7%	0	
100.301 punctate cataract, anterior cortex	3	1.0%	7	1.0%	0		0		0	
100.302 punctate cataract, posterior cortex	6	1.9%	6	0.8%	0		0		0	
100.303 punctate cataract, equatorial cortex	2	0.6%	4	0.5%	0		0		0	
100.304 punctate cataract, anterior sutures	0		3	0.4%	0		0		0	
100.305 punctate cataract, posterior sutures	0		3	0.4%	0		0		0	
100.306 punctate cataract, nucleus	1	0.3%	2	0.3%	0		0		0	
100.307 punctate cataract, capsular	0		1	0.1%	0		0		0	
100.311 incipient cataract, anterior cortex	8	2.6%	14	1.9%	0		0		0	
100.312 incipient cataract, posterior cortex	0		16	2.2%	1	0.7%	0		0	
100.313 incipient cataract, equatorial cortex	8	2.6%	12	1.6%	0		0		0	
100.315 incipient cataract, posterior sutures	0		4	0.5%	0		0		0	
100.316 incipient cataract, nucleus	1	0.3%	0		0		0		0	
100.317 incipient cataract, capsular	0		4	0.5%	0		0		0	
100.330 generalized/complete cataract	1	0.3%	4	0.5%	0		0		0	
100.375 subluxation/luxation, unspecified	0		1	0.1%	0		0		0	
VITREOUS										
110.135 PHPV/PTVL	0		1	0.1%	0		0		0	
FUNDUS										
97.110 choroidal hypoplasia	0		2	0.3%	0		0		0	
97.120 coloboma	0		1	0.1%	0		0		0	

OCULAR DISORDERS REPORT GREAT PYRENEES

	1991-1999	2000-2009	2010-2013	2014
RETINA				
120.170 retinal dysplasia, folds	3 1.0%	5 0.7%	1 0.7%	0
120.180 retinal dysplasia, geographic	1 0.3%	11 1.5%	3 2.2%	0
120.190 retinal dysplasia, detached	1 0.3%	1 0.1%	0	0
120.200 retinitis	0	0	0	1 6.7%
120.310 generalized progressive retinal atrophy (PRA)	2 0.6%	3 0.4%	0	0
120.910 retinal detachment without dialysis	0	4 0.5%	0	0
120.960 retinopathy	0	0	1 0.7%	0
OPTIC NERVE				
130.110 micropapilla	0	6 0.8%	0	0
130.120 optic nerve hypoplasia	0	5 0.7%	0	0
130.150 optic disc coloboma	1 0.3%	0	1 0.7%	0
OTHER				
900.000 other, unspecified	0	2 0.3%	5 3.6%	0
900.100 other, not inherited	1 0.3%	34 4.6%	2 1.5%	0
900.110 other, suspected as inherited	7 2.3%	5 0.7%	1 0.7%	0
NORMAL				
0.000 normal globe	183 59.4%	493 67.1%	115 83.9%	11 73.3%

OCULAR DISORDERS REPORT

GREATER SWISS MOUNTAIN DOG - 1

GREATER SWISS MOUNTAIN DOG

	DISORDER	INHERITANCE	REFERENCE	BREEDING ADVICE
A.	Distichiasis	Not defined	1	Breeder option
B.	Entropion	Not defined	2	Breeder option
C.	Persistent pupillary membranes			
	- iris to iris	Not defined	3-5	Breeder option
	- all other forms	Not defined	5	NO
D.	Cataract	Not defined	1	NO
E.	Retinal dysplasia - folds	Not defined	5	Breeder option

Description and Comments

A. Distichiasis

Eyelashes abnormally located on the eyelid margin which may cause ocular irritation. Distichiasis may occur at any time in the life of a dog. It is difficult to make a strong recommendation with regard to breeding dogs with this entity. The hereditary basis has not been established although it seems probable due to the high incidence in some breeds. Reducing the incidence is a logical goal. When diagnosed, distichiasis should be recorded; breeding discretion is advised.

B. Entropion

A conformational defect resulting in an "in-rolling" of one or both of the eyelids which may cause ocular irritation. It is likely that entropion is influenced by several genes (polygenic), defining the skin and other structures which make up the eyelids, the amount and weight of the skin covering the head and face, the orbital contents, and the conformation of the skull. Entropion and ectropion often occur together in this breed, associated with an abnormally large palpebral fissure.

C. Persistent pupillary membrane (PPM)

Persistent blood vessel remnants in the anterior chamber of the eye which fail to regress normally by 3 months of age. These strands may bridge from iris to iris, iris to cornea, iris to lens, or form sheets of tissue in the anterior chamber. The last three forms pose the greatest threat to vision and when severe, vision impairment or blindness may occur.

OCULAR DISORDERS REPORT

GREATER SWISS MOUNTAIN DOG - 2

D. Cataract

A partial or complete opacity of the lens and/or its capsule. In cases where cataracts are complete and affect both eyes, blindness results. The prudent approach is to assume cataracts to be hereditary except in cases known to be associated with trauma, other causes of ocular inflammation, specific metabolic diseases, persistent pupillary membrane, persistent hyaloid or nutritional deficiencies. Cataracts may involve the lens completely (diffuse) or in a localized region.

E. Retinal dysplasia - folds

Linear, triangular, curved or curvilinear foci of retinal folding that may be single or multiple. When seen in puppies, this condition may partially or completely resolve with maturity. Its significance to vision is unknown. There are two other forms of retinal dysplasia (geographic, detached) which are known to be inherited in other breeds and, in their most severe form, cause blindness. The genetic relationship between folds and more severe forms of retinal dysplasia is undetermined.

References

There are no references providing detailed descriptions of hereditary ocular conditions of the Greater Swiss Mountain Dog breed. The conditions listed above are generally recognized to exist in this breed, as evidenced by identification on breed eye screening examinations and/or clinical experience of veterinary ophthalmologists.

1. ACVO Genetics Committee, 1999 and/or Data from CERF All-Breeds Report, 1991-1998.
2. ACVO Genetics Committee, 2013-2014 and Data from OFA All-Breeds Report, 2013-2014.
3. ACVO Genetics Committee, 2000-2002 and/or Data from CERF All-Breeds Report, 2000-2002.
4. ACVO Genetics Committee, 2002-2003 and/or Data from CERF All-Breeds Report, 2002-2003.
5. ACVO Genetics Committee, 2003-2004 and/or Data from CERF All-Breeds Report, 2005.

OCULAR DISORDERS REPORT GREATER SWISS MOUNTAIN DOG

Diagnostic Name	TOTAL DOGS EXAMINED		1991-1999		2000-2009		2010-2013		2014	
	#	%	#	%	#	%	#	%	#	%
GLOBE										
0.110 microphthalmia	0		0		0		0		1	0.9%
EYELIDS										
20.140 ectopic cilia	0		1	0.1%	0		0		0	
20.160 macropalpebral fissure	0		1	0.1%	0		0		0	
21.000 entropion, unspecified	3	0.8%	7	0.4%	5	0.8%	3	2.7%		
22.000 ectropion, unspecified	1	0.3%	0		2	0.3%	0			
25.110 distichiasis	139	36.0%	628	34.3%	173	29.3%	32	28.8%		
NICTITANS										
51.100 third eyelid cartilage anomaly	0		2	0.1%	2	0.3%	0			
CORNEA										
70.210 corneal pannus	0		1	0.1%	1	0.2%	0			
70.700 corneal dystrophy	0		10	0.5%	3	0.5%	0			
70.730 corneal endothelial degeneration	0		1	0.1%	0		0			
UVEA										
93.120 iris cyst	0		2	0.1%	0		1	0.9%		
93.150 iris coloboma	0		1	0.1%	0		0			
93.710 persistent pupillary membranes, iris to iris	9	2.3%	69	3.8%	17	2.9%	5	4.5%		
93.720 persistent pupillary membranes, iris to lens	2	0.5%	0		3	0.5%	0			
93.730 persistent pupillary membranes, iris to cornea	0		5	0.3%	0		0			
93.740 persistent pupillary membranes, iris sheets	2	0.5%	3	0.2%	0		0			
93.750 persistent pupillary membranes, lens pigment foci/no strands	0		0		1	0.2%	0			
93.760 persistent pupillary membranes, endothelial opacity/no strands	0		1	0.1%	0		0			
LENS										
100.210 cataract, significance unknown	17	4.4%	191	10.4%	39	6.6%	7	6.3%		
100.301 punctate cataract, anterior cortex	4	1.0%	34	1.9%	18	3.1%	0			
100.302 punctate cataract, posterior cortex	1	0.3%	30	1.6%	17	2.9%	3	2.7%		
100.303 punctate cataract, equatorial cortex	3	0.8%	16	0.9%	7	1.2%	0			
100.304 punctate cataract, anterior sutures	0		1	0.1%	1	0.2%	0			
100.305 punctate cataract, posterior sutures	0		8	0.4%	1	0.2%	1	0.9%		
100.306 punctate cataract, nucleus	1	0.3%	3	0.2%	1	0.2%	0			
100.307 punctate cataract, capsular	0		10	0.5%	1	0.2%	0			
100.311 incipient cataract, anterior cortex	8	2.1%	33	1.8%	9	1.5%	3	2.7%		
100.312 incipient cataract, posterior cortex	8	2.1%	59	3.2%	20	3.4%	0			
100.313 incipient cataract, equatorial cortex	4	1.0%	49	2.7%	14	2.4%	1	0.9%		
100.314 incipient cataract, anterior sutures	0		2	0.1%	0		0			
100.315 incipient cataract, posterior sutures	0		7	0.4%	2	0.3%	1	0.9%		
100.316 incipient cataract, nucleus	1	0.3%	7	0.4%	1	0.2%	0			
100.317 incipient cataract, capsular	0		8	0.4%	1	0.2%	1	0.9%		
100.321 incomplete cataract, anterior cortex	0		0		1	0.2%	0			
100.330 generalized/complete cataract	0		6	0.3%	0		0			
100.375 subluxation/luxation, unspecified	0		2	0.1%	0		0			

OCULAR DISORDERS REPORT GREATER SWISS MOUNTAIN DOG

	1991-1999	2000-2009	2010-2013	2014
VITREOUS				
110.120 persistant hyaloid artery/remnant	0	6 0.3%	0	1 0.9%
110.135 PHPV/PTVL	0	2 0.1%	1 0.2%	1 0.9%
110.320 vitreous degeneration syneresis	0	0	1 0.2%	0
110.330 vitreous degeneration anterior chamber	0	0	1 0.2%	0
RETINA				
120.170 retinal dysplasia, folds	1 0.3%	11 0.6%	2 0.3%	0
120.180 retinal dysplasia, geographic	1 0.3%	3 0.2%	1 0.2%	0
120.190 retinal dysplasia, detached	0	1 0.1%	0	0
120.310 generalized progressive retinal atrophy (PRA)	2 0.5%	1 0.1%	0	0
OPTIC NERVE				
130.110 micropapilla	0	7 0.4%	0	0
130.120 optic nerve hypoplasia	0	4 0.2%	1 0.2%	0
OTHER				
900.000 other, unspecified	0	16 0.9%	13 2.2%	0
900.100 other, not inherited	6 1.6%	63 3.4%	4 0.7%	3 2.7%
900.110 other, suspected as inherited	3 0.8%	7 0.4%	2 0.3%	0
NORMAL				
0.000 normal globe	217 56.2%	1036 56.6%	423 71.7%	75 67.6%

OCULAR DISORDERS REPORT

GREYHOUND - 1

GREYHOUND

	DISORDER	INHERITANCE	REFERENCE	BREEDING ADVICE
A.	Chronic superficial keratitis/pannus	Not defined	1, 2	NO
B.	Lens luxation	Not defined	3	NO
C.	Cataract	Not defined	4	NO
D.	Vitreous degeneration	Not defined	5	Breeder option
E.	Persistent hyperplastic primary vitreous (PHPV)	Not defined	6	NO
F.	Retinal atrophy - generalized	Not defined	1, 7	NO

Description and Comments

A. Chronic superficial keratitis/Pannus

A bilateral disease of the cornea which usually starts as a grayish haze to the ventral or ventrolateral cornea, followed by the formation of a vascularized subepithelial growth that begins to spread toward the central cornea; pigmentation follows the vascularization. If severe, vision impairment occurs. Pannus may be associated with plasma cell infiltration of the nictitans.

B. Lens luxation

Partial (subluxated) or complete displacement of the lens from the normal anatomic site behind the pupil. Lens luxation not associated with trauma or inflammation is presumed to be inherited. Lens luxation may result in elevated intraocular pressure (glaucoma) causing vision impairment or blindness.

OCULAR DISORDERS REPORT

GREYHOUND - 2

C. Cataract

A partial or complete opacity of the lens and/or its capsule. In cases where cataracts are complete and affect both eyes, blindness results. The prudent approach is to assume cataracts to be hereditary except in cases known to be associated with trauma, other causes of ocular inflammation, specific metabolic diseases, persistent pupillary membrane, persistent hyaloid or nutritional deficiencies. Cataracts may involve the lens completely (diffuse) or in a localized region.

D. Vitreous degeneration

Liquefaction of the vitreous gel which may predispose to retinal detachment.

E. Persistent hyperplastic primary vitreous (PHPV)

Persistent hyperplastic primary vitreous is a congenital defect resulting from abnormalities in the development and regression of the hyaloid artery (the primary vitreous) and the interaction of this blood vessel with the posterior lens capsule/cortex during embryogenesis.

F. Retinal atrophy - generalized

A degenerative disease of the retinal visual cells which progresses to blindness. This abnormality, also known as progressive retinal atrophy or PRA, may be detected by electroretinogram (not part of a routine eye screening examination) before it is apparent clinically. Except for X-linked PRA in the Siberian Husky, in all breeds studied to date, PRA is inherited as an autosomal recessive trait.

PRA in the Greyhound may begin as early as 12 months of age, and affected dogs may progress to complete blindness at a relatively young age. In contrast to PRA in other dog breeds, nyctalopia (night blindness) is not an initial finding. In the early stages, the fundus has a characteristic "moth-eaten" appearance with patches of tapetal hyper-reflectivity alternating between areas of decreased reflectivity. In advanced stages, tapetal hyper-reflectivity is more diffuse.

References

1. ACVO Genetics Committee, 1999 and/or Data from CERF All-Breeds Report, 1991-1998.
2. Peiffer RL, Jr., Gelatt KN and Gwin RM. Chronic superficial keratitis. *Vet Med Small Anim Clin.* 1977 Jan;72:35-37.
3. ACVO Genetics Committee, 2006 and/or Data from CERF All Breeds Report, 2001-2005.
4. ACVO Genetics Committee, 2003-2004 and/or Data from CERF All-Breeds Report, 2005.
5. ACVO Genetics Committee, 2002-2003 and/or Data from CERF All-Breeds Report, 2002-2003.

OCULAR DISORDERS REPORT

GREYHOUND - 3

6. Grimes TD and Mullaney J. Persistent hyperplastic primary vitreous in a greyhound. *Vet Rec.* 1969 Nov 29;85:607-610.
7. Slatter DH, Blogg JR and Constable IJ. Retinal degeneration in Greyhounds. *Aust Vet J.* 1980 Mar;56:106-115.

OCULAR DISORDERS REPORT GREYHOUND

Diagnostic Name	TOTAL DOGS EXAMINED	1991-1999		2000-2009		2010-2013		2014	
		#	%	#	%	#	%	#	%
GLOBE									
0.110 microphthalmia		1	0.4%	0		0		0	
EYELIDS									
25.110 distichiasis		0		0		1	1.0%	0	
NASOLACRIMAL									
40.910 keratoconjunctivitis sicca		0		1	0.4%	0		0	
NICTITANS									
51.100 third eyelid cartilage anomaly		1	0.4%	0		1	1.0%	0	
CORNEA									
70.210 corneal pannus		7	2.5%	8	3.3%	4	4.0%	3	8.8%
70.700 corneal dystrophy		3	1.1%	2	0.8%	0		0	
70.730 corneal endothelial degeneration		0		1	0.4%	0		0	
UVEA									
93.710 persistent pupillary membranes, iris to iris		0		1	0.4%	1	1.0%	0	
93.730 persistent pupillary membranes, iris to cornea		2	0.7%	0		0		0	
93.760 persistent pupillary membranes, endothelial opacity/no strands		0		0		1	1.0%	0	
LENS									
100.200 cataract, unspecified		2	0.7%	0		0		0	
100.210 cataract, significance unknown		11	4.0%	6	2.5%	1	1.0%	2	5.9%
100.301 punctate cataract, anterior cortex		3	1.1%	2	0.8%	0		0	
100.304 punctate cataract, anterior sutures		0		0		1	1.0%	0	
100.306 punctate cataract, nucleus		0		1	0.4%	0		0	
100.307 punctate cataract, capsular		1	0.4%	0		0		0	
100.311 incipient cataract, anterior cortex		2	0.7%	1	0.4%	5	5.0%	0	
100.312 incipient cataract, posterior cortex		3	1.1%	3	1.2%	0		2	5.9%
100.313 incipient cataract, equatorial cortex		2	0.7%	2	0.8%	3	3.0%	0	
100.314 incipient cataract, anterior sutures		0		1	0.4%	0		0	
100.316 incipient cataract, nucleus		1	0.4%	1	0.4%	0		0	
100.317 incipient cataract, capsular		0		1	0.4%	0		0	
100.330 generalized/complete cataract		0		1	0.4%	0		0	
100.375 subluxation/luxation, unspecified		0		2	0.8%	0		0	
VITREOUS									
110.120 persistent hyaloid artery/remnant		0		1	0.4%	0		0	
110.320 vitreous degeneration syneresis		5	1.8%	8	3.3%	0		0	
110.330 vitreous degeneration anterior chamber		0		2	0.8%	1	1.0%	0	
RETINA									
120.170 retinal dysplasia, folds		1	0.4%	2	0.8%	0		0	
120.180 retinal dysplasia, geographic		0		1	0.4%	0		0	
120.310 generalized progressive retinal atrophy (PRA)		2	0.7%	4	1.7%	0		0	

OCULAR DISORDERS REPORT GREYHOUND

	1991-1999	2000-2009	2010-2013	2014
OPTIC NERVE				
130.110 micropapilla	2 0.7%	0	0	0
130.120 optic nerve hypoplasia	1 0.4%	0	1 1.0%	0
OTHER				
900.000 other, unspecified	0	2 0.8%	6 5.9%	0
900.100 other, not inherited	2 0.7%	11 4.6%	2 2.0%	6 17.6%
900.110 other, suspected as inherited	10 3.6%	2 0.8%	2 2.0%	1 2.9%
NORMAL				
0.000 normal globe	234 84.8%	200 83.3%	88 87.1%	27 79.4%

OCULAR DISORDERS REPORT

HARRIER - 1

HARRIER

	DISORDER	INHERITANCE	REFERENCE	BREEDING ADVICE
A.	Persistent pupillary membranes			
	- iris to iris	Not defined	1, 2	Breeder option
	- all other forms	Not defined	2	NO
B.	Cataract	Not defined	3	NO

Description and Comments

A. Persistent pupillary membranes (PPM)

Persistent blood vessel remnants in the anterior chamber of the eye which fail to regress normally by 3 months of age. These strands may bridge from iris to iris, iris to cornea, iris to lens, or form sheets of tissue in the anterior chamber. The last three forms pose the greatest threat to vision and when severe, vision impairment or blindness may occur.

B. Cataract

A partial or complete opacity of the lens and/or its capsule. In cases where cataracts are complete and affect both eyes, blindness results. The prudent approach is to assume cataracts to be hereditary except in cases known to be associated with trauma, other causes of ocular inflammation, specific metabolic diseases, persistent pupillary membrane, persistent hyaloid or nutritional deficiencies. Cataracts may involve the lens completely (diffuse) or in a localized region.

References

There are no references providing detailed descriptions of hereditary ocular conditions of the Harrier breed. The conditions listed above are generally recognized to exist in this breed, as evidenced by identification on breed eye screening examinations and/or clinical experience of veterinary ophthalmologists.

1. ACVO Genetics Committee, 2000-2002 and/or Data from CERF All-Breeds Report, 2000-2002.
2. ACVO Genetics Committee, 2005 and/or Data from CERF All-Breeds Report 2003-2004.
3. ACVO Genetics Committee, 2008 and/or Data from CERF All-Breeds Report, 2003-2007.

OCULAR DISORDERS REPORT HARRIER

Diagnostic Name	TOTAL DOGS EXAMINED	1991-1999		2000-2009		2010-2013		2014	
		#	%	#	%	#	%	#	%
EYELIDS									
21.000	entropion, unspecified	1	0.9%	0		0		0	
25.110	distichiasis	1	0.9%	1	0.4%	0		0	
CORNEA									
70.210	corneal pannus	0		1	0.4%	0		0	
UVEA									
93.710	persistent pupillary membranes, iris to iris	7	6.6%	5	1.9%	0		0	
93.730	persistent pupillary membranes, iris to cornea	1	0.9%	0		0		0	
93.740	persistent pupillary membranes, iris sheets	0		1	0.4%	0		0	
LENS									
100.210	cataract, significance unknown	3	2.8%	4	1.5%	0		1	100.0%
100.302	punctate cataract, posterior cortex	0		2	0.8%	0		0	
100.306	punctate cataract, nucleus	0		1	0.4%	0		0	
100.311	incipient cataract, anterior cortex	0		4	1.5%	0		0	
100.312	incipient cataract, posterior cortex	0		3	1.1%	0		0	
VITREOUS									
110.120	persistant hyaloid artery/remnant	0		0		0		1	100.0%
FUNDUS									
97.120	coloboma	1	0.9%	0		0		0	
RETINA									
120.310	generalized progressive retinal atrophy (PRA)	0		3	1.1%	0		0	
OPTIC NERVE									
130.150	optic disc coloboma	1	0.9%	0		0		0	
OTHER									
900.000	other, unspecified	0		1	0.4%	1	3.3%	0	
900.100	other, not inherited	0		11	4.2%	1	3.3%	0	
900.110	other, suspected as inherited	2	1.9%	1	0.4%	0		0	
NORMAL									
0.000	normal globe	93	87.7%	246	93.9%	29	96.7%	1	100.0%

OCULAR DISORDERS REPORT

HAVANESE - 1

HAVANESE/HAVANA SILK DOG

	DISORDER	INHERITANCE	REFERENCE	BREEDING ADVICE
A.	Distichiasis	Not defined	1	Breeder option
B.	Persistent pupillary membranes			
	- iris to iris	Not defined	1, 2	Breeder option
	- all other forms	Not defined	2	NO
C.	Cataract	Not defined	1, 3	NO
D.	Vitreous degeneration	Not defined	1, 4	Breeder option
E.	Retinal dysplasia - folds	Not defined	5	Breeder option
F.	Retinal atrophy - generalized	Not defined	1	NO

Description and Comments

A. Distichiasis

Eyelashes abnormally located on the eyelid margin, which may cause ocular irritation. Distichiasis may occur at any time in the life of a dog. It is difficult to make a strong recommendation with regard to breeding dogs with this entity. The hereditary basis has not been established, although it seems probable due to the high incidence in some breeds. Reducing the incidence is a logical goal. When diagnosed, distichiasis should be recorded; breeding discretion is advised.

B. Persistent pupillary membranes (PPM)

Persistent blood vessel remnants in the anterior chamber of the eye which fail to regress normally by 3 months of age. These strands may bridge from iris to iris, iris to cornea, iris to lens, or form sheets of tissue in the anterior chamber. The last three forms pose the greatest threat to vision and when severe, vision impairment or blindness may occur.

C. Cataract

A partial or complete opacity of the lens and/or its capsule. In cases where cataracts are complete and affect both eyes, blindness results. The prudent approach is to assume

OCULAR DISORDERS REPORT

HAVANESE - 2

cataracts to be hereditary except in cases known to be associated with trauma, other causes of ocular inflammation, specific metabolic diseases, persistent pupillary membrane, persistent hyaloid or nutritional deficiencies. Cataracts may involve the lens completely (diffuse) or in a localized region. The exact frequency and significance of cataracts in the breed is not known.

D. Vitreous degeneration

A liquefaction of the vitreous gel which may predispose to retinal detachment.

E. Retinal dysplasia - folds

Linear, triangular, curved or curvilinear foci of retinal folding that may be single or multiple. When seen in puppies, this condition may partially or completely resolve with maturity. Its significance to vision is unknown. There are two other forms of retinal dysplasia (geographic, detached), which are known to be inherited in other breeds and, in their most severe form, cause blindness. The genetic relationship between folds and more severe forms of retinal dysplasia is undetermined.

F. Retinal atrophy - generalized

A degenerative disease of the retinal visual cells which progresses to blindness. This abnormality, also known as progressive retinal atrophy or PRA, may be detected by electroretinogram (not part of a routine eye screening examination) before it is apparent clinically. Except for X-linked PRA in the Siberian Husky, in all breeds studied to date, PRA is inherited as an autosomal recessive trait. To date all reports of PRA in the Havanese to CERF or the OFA have been listed as "suspicious" and not affected. Breeder concern has caused the listing here.

References

There are few references providing detailed descriptions of hereditary ocular conditions of the Havanese breed. The conditions listed above are generally recognized to exist in this breed, as evidenced by identification on breed eye screening examinations and/or clinical experience of veterinary ophthalmologists.

1. ACVO Genetics Committee, 1999 and/or Data from CERF All-Breeds Report, 1991-1998.
2. ACVO Genetics Committee, 2005 and/or Data from CERF All-Breeds Report 2003-2004.
3. Starr AN, Famula TR, Markward NJ, et al. Hereditary evaluation of multiple developmental abnormalities in the Havanese dog breed. *J Hered.* 2007;98:510-517.
4. ACVO Genetics Committee, 2009 and/or Data from CERF All-Breeds Report, 2008.
5. ACVO Genetics Committee, 2008 and/or Data from CERF All-Breeds Report, 2003-2007.

OCULAR DISORDERS REPORT HAVANA SILK DOG

Diagnostic Name	TOTAL DOGS EXAMINED	1991-1999		2000-2009		2010-2013		2014	
		#	%	#	%	#	%	#	%
EYELIDS									
25.110 distichiasis		0		8	5.8%	19	4.6%	3	5.9%
NICTITANS									
52.110 prolapsed gland of the third eyelid		0		0		2	0.5%	0	
CORNEA									
70.700 corneal dystrophy		0		2	1.4%	2	0.5%	3	5.9%
UVEA									
93.710 persistent pupillary membranes, iris to iris		0		14	10.1%	23	5.6%	1	2.0%
93.740 persistent pupillary membranes, iris sheets		0		0		1	0.2%	0	
93.760 persistent pupillary membranes, endothelial opacity/no strands		0		0		1	0.2%	0	
LENS									
100.210 cataract, significance unknown		0		2	1.4%	10	2.4%	5	9.8%
100.301 punctate cataract, anterior cortex		0		1	0.7%	1	0.2%	0	
100.304 punctate cataract, anterior sutures		0		1	0.7%	0		0	
100.305 punctate cataract, posterior sutures		0		0		2	0.5%	0	
100.311 incipient cataract, anterior cortex		0		1	0.7%	1	0.2%	0	
100.312 incipient cataract, posterior cortex		0		1	0.7%	2	0.5%	0	
100.313 incipient cataract, equatorial cortex		0		1	0.7%	0		0	
100.316 incipient cataract, nucleus		0		0		1	0.2%	0	
100.330 generalized/complete cataract		0		2	1.4%	0		0	
100.375 subluxation/luxation, unspecified		0		0		1	0.2%	0	
VITREOUS									
110.120 persistent hyaloid artery/remnant		0		0		4	1.0%	0	
110.320 vitreous degeneration syneresis		0		1	0.7%	2	0.5%	0	
110.330 vitreous degeneration anterior chamber		0		2	1.4%	1	0.2%	0	
RETINA									
120.170 retinal dysplasia, folds		0		0		1	0.2%	0	
OTHER									
900.000 other, unspecified		0		0		7	1.7%	0	
900.100 other, not inherited		0		1	0.7%	5	1.2%	0	
900.110 other, suspected as inherited		0		0		1	0.2%	0	
NORMAL									
0.000 normal globe		0		119	85.6%	365	88.6%	44	86.3%

OCULAR DISORDERS REPORT HAVANESE

Diagnostic Name	TOTAL DOGS EXAMINED		1991-1999 1557		2000-2009 17485		2010-2013 6414		2014 1364	
	#	%	#	%	#	%	#	%	#	%
GLOBE										
0.110 microphthalmia	0		3	0.0%	2	0.0%	0			
EYELIDS										
20.140 ectopic cilia	1	0.1%	5	0.0%	5	0.1%	0			
21.000 entropion, unspecified	2	0.1%	15	0.1%	1	0.0%	0			
22.000 ectropion, unspecified	1	0.1%	3	0.0%	0		0			
25.110 distichiasis	60	3.9%	844	4.8%	346	5.4%	80	5.9%		
NASOLACRIMAL										
32.110 imperforate lower nasolacrimal punctum	0		0		1	0.0%	2	0.1%		
40.910 keratoconjunctivitis sicca	1	0.1%	2	0.0%	3	0.0%	1	0.1%		
NICTITANS										
51.100 third eyelid cartilage anomaly	0		2	0.0%	0		0			
52.110 prolapsed gland of the third eyelid	6	0.4%	67	0.4%	43	0.7%	5	0.4%		
CORNEA										
70.210 corneal pannus	1	0.1%	0		0		0			
70.220 pigmentary keratitis	0		1	0.0%	1	0.0%	0			
70.700 corneal dystrophy	4	0.3%	60	0.3%	39	0.6%	9	0.7%		
70.730 corneal endothelial degeneration	0		1	0.0%	2	0.0%	0			
UVEA										
90.250 pigmentary uveitis	0		1	0.0%	0		0			
93.120 iris cyst	0		3	0.0%	0		0			
93.140 corneal endothelial pigment without PPM	0		3	0.0%	0		0			
93.150 iris coloboma	0		1	0.0%	0		0			
93.710 persistent pupillary membranes, iris to iris	70	4.5%	1179	6.7%	320	5.0%	63	4.6%		
93.720 persistent pupillary membranes, iris to lens	2	0.1%	21	0.1%	3	0.0%	0			
93.730 persistent pupillary membranes, iris to cornea	0		12	0.1%	1	0.0%	0			
93.740 persistent pupillary membranes, iris sheets	0		18	0.1%	0		0			
93.750 persistent pupillary membranes, lens pigment foci/no strands	0		1	0.0%	17	0.3%	6	0.4%		
93.760 persistent pupillary membranes, endothelial opacity/no strands	0		0		4	0.1%	0			
93.810 uveal melanoma	0		2	0.0%	1	0.0%	0			
LENS										
100.200 cataract, unspecified	22	1.4%	0		0		0			
100.210 cataract, significance unknown	78	5.0%	985	5.6%	342	5.3%	102	7.5%		
100.301 punctate cataract, anterior cortex	6	0.4%	64	0.4%	44	0.7%	7	0.5%		
100.302 punctate cataract, posterior cortex	11	0.7%	56	0.3%	30	0.5%	2	0.1%		
100.303 punctate cataract, equatorial cortex	3	0.2%	24	0.1%	8	0.1%	1	0.1%		
100.304 punctate cataract, anterior sutures	0		13	0.1%	12	0.2%	1	0.1%		
100.305 punctate cataract, posterior sutures	10	0.6%	118	0.7%	67	1.0%	6	0.4%		
100.306 punctate cataract, nucleus	0		12	0.1%	3	0.0%	1	0.1%		
100.307 punctate cataract, capsular	2	0.1%	24	0.1%	19	0.3%	0			
100.311 incipient cataract, anterior cortex	10	0.6%	74	0.4%	26	0.4%	3	0.2%		
100.312 incipient cataract, posterior cortex	14	0.9%	133	0.8%	54	0.8%	10	0.7%		
100.313 incipient cataract, equatorial cortex	6	0.4%	29	0.2%	10	0.2%	1	0.1%		
100.314 incipient cataract, anterior sutures	2	0.1%	4	0.0%	9	0.1%	0			

OCULAR DISORDERS REPORT HAVANESE

LENS CONTINUED	1991-1999	2000-2009	2010-2013	2014
100.315 incipient cataract, posterior sutures	3 0.2%	60 0.3%	26 0.4%	1 0.1%
100.316 incipient cataract, nucleus	1 0.1%	12 0.1%	6 0.1%	0
100.317 incipient cataract, capsular	0	41 0.2%	6 0.1%	2 0.1%
100.321 incomplete cataract, anterior cortex	0	0	2 0.0%	1 0.1%
100.322 incomplete cataract, posterior cortex	0	0	4 0.1%	3 0.2%
100.323 incomplete cataract, equatorial cortex	0	0	1 0.0%	0
100.325 incomplete cataract, posterior sutures	0	0	1 0.0%	0
100.326 incomplete cataract, nucleus	0	0	0	1 0.1%
100.327 incomplete cataract, capsular	0	0	0	1 0.1%
100.330 generalized/complete cataract	21 1.3%	86 0.5%	11 0.2%	1 0.1%
100.340 resorbing/hypermature cataract	0	0	2 0.0%	1 0.1%
100.375 subluxation/luxation, unspecified	0	10 0.1%	1 0.0%	0
VITREOUS				
110.120 persistent hyaloid artery/remnant	3 0.2%	20 0.1%	8 0.1%	1 0.1%
110.135 PHPV/PTVL	0	2 0.0%	1 0.0%	0
110.200 vitritis	0	0	7 0.1%	5 0.4%
110.320 vitreous degeneration syneresis	23 1.5%	297 1.7%	124 1.9%	16 1.2%
110.330 vitreous degeneration anterior chamber	0	23 0.1%	12 0.2%	0
FUNDUS				
97.110 choroidal hypoplasia	0	2 0.0%	0	0
97.120 coloboma	0	4 0.0%	0	0
RETINA				
120.170 retinal dysplasia, folds	8 0.5%	92 0.5%	29 0.5%	7 0.5%
120.180 retinal dysplasia, geographic	0	14 0.1%	5 0.1%	1 0.1%
120.190 retinal dysplasia, detached	0	1 0.0%	0	0
120.200 retinitis	0	0	2 0.0%	2 0.1%
120.310 generalized progressive retinal atrophy (PRA)	15 1.0%	78 0.4%	11 0.2%	0
120.400 retinal hemorrhage	0	1 0.0%	0	0
120.910 retinal detachment without dialysis	5 0.3%	6 0.0%	1 0.0%	0
120.960 retinopathy	0	0	8 0.1%	0
OPTIC NERVE				
130.110 micropapilla	0	0	1 0.0%	0
130.120 optic nerve hypoplasia	0	3 0.0%	0	0
130.150 optic disc coloboma	1 0.1%	4 0.0%	2 0.0%	0
OTHER				
900.000 other, unspecified	0	75 0.4%	182 2.8%	0
900.100 other, not inherited	10 0.6%	543 3.1%	52 0.8%	50 3.7%
900.110 other, suspected as inherited	8 0.5%	46 0.3%	11 0.2%	1 0.1%
NORMAL				
0.000 normal globe	1257 80.7%	14699 84.1%	5577 87.0%	1152 84.5%

OCULAR DISORDERS REPORT

IBIZAN HOUND - 1

IBIZAN HOUND

	DISORDER	INHERITANCE	REFERENCE	BREEDING ADVICE
A.	Persistent pupillary membranes - iris to iris - all other forms	Not defined Not defined	1, 2 3	Breeder option NO
B.	Cataract	Not defined	4	NO
C.	Retinal dysplasia - folds	Presumed autosomal recessive	4, 5	Breeder option

Description and Comments

A. Persistent pupillary membranes (PPM)

Persistent blood vessel remnants in the anterior chamber of the eye which fail to regress normally by 3 months of age. These strands may bridge from iris to iris, iris to cornea, iris to lens, or form sheets of tissue in the anterior chamber. The last three forms pose the greatest threat to vision and when severe, vision impairment or blindness may occur.

B. Cataract

A partial or complete opacity of the lens and/or its capsule. In cases where cataracts are complete and affect both eyes, blindness results. The prudent approach is to assume cataracts to be hereditary except in cases known to be associated with trauma, other causes of ocular inflammation, specific metabolic diseases, persistent pupillary membrane, persistent hyaloid or nutritional deficiencies. Cataracts may involve the lens completely (diffuse) or in a localized region.

C. Retinal dysplasia - folds

Linear, triangular, curved or curvilinear foci of retinal folding that may be single or multiple. When seen in puppies, this condition may partially or completely resolve with maturity. Its significance to vision is unknown. There are two other forms of retinal dysplasia (geographic, detached) which are known to be inherited in other breeds and, in their most severe form, cause blindness. The genetic relationship between folds and more severe forms of retinal dysplasia is undetermined.

OCULAR DISORDERS REPORT

IBIZAN HOUND - 2

References

There are no references providing detailed descriptions of hereditary ocular conditions of the Ibizan Hound breed. The conditions listed above are generally recognized to exist in the breed, as evidenced by identification on breed eye screening examinations and/or clinical experience of veterinary ophthalmologists.

1. ACVO Genetics Committee, 2002-2003 and/or Data from CERF All-Breeds Report, 2002-2003.
2. ACVO Genetics Committee, 2005 and/or Data from CERF All-Breeds Report 2003-2004.
3. ACVO Genetics Committee, 2011 and/or Data from CERF All-Breeds Report, 2009.
4. ACVO Genetics Committee, 1999 and/or Data from CERF All-Breeds Report, 1991-1998.
5. ACVO Genetics Committee, 2011 and/or Data from CERF All-Breeds Report, 2010.

OCULAR DISORDERS REPORT IBIZAN HOUND

Diagnostic Name	TOTAL DOGS EXAMINED	1991-1999		2000-2009		2010-2013		2014	
		#	%	#	%	#	%	#	%
GLOBE									
0.110 microphthalmia		0		2	0.4%	0		0	
EYELIDS									
25.110 distichiasis		2	1.2%	2	0.4%	0		0	
NASOLACRIMAL									
40.910 keratoconjunctivitis sicca		1	0.6%	0		0		0	
NICTITANS									
51.100 third eyelid cartilage anomaly		0		1	0.2%	0		0	
52.110 prolapsed gland of the third eyelid		0		0		0		1	1.4%
CORNEA									
70.700 corneal dystrophy		1	0.6%	2	0.4%	5	1.4%	0	
UVEA									
93.120 iris cyst		0		2	0.4%	1	0.3%	0	
93.140 corneal endothelial pigment without PPM		0		0		1	0.3%	0	
93.710 persistent pupillary membranes, iris to iris		12	7.3%	49	8.6%	68	18.6%	10	13.7%
93.720 persistent pupillary membranes, iris to lens		0		0		1	0.3%	0	
93.750 persistent pupillary membranes, lens pigment foci/no strands		0		1	0.2%	6	1.6%	2	2.7%
93.760 persistent pupillary membranes, endothelial opacity/no strands		0		5	0.9%	0		0	
95.120 ciliary body cyst		0		0		0		1	1.4%
LENS									
100.200 cataract, unspecified		4	2.4%	0		0		0	
100.210 cataract, significance unknown		14	8.5%	28	4.9%	24	6.6%	5	6.8%
100.301 punctate cataract, anterior cortex		1	0.6%	1	0.2%	1	0.3%	0	
100.302 punctate cataract, posterior cortex		0		0		2	0.5%	0	
100.304 punctate cataract, anterior sutures		0		0		1	0.3%	0	
100.305 punctate cataract, posterior sutures		0		0		0		1	1.4%
100.306 punctate cataract, nucleus		0		4	0.7%	4	1.1%	0	
100.307 punctate cataract, capsular		0		1	0.2%	1	0.3%	0	
100.311 incipient cataract, anterior cortex		1	0.6%	4	0.7%	1	0.3%	0	
100.312 incipient cataract, posterior cortex		0		6	1.1%	1	0.3%	1	1.4%
100.313 incipient cataract, equatorial cortex		0		3	0.5%	1	0.3%	0	
100.314 incipient cataract, anterior sutures		0		0		1	0.3%	0	
100.316 incipient cataract, nucleus		1	0.6%	11	1.9%	4	1.1%	1	1.4%
100.317 incipient cataract, capsular		0		1	0.2%	1	0.3%	0	
100.330 generalized/complete cataract		0		2	0.4%	0		0	
100.375 subluxation/luxation, unspecified		0		0		1	0.3%	0	
VITREOUS									
110.120 persistent hyaloid artery/remnant		0		1	0.2%	1	0.3%	0	
110.320 vitreous degeneration syneresis		2	1.2%	5	0.9%	2	0.5%	0	
110.330 vitreous degeneration anterior chamber		0		2	0.4%	2	0.5%	0	

OCULAR DISORDERS REPORT IBIZAN HOUND

	1991-1999	2000-2009	2010-2013	2014
RETINA				
120.170 retinal dysplasia, folds	4 2.4%	5 0.9%	2 0.5%	0
120.180 retinal dysplasia, geographic	0	2 0.4%	0	0
120.310 generalized progressive retinal atrophy (PRA)	1 0.6%	1 0.2%	2 0.5%	0
120.910 retinal detachment without dialysis	0	1 0.2%	0	0
OPTIC NERVE				
130.150 optic disc coloboma	0	2 0.4%	1 0.3%	0
OTHER				
900.000 other, unspecified	0	4 0.7%	20 5.5%	0
900.100 other, not inherited	1 0.6%	17 3.0%	2 0.5%	2 2.7%
900.110 other, suspected as inherited	0	1 0.2%	1 0.3%	0
NORMAL				
0.000 normal globe	128 77.6%	487 85.3%	297 81.1%	62 84.9%

OCULAR DISORDERS REPORT

ICELANDIC SHEEPDOG - 1

ICELANDIC SHEEPDOG

	DISORDER	INHERITANCE	REFERENCE	BREEDING ADVICE
A.	Persistent pupillary membranes - iris to iris	Not defined	1	Breeder option
B.	Cataract	Not defined	2	NO
C.	Retinal dysplasia - folds	Not defined	3	Breeder option

Description and Comments

A. Persistent pupillary membranes (PPM)

Persistent blood vessel remnants in the anterior chamber of the eye which fail to regress normally by 3 months of age. These strands may bridge from iris to iris, iris to cornea, iris to lens, or form sheets of tissue in the anterior chamber. The last three forms pose the greatest threat to vision and when severe, vision impairment or blindness may occur.

B. Cataract

A partial or complete opacity of the lens and/or its capsule. In cases where cataracts are complete and affect both eyes, blindness results. The prudent approach is to assume cataracts to be hereditary except in cases known to be associated with trauma, other causes of ocular inflammation, specific metabolic diseases, persistent pupillary membrane, persistent hyaloid or nutritional deficiencies. Cataracts may involve the lens completely (diffuse) or in a localized region.

The most frequently reported cataracts in the breed are bilateral or unilateral, focal, posterior polar (posterior cortical)/subcapsular cataracts usually present between 1-3 years of age. These are generally stationary or very slowly progressive and generally do not interfere with vision. It has been suggested that these cataracts are inherited as dominant with incomplete penetrance, but definitive breeding studies are still required to verify this hypothesis.

A second type of cataract is a progressive cortical cataract which may involve the entire lens. It is not clear whether this is a distinct entity, or an aberrant form of the posterior polar cataract.

C. Retinal dysplasia - folds

Linear, triangular, curved or curvilinear foci of retinal folding that may be single or multiple.

OCULAR DISORDERS REPORT

ICELANDIC SHEEPDOG - 2

When seen in puppies, this condition may partially or completely resolve with maturity. Its significance to vision is unknown. There are two other forms of retinal dysplasia (geographic, detached) which are known to be inherited in other breeds and, in their most severe form, cause blindness. The genetic relationship between folds and more severe forms of retinal dysplasia is undetermined.

References

There are no references providing detailed descriptions of hereditary ocular conditions of the Icelandic Sheepdog breed. The conditions listed above are generally recognized to exist in the breed, as evidenced by identification on breed eye screening examinations and/or clinical experience of veterinary ophthalmologists.

1. ACVO Genetics Committee, 2005 and/or Data from CERF All-Breeds Report 2003-2004.
2. ACVO Genetics Committee, 2009 and/or Data from CERF All-Breeds Report, 2008.
3. ACVO Genetics Committee, 2006 and/or Data from CERF All-Breeds Report, 2001-2005.

OCULAR DISORDERS REPORT ICELANDIC SHEEPDOG

Diagnostic Name	TOTAL DOGS EXAMINED	1991-1999		2000-2009		2010-2013		2014	
		#	%	#	%	#	%	#	%
EYELIDS									
21.000	entropion, unspecified	0		5	0.6%	0		0	
25.110	distichiasis	1	4.3%	9	1.0%	7	0.9%	0	
CORNEA									
70.700	corneal dystrophy	0		2	0.2%	3	0.4%	1	0.6%
UVEA									
93.110	iris hypoplasia	0		0		2	0.3%	0	
93.710	persistent pupillary membranes, iris to iris	0		55	6.4%	36	4.8%	8	4.8%
93.720	persistent pupillary membranes, iris to lens	0		1	0.1%	0		0	
93.730	persistent pupillary membranes, iris to cornea	0		3	0.3%	0		0	
LENS									
100.210	cataract, significance unknown	2	8.7%	14	1.6%	17	2.3%	9	5.5%
100.301	punctate cataract, anterior cortex	0		0		3	0.4%	0	
100.302	punctate cataract, posterior cortex	0		1	0.1%	2	0.3%	0	
100.303	punctate cataract, equatorial cortex	0		1	0.1%	0		0	
100.304	punctate cataract, anterior sutures	0		0		1	0.1%	0	
100.305	punctate cataract, posterior sutures	0		0		3	0.4%	0	
100.311	incipient cataract, anterior cortex	1	4.3%	0		0		1	0.6%
100.312	incipient cataract, posterior cortex	1	4.3%	3	0.3%	5	0.7%	2	1.2%
100.313	incipient cataract, equatorial cortex	1	4.3%	1	0.1%	1	0.1%	0	
100.315	incipient cataract, posterior sutures	0		4	0.5%	3	0.4%	0	
100.317	incipient cataract, capsular	0		1	0.1%	0		0	
100.321	incomplete cataract, anterior cortex	0		0		1	0.1%	0	
100.322	incomplete cataract, posterior cortex	0		0		2	0.3%	1	0.6%
100.330	generalized/complete cataract	0		1	0.1%	0		0	
VITREOUS									
110.120	persistant hyaloid artery/remnant	0		1	0.1%	1	0.1%	1	0.6%
110.320	vitreous degeneration syneresis	0		1	0.1%	2	0.3%	0	
RETINA									
120.170	retinal dysplasia, folds	1	4.3%	7	0.8%	1	0.1%	0	
120.180	retinal dysplasia, geographic	0		1	0.1%	0		0	
120.310	generalized progressive retinal atrophy (PRA)	0		0		1	0.1%	0	
OPTIC NERVE									
130.150	optic disc coloboma	0		0		2	0.3%	0	
OTHER									
900.000	other, unspecified	0		9	1.0%	16	2.1%	0	
900.100	other, not inherited	0		31	3.6%	9	1.2%	5	3.0%
900.110	other, suspected as inherited	0		1	0.1%	2	0.3%	0	
NORMAL									
0.000	normal globe	18	78.3%	805	93.1%	709	94.8%	155	93.9%

OCULAR DISORDERS REPORT

IRISH RED AND WHITE SETTER - 1

IRISH RED AND WHITE SETTER

	DISORDER	INHERITANCE	REFERENCE	BREEDING ADVICE
A.	Distichiasis	Not defined	1	Breeder option
B.	Persistent pupillary membranes - iris to iris	Not defined	2	Breeder option
C.	Retinal atrophy - rod-cone dysplasia, type 1 (<i>rcd1</i>) * a DNA test is available	Autosomal recessive	**	NO
D.	Retinal atrophy - rod-cone dysplasia, type 4 (<i>rcd4</i>) * a DNA test is available	Autosomal recessive	3	NO
E.	Retinal dysplasia - folds	Not defined	1	Breeder option

** see numerous *rcd1* PRA references under Irish Setters

Description and Comments

A. Distichiasis

Eyelashes abnormally located on the eyelid margin which may cause ocular irritation. Distichiasis may occur at any time in the life of a dog. It is difficult to make a strong recommendation with regard to breeding dogs with this entity. The hereditary basis has not been established although it seems probable due to the high incidence in some breeds. Reducing the incidence is a logical goal. When diagnosed, distichiasis should be recorded; breeding discretion is advised.

B. Persistent pupillary membranes (PPM)

Persistent blood vessel remnants in the anterior chamber of the eye which fail to regress normally by 3 months of age. These strands may bridge from iris to iris, iris to cornea, iris to lens, or form sheets of tissue in the anterior chamber. The last three forms pose the greatest threat to vision and when severe, vision impairment

OCULAR DISORDERS REPORT

IRISH RED AND WHITE SETTER - 2

C. Retinal atrophy - rod-cone dysplasia, type 1 (*rcd1*)

A form of PRA identified in Irish Setters and Irish Red and White Setters. Clinical night blindness is observed as early as 6 weeks of age progressing to total blindness by one year. It may be diagnosed as early as 24 days with an ERG. Histologically the disease can be detected by 6 weeks. The disorder is caused by a mutation present in exon 21/codon 807 of the cGMP PDE Beta gene. A DNA test is now available that will unequivocally identify genetically normal, affected and carrier dogs. The test is accurate only for this mutation and will not identify other forms of PRA.

D. Retinal atrophy - rod-cone dysplasia, type 4 (*rcd4*)

A form of PRA identified in the Gordon and Irish Setter breeds. Clinical night blindness is observed on average as late as 10 years of age and progresses to total blindness. This form of PRA has been referred to as late-onset PRA (LOPRA). The disorder is caused by a mutation present in the C2orf71 gene. A DNA test is now available that will unequivocally identify genetically normal, affected and carrier dogs. The test is accurate only for this mutation and will not identify other forms of PRA.

E. Retinal dysplasia - folds

Linear, triangular, curved or curvilinear foci of retinal folding that may be single or multiple. When seen in puppies, this condition may partially or completely resolve with maturity. Its significance to vision is unknown. There are two other forms of retinal dysplasia (geographic, detached) which are known to be inherited in other breeds and, in their most severe form, cause blindness. The genetic relationship between folds and more severe forms of retinal dysplasia is undetermined.

References

There are no references providing detailed descriptions of hereditary ocular conditions of the Irish Red and White Setter breed. The conditions listed above are generally recognized to exist in the breed, as evidenced by identification on breed eye screening examinations and/or clinical experience of veterinary ophthalmologists.

1. ACVO Genetics Committee, 2000-2002 and/or Data from CERF All-Breeds Report, 2000-2002.
2. ACVO Genetics Committee, 2009 and/or Data from CERF All-Breeds Report, 2008.
3. Downs LM, Bell JS, Freeman J, et al. Late-onset progressive retinal atrophy in the Gordon and Irish Setter breeds is associated with a frameshift mutation in C2orf71. *Anim Genet.* 2012 Jun 12.

OCULAR DISORDERS REPORT

IRISH RED & WHITE SETTER

Diagnostic Name	TOTAL DOGS EXAMINED	1991-1999		2000-2009		2010-2013		2014		
		#	%	#	%	#	%	#	%	
EYELIDS										
21.000	entropion, unspecified	0		0		0		1	1.9%	
25.110	distichiasis	6	9.2%	8	4.8%	5	3.8%	1	1.9%	
CORNEA										
70.210	corneal pannus	0		2	1.2%	0		0		
70.700	corneal dystrophy	0		0		1	0.8%	0		
UVEA										
93.120	iris cyst	0		1	0.6%	0		0		
93.710	persistent pupillary membranes, iris to iris	0		5	3.0%	0		1	1.9%	
93.750	persistent pupillary membranes, lens pigment foci/no strands	0		0		1	0.8%	0		
93.760	persistent pupillary membranes, endothelial opacity/no strands	0		0		1	0.8%	0		
LENS										
100.210	cataract, significance unknown	3	4.6%	6	3.6%	5	3.8%	3	5.8%	
100.301	punctate cataract, anterior cortex	0		2	1.2%	0		0		
100.302	punctate cataract, posterior cortex	0		2	1.2%	3	2.3%	0		
100.304	punctate cataract, anterior sutures	0		1	0.6%	0		0		
100.311	incipient cataract, anterior cortex	0		1	0.6%	1	0.8%	1	1.9%	
100.312	incipient cataract, posterior cortex	0		1	0.6%	4	3.1%	1	1.9%	
100.315	incipient cataract, posterior sutures	1	1.5%	0		0		0		
100.321	incomplete cataract, anterior cortex	0		0		0		1	1.9%	
100.375	subluxation/luxation, unspecified	0		1	0.6%	0		0		
VITREOUS										
110.135	PHPV/PTVL	0		1	0.6%	0		0		
110.320	vitreous degeneration syneresis	0		0		1	0.8%	2	3.8%	
RETINA										
120.170	retinal dysplasia, folds	1	1.5%	1	0.6%	2	1.5%	0		
120.180	retinal dysplasia, geographic	0		2	1.2%	0		0		
120.310	generalized progressive retinal atrophy (PRA)	0		1	0.6%	1	0.8%	0		
OTHER										
900.000	other, unspecified	0		1	0.6%	4	3.1%	0		
900.100	other, not inherited	1	1.5%	6	3.6%	3	2.3%	4	7.7%	
900.110	other, suspected as inherited	1	1.5%	0		0		0		
NORMAL										
0.000	normal globe	54	83.1%	146	87.4%	121	92.4%	48	92.3%	

OCULAR DISORDERS REPORT

IRISH SETTER - 1

IRISH SETTER

	DISORDER	INHERITANCE	REFERENCE	BREEDING ADVICE
A.	Distichiasis	Not defined	1, 2	Breeder option
B.	Entropion	Not defined	1	Breeder option
C.	Nictitans cartilage anomaly/eversion	Not defined	1	Breeder option
D.	Persistent pupillary membranes - iris to iris	Not defined	1, 3	Breeder option
E.	Cataract	Not defined	1	NO
F.	Persistent hyaloid artery	Not defined	1	Breeder option
G.	Retinal atrophy - rod-cone dysplasia, type 1 (<i>rcd1</i>) * a DNA test is available	Autosomal Recessive	1-23	NO
H.	Retinal atrophy - rod-cone dysplasia type 4 (<i>rcd4</i>) * a DNA test is available	Autosomal Recessive	7	NO
I.	Retinal atrophy - generalized	Presumed Autosomal Recessive	1-24	NO
J.	Amblyopia with quadriplegia	Autosomal Recessive	25,26	NO

Description and Comments

A. Distichiasis

Eyelashes abnormally located on the eyelid margin which may cause ocular irritation. Distichiasis may occur at any time in the life of a dog. It is difficult to make a strong

OCULAR DISORDERS REPORT

IRISH SETTER - 2

recommendation with regard to breeding dogs with this entity. The hereditary basis has not been established, although it seems probable due to the high incidence in some breeds. Reducing the incidence is a logical goal. When diagnosed, distichiasis should be recorded; breeding discretion is advised.

B. Entropion

A conformational defect resulting in an "in-rolling" of one or both of the eyelids which may cause ocular irritation. It is likely that entropion is influenced by several genes (polygenic), defining the skin and other structures which make up the eyelids, the amount and weight of the skin covering the head and face, the orbital contents, and the conformation of the skull. In the Irish Setter, the entropion usually involves the lower eyelids.

C. Nictitans cartilage anomaly/eversion

A scroll-like curling of the cartilage of the third eyelid, usually everting the margin. This condition may occur in one or both eyes and may cause mild ocular irritation.

D. Persistent pupillary membranes (PPM)

Persistent blood vessel remnants in the anterior chamber of the eye which fail to regress normally by 3 months of age. These strands may bridge from iris to iris, iris to cornea, iris to lens, or form sheets of tissue in the anterior chamber. The last three forms pose the greatest threat to vision and when severe, vision impairment or blindness may occur.

E. Cataract

A partial or complete opacity of the lens and/or its capsule. In cases where cataracts are complete and affect both eyes, blindness results. The prudent approach is to assume cataracts to be hereditary except in cases known to be associated with trauma, other causes of ocular inflammation, specific metabolic diseases, persistent pupillary membrane, persistent hyaloid or nutritional deficiencies. Cataracts may involve the lens completely (diffuse) or in a localized region.

F. Persistent hyaloid artery (PHA)

A congenital defect resulting from abnormalities in the development and regression of the hyaloid artery. The blood vessel remnant can be present in the vitreous as a small vascular strand (PHA) or as a non-vascular strand that appears gray-white (persistent hyaloid remnant).

G. Retinal atrophy - rod-cone dysplasia, type 1 (*rcd1*)

A form of PRA identified in Irish Setters. Clinical night blindness is observed as early as 6 weeks of age progressing to total blindness by one year. It may be diagnosed as early as 24 days with an ERG. Histologically the disease can be detected by 6 weeks. The disorder is caused by a mutation present in exon 21/codon 807 of the cGMP PDE Beta gene. A DNA test is available that will unequivocally identify genetically normal, affected and carrier dogs.

OCULAR DISORDERS REPORT

IRISH SETTER - 3

The test is accurate only for this mutation and will not identify other forms of PRA.

H. Retinal atrophy - rod-cone dysplasia, type 4 (*rcd4*)

A form of PRA identified in the Gordon and Irish Setter breeds. Clinical night blindness is observed on average as late as 10 years of age and progresses to total blindness. This form of PRA has been referred to as late-onset PRA (LOPRA). The disorder is caused by a mutation present in the *C2orf71* gene. . A DNA test is available that will unequivocally identify genetically normal, affected and carrier dogs. The test is accurate only for this mutation and will not identify other forms of PRA.

I. Retinal atrophy - generalized

A degenerative disease of the retinal visual cells which progresses to blindness. This abnormality, also known as progressive retinal atrophy or PRA, may be detected by electroretinogram (not part of a routine eye screening examination) before it is apparent clinically. Except for X-linked PRA in the Siberian Husky, in all breeds studied to date, PRA is inherited as an autosomal recessive trait.

In the Irish Setter, a later form of progressive retinal atrophy has been observed by several ophthalmologists at 4-5 years of age. Cases seen in this category appear to advance more rapidly than those with rod-cone dysplasia.

J. Amblyopia with quadriplegia

A congenital quadriplegia and amblyopia. The main symptoms include inability to stand or walk, amblyopia, tremor, nystagmus and possible seizures. Pathologic lesions are confined to the cerebellum. The condition was shown to be due to a fully penetrant autosomal recessive gene that is post-natally lethal in the homozygote.

References

1. ACVO Genetics Committee, 1999 and/or Data from CERF All-Breeds Report, 1991-1998.
2. Hodgman SS et al: Progressive retinal atrophy in dogs I. The disease of Irish Setters (*rcd*). *Vet Rec* 61:185, 1949.
3. Parry HB: Degenerations of dog retina II. Progressive retinal atrophy of hereditary origin. *Br J Ophthalmol* 37:487, 1953.
4. Aguirre GD, Rubin LF: Rod-cone dysplasia (progressive retinal atrophy) in Irish Setters. *J Am Vet Med Assoc* 166:157, 1975.
5. Aguirre GD, Farber D, Lolley R, et al: Rod-cone dysplasia in Irish Setters. A defect in cyclic GMP metabolism in visual cells. *Science* 201:1133, 1978.
6. Lewis DG: Reappearance of PRA in the Irish Setter. *Vet Rec* 101:468, 1977.

OCULAR DISORDERS REPORT

IRISH SETTER - 4

7. Liu YP, et al: Involvement of cyclic GMP phosphodiesterase activator in an hereditary retinal degeneration. *Nature* 280: 62, 1979.
8. Aguirre GD, Farber D, Lolley R, et al: Retinal degeneration in the dog III: Abnormal cyclic nucleotide metabolism in rod-cone dysplasia. *Exp Eye Res* 35:625, 1982.
9. Lee, RH, Lieberman, BS, Hurwitz, RL: Phosphodiesterase probes show distinct defects in rd mice and Irish Setter dog disorders. *Invest Ophthal Vis Sci* 26: 1569, 1985.
10. Lolley RN, Lee RH, Hurwitz RL: Biochemical and immunological characteristics of photoreceptor phosphodiesterase in inherited retinal degeneration of rd mice and affected Irish Setter dogs. In LaVail MM, Hollyfield JG, Anderson RE (eds): *Retinal Degeneration: Experimental and Clinical Studies*. New York, Alan R. Liss, pp133, 1985.
11. Schmidt SY, Aguirre GD: Reduction in taurine secondary to photoreceptor loss in Irish Setters with rod-cone dysplasia. *Invest Ophthalmol Vis Sci* 26:679, 1985.
12. Fletcher RT, Sanyal S, Krishna G, et al: Genetic expression of cyclic GMP phosphodiesterase activity defines abnormal photoreceptor differentiation in neurological mutants of inherited retinal degeneration. *J Neurochem* 46:1240, 1986
13. Schmidt SY, et al: Deficiency in light-dependent opsin phosphorylation in Irish Setters with rod-cone dysplasia. *Invest Ophthalmol Vis Sci* 27:1551, 1986.
14. Barbehenn E, Gagnon C, Noelker D, et al: Inherited rod-cone dysplasia: Abnormal distribution of cyclic GMP in visual cells of affected Irish Setters. *Exp Eye Res* 46:149, 1988.
15. Cunnick J, Rider M, Takemoto LJ, et al: Rod-cone dysplasia in Irish Setters. Presence of an altered rhodopsin. *Biochem J* 250:335, 1988.
16. Farber DB, Danciger JS, Aguirre GD: Early mRNA defect in Irish Setter dog retina. *Invest Ophthalmol Vis Sci (Suppl)* 31:310, 1990.
17. Farber DB, Danciger JS, Aguirre GD: The B subunit of cyclic GMP phosphodiesterase mRNA is deficient in canine rod-cone dysplasia 1. *Neuron* 9:349, 1992.
18. Clement PJM, Gregory CY, Petersen-Jones SM, et al: Confirmation of the rod cGMP phosphodiesterase B (PDEB) nonsense mutation in affected rcd-1 Irish Setters in the UK and development of a diagnostic test. *Curr Eye Res* 12:861, 1993.
19. Suber ML, Pittler SJ, Qin N, et al: Irish Setter dogs affected with rod/cone dysplasia contain a nonsense mutation in the rod cGMP phosphodiesterase B-subunit gene. *Proc Natl Acad Sci* 90:3968, 1993
20. Ray K, Baldwin VJ, Acland G, et al: Cosegregation of codon 807 mutation of the canine rod cGMP phosphodiesterase B gene and rcd1. *Invest Ophthalmol Vis Sci* 35:4291, 1994.
21. Ray K, Baldwin VJ, Acland G, et al: Molecular diagnostic tests for ascertainment of genotype

OCULAR DISORDERS REPORT

IRISH SETTER - 5

- at the rod-cone dysplasia 1 (rcd1) locus in Irish Setters. *Curr Eye Res* 14:243, 1995.
22. Aguirre, Gustavo: Announcement from the James A. Baker Institute for Animal Health, Cornell University, Ithaca, NY 14853; March 14, 1994
 23. Petersen-Jones SM, Clements PJM, Barnett KC, et al: Incidence of the gene mutation causal for rod-cone dysplasia type I in Irish Setters in the UK. *J Small Anim Pract* 36:310, 1995.
 24. Djajdiningrat-Laaner SC, Boeve MH, et al: Familial non-rcd 1 generalized retinal degeneration in Irish Setters. *J Sm An Prac* 113, 2002.
 25. Palmer AC, Payne JE, Wallace ME: Hereditary quadriplegia and amblyopia in the Irish Setter. *J Small Anim Pract* 14:343, 1973.
 26. Sakai T, Harashima T, Yamamura H, et al: Two cases of hereditary quadriplegia and amblyopia in a litter of Irish Setters. *J Small Anim Pract* 35:221, 1994.

OCULAR DISORDERS REPORT IRISH SETTER

Diagnostic Name	TOTAL DOGS EXAMINED	1991-1999		2000-2009		2010-2013		2014	
		#	%	#	%	#	%	#	%
GLOBE									
0.110	microphthalmia	0		1	0.2%	0		1	0.8%
10.000	glaucoma	1	0.1%	0		0		0	
EYELIDS									
20.140	ectopic cilia	1	0.1%	0		0		0	
20.160	macropalpebral fissure	2	0.2%	0		0		0	
21.000	entropion, unspecified	31	3.0%	10	1.7%	9	3.5%	2	1.7%
22.000	ectropion, unspecified	6	0.6%	2	0.3%	0		0	
25.110	distichiasis	53	5.1%	41	6.8%	22	8.5%	2	1.7%
NASOLACRIMAL									
32.110	imperforate lower nasolacrimal punctum	1	0.1%	0		0		0	
40.910	keratoconjunctivitis sicca	0		0		1	0.4%	0	
NICTITANS									
52.110	prolapsed gland of the third eyelid	0		0		3	1.2%	0	
CORNEA									
70.210	corneal pannus	0		1	0.2%	0		0	
70.220	pigmentary keratitis	1	0.1%	0		0		0	
70.700	corneal dystrophy	3	0.3%	1	0.2%	3	1.2%	0	
70.730	corneal endothelial degeneration	0		0		1	0.4%	0	
UVEA									
93.120	iris cyst	0		2	0.3%	0		0	
93.140	corneal endothelial pigment without PPM	0		1	0.2%	1	0.4%	0	
93.710	persistent pupillary membranes, iris to iris	28	2.7%	37	6.2%	7	2.7%	8	6.8%
93.720	persistent pupillary membranes, iris to lens	3	0.3%	3	0.5%	1	0.4%	0	
93.730	persistent pupillary membranes, iris to cornea	5	0.5%	0		0		1	0.8%
93.750	persistent pupillary membranes, lens pigment foci/no strands	0		1	0.2%	14	5.4%	4	3.4%
93.760	persistent pupillary membranes, endothelial opacity/no strands	0		0		0		3	2.5%
93.810	uveal melanoma	0		1	0.2%	0		0	
LENS									
100.200	cataract, unspecified	31	3.0%	0		0		0	
100.210	cataract, significance unknown	40	3.9%	39	6.5%	16	6.2%	8	6.8%
100.301	punctate cataract, anterior cortex	2	0.2%	1	0.2%	1	0.4%	3	2.5%
100.302	punctate cataract, posterior cortex	4	0.4%	3	0.5%	3	1.2%	1	0.8%
100.303	punctate cataract, equatorial cortex	2	0.2%	1	0.2%	0		1	0.8%
100.304	punctate cataract, anterior sutures	0		0		0		1	0.8%
100.305	punctate cataract, posterior sutures	1	0.1%	1	0.2%	0		0	
100.306	punctate cataract, nucleus	3	0.3%	1	0.2%	0		0	
100.307	punctate cataract, capsular	0		5	0.8%	2	0.8%	1	0.8%
100.311	incipient cataract, anterior cortex	9	0.9%	6	1.0%	5	1.9%	0	
100.312	incipient cataract, posterior cortex	7	0.7%	7	1.2%	4	1.6%	1	0.8%
100.313	incipient cataract, equatorial cortex	1	0.1%	3	0.5%	1	0.4%	0	
100.314	incipient cataract, anterior sutures	2	0.2%	1	0.2%	1	0.4%	0	
100.315	incipient cataract, posterior sutures	3	0.3%	0		0		1	0.8%
100.316	incipient cataract, nucleus	1	0.1%	7	1.2%	0		0	

OCULAR DISORDERS REPORT IRISH SETTER

LENS CONTINUED	1991-1999	2000-2009	2010-2013	2014
100.317 incipient cataract, capsular	0	1 0.2%	1 0.4%	1 0.8%
100.325 incomplete cataract, posterior sutures	0	0	1 0.4%	0
100.330 generalized/complete cataract	9 0.9%	7 1.2%	0	1 0.8%
100.340 resorbing/hypermature cataract	0	0	0	1 0.8%
100.375 subluxation/luxation, unspecified	0	1 0.2%	0	0
VITREOUS				
110.120 persistant hyaloid artery/remnant	15 1.5%	5 0.8%	0	1 0.8%
110.135 PHPV/PTVL	4 0.4%	5 0.8%	1 0.4%	0
110.320 vitreous degeneration syneresis	3 0.3%	1 0.2%	0	0
RETINA				
120.170 retinal dysplasia, folds	4 0.4%	1 0.2%	3 1.2%	2 1.7%
120.180 retinal dysplasia, geographic	1 0.1%	0	0	0
120.310 generalized progressive retinal atrophy (PRA)	10 1.0%	6 1.0%	3 1.2%	0
OPTIC NERVE				
130.120 optic nerve hypoplasia	4 0.4%	0	0	0
130.150 optic disc coloboma	1 0.1%	0	0	0
OTHER				
900.000 other, unspecified	0	5 0.8%	14 5.4%	0
900.100 other, not inherited	2 0.2%	35 5.8%	6 2.3%	9 7.6%
900.110 other, suspected as inherited	15 1.5%	3 0.5%	1 0.4%	0
NORMAL				
0.000 normal globe	801 77.6%	483 80.5%	202 78.3%	94 79.7%

OCULAR DISORDERS REPORT

IRISH TERRIER - 1

IRISH TERRIER

	DISORDER	INHERITANCE	REFERENCE	BREEDING ADVICE
A.	Cataract	Not defined	1	NO

Description and Comments

A. Cataract

A partial or complete opacity of the lens and/or its capsule. In cases where cataracts are complete and affect both eyes, blindness results. The prudent approach is to assume cataracts to be hereditary except in cases known to be associated with trauma, other causes of ocular inflammation, specific metabolic diseases, persistent pupillary membrane, persistent hyaloid or nutritional deficiencies. Cataracts may involve the lens completely (diffuse) or in a localized region.

References

There are no references providing detailed descriptions of hereditary ocular conditions of the Irish Terrier breed. The conditions listed above are generally recognized to exist in this breed, as evidenced by identification on breed eye screening examinations and/or clinical experience of veterinary ophthalmologists.

1. ACVO Genetics Committee, 1999 and/or Data from CERF All-Breeds Report, 1991-1998.

OCULAR DISORDERS REPORT IRISH TERRIER

Diagnostic Name	TOTAL DOGS EXAMINED		1991-1999		2000-2009		2010-2013		2014	
	#	%	#	%	#	%	#	%	#	%
EYELIDS										
25.110	distichiasis		0		1	2.8%	0		0	
UVEA										
93.710	persistent pupillary membranes, iris to iris		1	3.4%	0		0		0	
93.720	persistent pupillary membranes, iris to lens		0		1	2.8%	0		0	
LENS										
100.210	cataract, significance unknown		2	6.9%	2	5.6%	2	15.4%	0	
100.306	punctate cataract, nucleus		0		0		1	7.7%	0	
100.311	incipient cataract, anterior cortex		0		1	2.8%	0		0	
100.316	incipient cataract, nucleus		0		1	2.8%	0		0	
100.317	incipient cataract, capsular		0		1	2.8%	0		0	
100.330	generalized/complete cataract		1	3.4%	0		0		0	
OTHER										
900.000	other, unspecified		0		1	2.8%	2	15.4%	0	
900.100	other, not inherited		0		1	2.8%	0		0	
NORMAL										
0.000	normal globe		25	86.2%	30	83.3%	13	100.0%	2	100.0%

OCULAR DISORDERS REPORT

IRISH WATER SPANIEL - 1

IRISH WATER SPANIEL

	DISORDER	INHERITANCE	REFERENCE	BREEDING ADVICE
A.	Distichiasis	Not defined	1	Breeder option
B.	Entropion	Not defined	1	Breeder option
C.	Persistent pupillary membranes			
	- iris to iris	Not defined	2, 3	Breeder option
	- all other forms	Not defined	2	NO
D.	Cataract	Not defined	1	NO

Description and Comments

A. Distichiasis

Eyelashes abnormally located on the eyelid margin which may cause ocular irritation. Distichiasis may occur at any time in the life of a dog. It is difficult to make a strong recommendation with regard to breeding dogs with this entity. The hereditary basis has not been established although it seems probable due to the high incidence in some breeds. Reducing the incidence is a logical goal. When diagnosed, distichiasis should be recorded; breeding discretion is advised.

B. Entropion

A conformational defect resulting in an "in-rolling" of one or more of the eyelids which may cause ocular irritation. It is likely that entropion is influenced by several genes (polygenic), defining the skin and other structures, which make up the eyelids, the amount and weight of the skin covering the head and face, the orbital contents, and the conformation of the skull.

C. Persistent pupillary membranes (PPM)

Persistent blood vessel remnants in the anterior chamber of the eye which fail to regress normally by 3 months of age. These strands may bridge from iris to iris, iris to cornea, iris to lens, or form sheets of tissue in the anterior chamber. The last three forms pose the greatest threat to vision and when severe, vision impairment or blindness may occur.

OCULAR DISORDERS REPORT

IRISH WATER SPANIEL - 2

D. Cataract

A partial or complete opacity of the lens and/or its capsule. In cases where cataracts are complete and affect both eyes, blindness results. The prudent approach is to assume cataracts to be hereditary except in cases known to be associated with trauma, other causes of ocular inflammation, specific metabolic diseases, persistent pupillary membrane, persistent hyaloid or nutritional deficiencies. Cataracts may involve the lens completely (diffuse) or in a localized region.

References

There are no references providing detailed descriptions of hereditary ocular conditions of the Irish Water Spaniel breed. The conditions listed above are generally recognized to exist in this breed, as evidenced by identification on breed eye screening examinations and/or clinical experience of veterinary ophthalmologists.

1. ACVO Genetics Committee, 1999 and/or Data from CERF All-Breeds Report, 1991-1998.
2. ACVO Genetics Committee, 2002-2003 and/or Data from CERF All-Breeds Report, 2002-2003.
3. ACVO Genetics Committee, 2005 and/or Data from CERF All-Breeds Report 2003-2004.

OCULAR DISORDERS REPORT IRISH WATER SPANIEL

Diagnostic Name	TOTAL DOGS EXAMINED	1991-1999		2000-2009		2010-2013		2014	
		#	%	#	%	#	%	#	%
EYELIDS									
20.140	ectopic cilia	0		1	0.2%	0		0	
21.000	entropion, unspecified	2	1.0%	4	0.8%	4	1.5%	0	
22.000	ectropion, unspecified	0		2	0.4%	2	0.7%	0	
25.110	distichiasis	55	27.9%	117	23.1%	76	27.8%	15	22.7%
CORNEA									
70.700	corneal dystrophy	0		2	0.4%	1	0.4%	1	1.5%
UVEA									
93.120	iris cyst	0		1	0.2%	1	0.4%	0	
93.150	iris coloboma	0		0		1	0.4%	0	
93.710	persistent pupillary membranes, iris to iris	1	0.5%	13	2.6%	17	6.2%	6	9.1%
93.730	persistent pupillary membranes, iris to cornea	1	0.5%	1	0.2%	0		0	
93.750	persistent pupillary membranes, lens pigment foci/no strands	0		0		1	0.4%	1	1.5%
93.760	persistent pupillary membranes, endothelial opacity/no strands	0		0		1	0.4%	0	
LENS									
100.200	cataract, unspecified	3	1.5%	0		0		0	
100.210	cataract, significance unknown	7	3.6%	44	8.7%	34	12.5%	9	13.6%
100.301	punctate cataract, anterior cortex	0		7	1.4%	6	2.2%	0	
100.302	punctate cataract, posterior cortex	0		6	1.2%	4	1.5%	0	
100.303	punctate cataract, equatorial cortex	0		1	0.2%	3	1.1%	0	
100.305	punctate cataract, posterior sutures	0		1	0.2%	0		0	
100.306	punctate cataract, nucleus	0		0		1	0.4%	0	
100.311	incipient cataract, anterior cortex	1	0.5%	11	2.2%	2	0.7%	0	
100.312	incipient cataract, posterior cortex	0		21	4.1%	1	0.4%	0	
100.313	incipient cataract, equatorial cortex	1	0.5%	5	1.0%	3	1.1%	1	1.5%
100.314	incipient cataract, anterior sutures	0		2	0.4%	0		0	
100.315	incipient cataract, posterior sutures	0		1	0.2%	1	0.4%	0	
100.316	incipient cataract, nucleus	0		3	0.6%	2	0.7%	0	
100.317	incipient cataract, capsular	0		4	0.8%	0		0	
100.321	incomplete cataract, anterior cortex	0		0		1	0.4%	0	
100.326	incomplete cataract, nucleus	0		0		0		1	1.5%
100.330	generalized/complete cataract	0		0		1	0.4%	0	
VITREOUS									
110.120	persistant hyaloid artery/remnant	0		2	0.4%	0		0	
110.320	vitreous degeneration syneresis	0		2	0.4%	0		0	
RETINA									
120.170	retinal dysplasia, folds	1	0.5%	2	0.4%	0		1	1.5%
120.180	retinal dysplasia, geographic	0		1	0.2%	0		0	
120.200	retinitis	0		0		1	0.4%	0	
120.310	generalized progressive retinal atrophy (PRA)	1	0.5%	4	0.8%	0		0	
120.910	retinal detachment without dialysis	0		1	0.2%	0		0	
120.960	retinopathy	0		0		2	0.7%	0	

OCULAR DISORDERS REPORT IRISH WATER SPANIEL

	1991-1999	2000-2009	2010-2013	2014
OTHER				
900.000 other, unspecified	0	5 1.0%	15 5.5%	0
900.100 other, not inherited	0	15 3.0%	1 0.4%	5 7.6%
900.110 other, suspected as inherited	4 2.0%	0	0	0
NORMAL				
0.000 normal globe	139 70.6%	355 70.0%	206 75.5%	42 63.6%

OCULAR DISORDERS REPORT

IRISH WOLFHOUND - 1

IRISH WOLFHOUND

	DISORDER	INHERITANCE	REFERENCE	BREEDING ADVICE
A.	Distichiasis	Not defined	1	Breeder option
B.	Nictitans cartilage anomaly/eversion	Not defined	1	Breeder option
C.	Corneal dystrophy - epithelial/stromal	Not defined	1	Breeder option
D.	Persistent pupillary membranes - iris to iris - all other forms	Not defined Not defined	2 2	Breeder option NO
E.	Uveal cysts	Not defined	1	Breeder option
F.	Cataract	Not defined	1	NO
G.	Retinal atrophy - generalized	Presumed autosomal recessive	5	NO
H.	Retinal dysplasia - folds	Not defined	2,3	Breeder option
I.	Retinal dysplasia - geographic	Not defined	4	NO
J.	Optic nerve hypoplasia	Not defined	5	NO
K.	Micropapilla	Not defined	1	Breeder option

Description and Comments

A. Distichiasis

Eyelashes abnormally located on the eyelid margin which may cause ocular irritation. Distichiasis may occur at any time in the life of a dog. It is difficult to make a strong recommendation with regard to breeding dogs with this entity. The hereditary basis has not

OCULAR DISORDERS REPORT

IRISH WOLFHOUND - 2

been established although it seems probable due to the high incidence in some breeds. Reducing the incidence is a logical goal. When diagnosed, distichiasis should be recorded; breeding discretion is advised.

B. Nictitans cartilage anomaly/eversion

A scroll-like curling of the cartilage of the third eyelid, usually everting the margin. This condition may occur in one or both eyes and may cause mild ocular irritation.

C. Corneal dystrophy - epithelial/stromal

A non-inflammatory corneal opacity (white to gray) present in one or more of the corneal layers. Corneal dystrophy implies a probable inherited basis and is usually bilateral.

D. Persistent pupillary membranes (PPM)

Persistent blood vessel remnants in the anterior chamber of the eye which fail to regress normally in the neonatal period. These strands may bridge from iris to iris, iris to cornea, iris to lens, or form sheets of tissue in the anterior chamber. The last three forms pose the greatest threat to vision and when severe, vision impairment or blindness may occur.

E. Uveal cysts

Fluid filled sacs arising from the posterior surface of the iris, to which they may remain attached or break free and float into the anterior chamber. Usually occur in mature dogs.

F. Cataract

A partial or complete opacity of the lens and/or its capsule. In cases where cataracts are complete and affect both eyes, blindness results. The prudent approach is to assume cataracts to be hereditary except in cases known to be associated with trauma, other causes of ocular inflammation, specific metabolic diseases, persistent pupillary membrane, persistent hyaloid or nutritional deficiencies. Cataracts may involve the lens completely (diffuse) or in a localized region.

G. Retinal atrophy - generalized

A degenerative disease of the retinal visual cells which progresses to blindness. This abnormality, also known as progressive retinal atrophy or PRA, may be detected by electroretinogram (not part of a routine eye screening examination) before it is apparent clinically. Except for X-linked PRA in the Siberian Husky, in all breeds studied to date, PRA is inherited as an autosomal recessive trait.

H. Retinal dysplasia - folds

Linear, triangular, curved or curvilinear foci of retinal folding that may be single or multiple. When seen in puppies, this condition may partially or completely resolve with maturity. Its significance to vision is unknown. There are two other forms of retinal dysplasia

OCULAR DISORDERS REPORT

IRISH WOLFHOUND - 3

(geographic, detached) which are known to be inherited in other breeds and, in their most severe form, cause blindness. The genetic relationship between folds and more severe forms of retinal dysplasia is undetermined.

I. Retinal dysplasia - geographic

Abnormal development of the retina present at birth. Any irregularly shaped area of abnormal retinal development containing both areas of thinning and areas of elevation representing folds and retinal disorganization.

J. Optic nerve hypoplasia

A congenital defect of the optic nerve which causes blindness and abnormal pupil response in the affected eye. May be unable to differentiate from micropapilla on a routine (dilated) screening ophthalmoscopic exam.

K. Micropapilla

Micropapilla refers to a small optic disc which is not associated with vision impairment. Optic nerve hypoplasia refers to a congenital defect of the optic nerve which causes blindness and abnormal pupil response in the affected eye. May be difficult to differentiate between micropapilla and optic nerve hypoplasia on a routine (dilated) screening ophthalmoscopic exam.

References

There are no references providing detailed descriptions of hereditary ocular conditions of the Irish Wolfhound breed. The conditions listed above are generally recognized to exist in this breed, as evidenced by identification on breed eye screening examinations and/or clinical experience of veterinary ophthalmologists.

1. ACVO Genetics Committee, 1999 and/or Data from CERF All-Breeds Report, 1991-1998.
2. ACVO Genetics Committee, 2002-2003 and/or Data from CERF All-Breeds Report, 2002-2003.
3. ACVO Genetics Committee, 2005 and/or Data from CERF All-Breeds Report 2003-2004.
4. ACVO Genetics Committee, 2007 and/or Data from CERF All-Breeds Report 2002-2006.
5. ACVO Genetics Committee, 2013-2014 and Data from OFA All-Breeds Report, 2013-2014.

OCULAR DISORDERS REPORT IRISH WOLFHOUND

Diagnostic Name	TOTAL DOGS EXAMINED	1991-1999		2000-2009		2010-2013		2014	
		#	%	#	%	#	%	#	%
GLOBE									
0.110 microphthalmia		0		1	0.1%	0		0	
EYELIDS									
20.140 ectopic cilia		0		0		1	0.3%	0	
21.000 entropion, unspecified		4	0.8%	2	0.3%	0		0	
25.110 distichiasis		14	2.7%	53	7.1%	10	3.0%	3	3.1%
NICTITANS									
51.100 third eyelid cartilage anomaly		5	1.0%	7	0.9%	2	0.6%	0	
CORNEA									
70.220 pigmentary keratitis		0		0		1	0.3%	0	
70.700 corneal dystrophy		9	1.8%	19	2.5%	7	2.1%	2	2.1%
70.730 corneal endothelial degeneration		2	0.4%	0		0		0	
UVEA									
93.120 iris cyst		11	2.2%	51	6.8%	14	4.3%	2	2.1%
93.170 anterior chamber cyst		0		0		0		2	2.1%
93.710 persistent pupillary membranes, iris to iris		8	1.6%	8	1.1%	1	0.3%	0	
93.720 persistent pupillary membranes, iris to lens		3	0.6%	1	0.1%	0		0	
93.730 persistent pupillary membranes, iris to cornea		5	1.0%	4	0.5%	1	0.3%	0	
93.740 persistent pupillary membranes, iris sheets		3	0.6%	1	0.1%	0		1	1.0%
95.120 ciliary body cyst		0		0		1	0.3%	2	2.1%
LENS									
100.200 cataract, unspecified		12	2.3%	0		0		0	
100.210 cataract, significance unknown		13	2.5%	41	5.5%	10	3.0%	2	2.1%
100.301 punctate cataract, anterior cortex		2	0.4%	4	0.5%	6	1.8%	1	1.0%
100.302 punctate cataract, posterior cortex		8	1.6%	10	1.3%	3	0.9%	0	
100.303 punctate cataract, equatorial cortex		0		2	0.3%	0		0	
100.304 punctate cataract, anterior sutures		1	0.2%	0		0		0	
100.305 punctate cataract, posterior sutures		5	1.0%	3	0.4%	0		0	
100.306 punctate cataract, nucleus		1	0.2%	2	0.3%	0		2	2.1%
100.307 punctate cataract, capsular		0		2	0.3%	2	0.6%	0	
100.311 incipient cataract, anterior cortex		4	0.8%	2	0.3%	3	0.9%	1	1.0%
100.312 incipient cataract, posterior cortex		15	2.9%	13	1.7%	2	0.6%	1	1.0%
100.313 incipient cataract, equatorial cortex		2	0.4%	4	0.5%	1	0.3%	1	1.0%
100.314 incipient cataract, anterior sutures		1	0.2%	0		0		0	
100.315 incipient cataract, posterior sutures		6	1.2%	4	0.5%	0		0	
100.316 incipient cataract, nucleus		2	0.4%	7	0.9%	0		0	
100.317 incipient cataract, capsular		0		1	0.1%	0		0	
100.322 incomplete cataract, posterior cortex		0		0		0		1	1.0%
100.330 generalized/complete cataract		3	0.6%	1	0.1%	0		0	
VITREOUS									
110.120 persistent hyaloid artery/remnant		1	0.2%	4	0.5%	0		0	
110.320 vitreous degeneration syneresis		1	0.2%	5	0.7%	0		0	

OCULAR DISORDERS REPORT IRISH WOLFHOUND

	1991-1999	2000-2009	2010-2013	2014
RETINA				
120.170 retinal dysplasia, folds	5 1.0%	14 1.9%	3 0.9%	1 1.0%
120.180 retinal dysplasia, geographic	2 0.4%	7 0.9%	2 0.6%	0
120.190 retinal dysplasia, detached	1 0.2%	1 0.1%	0	0
120.310 generalized progressive retinal atrophy (PRA)	1 0.2%	1 0.1%	0	0
120.400 retinal hemorrhage	1 0.2%	0	0	0
120.910 retinal detachment without dialysis	1 0.2%	0	0	0
OPTIC NERVE				
130.110 micropapilla	2 0.4%	6 0.8%	3 0.9%	0
130.120 optic nerve hypoplasia	16 3.1%	5 0.7%	5 1.5%	0
130.150 optic disc coloboma	1 0.2%	0	1 0.3%	0
OTHER				
900.000 other, unspecified	0	5 0.7%	17 5.2%	0
900.100 other, not inherited	4 0.8%	54 7.2%	4 1.2%	4 4.1%
900.110 other, suspected as inherited	10 2.0%	3 0.4%	4 1.2%	0
NORMAL				
0.000 normal globe	382 74.8%	582 77.6%	289 88.1%	86 88.7%

OCULAR DISORDERS REPORT

ITALIAN GREYHOUND - 1

ITALIAN GREYHOUND

	DISORDER	INHERITANCE	REFERENCE	BREEDING ADVICE
A.	Persistent pupillary membranes - iris to iris	Not defined	1, 2	Breeder option
B.	Cataract	Not defined	3	NO
C.	Lens luxation	Not defined	4	NO
D.	Vitreous degeneration	Not defined	3-5	Breeder option
E.	Persistent hyaloid artery	Not defined	6	Breeder option
F.	Retinal atrophy - generalized	Not defined	3	NO

Description and Comments

A. Persistent pupillary membranes (PPM)

Persistent blood vessel remnants in the anterior chamber of the eye which fail to regress normally in the neonatal period. These strands may bridge from iris to iris, iris to cornea, iris to lens, or form sheets of tissue in the anterior chamber. The last three forms pose the greatest threat to vision and when severe, vision impairment or blindness may occur.

B. Cataract

A partial or complete opacity of the lens and/or its capsule. In cases where cataracts are complete and affect both eyes, blindness results. The prudent approach is to assume cataracts to be hereditary except in cases known to be associated with trauma, other causes of ocular inflammation, specific metabolic diseases, persistent pupillary membrane, persistent hyaloid or nutritional deficiencies. Cataracts may involve the lens completely (diffuse) or in a localized region.

In the Italian Greyhound, posterior subcapsular and cortical cataracts at two to three years of age appear to be the more common location of occurrence, with progression noted in an undetermined percentage of dogs.

C. Lens luxation

OCULAR DISORDERS REPORT

ITALIAN GREYHOUND - 2

Partial (subluxation) or complete displacement of the lens from the normal anatomic site behind the pupil. Lens luxation not associated with trauma or inflammation is presumed to be inherited. Lens luxation may result in elevated intraocular pressure (glaucoma) causing vision impairment or blindness.

D. Vitreous degeneration

A liquefaction of the vitreous gel which may predispose to retinal detachment.

E. Persistent hyaloid artery (PHA)

Congenital defect resulting from abnormalities in the development and regression of the hyaloid artery. The blood vessel remnant can be present in the vitreous as a small patent vascular strand (PHA) or as a non-vascular strand that appears gray-white (persistent hyaloid remnant).

F. Retinal atrophy - generalized

A degenerative disease of the retinal visual cells which progresses to blindness. This abnormality, also known as progressive retinal atrophy or PRA, may be detected by electroretinogram (not part of a routine eye screening examination) before it is apparent clinically. Except for X-linked PRA in the Siberian Husky, in all breeds studied to date, PRA is inherited as an autosomal recessive trait.

Progressive retinal atrophy in the Italian Greyhound is relatively uncommon. It has been observed in dogs in the advanced stage by four to five years of age.

References

There are no references providing detailed descriptions of hereditary ocular conditions of the Italian Greyhound breed. The conditions listed above are generally recognized to exist in this breed, as evidenced by identification on breed eye screening examinations and/or clinical experience of veterinary ophthalmologists.

1. ACVO Genetics Committee, 2006 and/or Data from CERF All-Breeds Report, 2001-2005.
2. ACVO Genetics Committee, 2007 and/or Data from CERF All-Breeds Report 2002-2006.
3. ACVO Genetics Committee, 1999 and/or Data from CERF All-Breeds Report, 1991-1998.
4. ACVO Genetics Committee, 2000-2002 and/or Data from CERF All-Breeds Report, 2000-2002.
5. ACVO Genetics Committee, 2009 and/or Data from CERF All-Breeds Report, 2008.
6. ACVO Genetics Committee, 2005 and/or Data from CERF All-Breeds Report 2003-2004.

OCULAR DISORDERS REPORT ITALIAN GREYHOUND

Diagnostic Name	TOTAL DOGS EXAMINED		1991-1999 1689		2000-2009 4284		2010-2013 1211		2014 248	
	#	%	#	%	#	%	#	%	#	%
GLOBE										
0.110 microphthalmia	0		0		1	0.1%	0			
EYELIDS										
25.110 distichiasis	4	0.2%	9	0.2%	4	0.3%	1	0.4%		
NASOLACRIMAL										
32.110 imperforate lower nasolacrimal punctum	0		1	0.0%	3	0.2%	0			
CORNEA										
70.210 corneal pannus	2	0.1%	2	0.0%	2	0.2%	1	0.4%		
70.220 pigmentary keratitis	0		2	0.0%	0		0			
70.700 corneal dystrophy	3	0.2%	14	0.3%	1	0.1%	1	0.4%		
UVEA										
93.110 iris hypoplasia	0		0		1	0.1%	0			
93.120 iris cyst	0		1	0.0%	1	0.1%	0			
93.140 corneal endothelial pigment without PPM	0		3	0.1%	0		0			
93.150 iris coloboma	1	0.1%	5	0.1%	0		0			
93.710 persistent pupillary membranes, iris to iris	5	0.3%	35	0.8%	10	0.8%	0			
93.720 persistent pupillary membranes, iris to lens	4	0.2%	2	0.0%	0		0			
93.730 persistent pupillary membranes, iris to cornea	1	0.1%	4	0.1%	0		0			
93.740 persistent pupillary membranes, iris sheets	3	0.2%	2	0.0%	0		0			
93.750 persistent pupillary membranes, lens pigment foci/no strands	0		1	0.0%	5	0.4%	2	0.8%		
93.760 persistent pupillary membranes, endothelial opacity/no strands	0		1	0.0%	2	0.2%	1	0.4%		
LENS										
100.200 cataract, unspecified	17	1.0%	0		0		0		0	
100.210 cataract, significance unknown	51	3.0%	195	4.6%	52	4.3%	16	6.5%		
100.301 punctate cataract, anterior cortex	20	1.2%	45	1.1%	20	1.7%	3	1.2%		
100.302 punctate cataract, posterior cortex	11	0.7%	40	0.9%	25	2.1%	5	2.0%		
100.303 punctate cataract, equatorial cortex	4	0.2%	16	0.4%	3	0.2%	1	0.4%		
100.304 punctate cataract, anterior sutures	0		3	0.1%	2	0.2%	0			
100.305 punctate cataract, posterior sutures	0		10	0.2%	6	0.5%	0			
100.306 punctate cataract, nucleus	0		5	0.1%	0		1	0.4%		
100.307 punctate cataract, capsular	2	0.1%	8	0.2%	1	0.1%	0			
100.311 incipient cataract, anterior cortex	25	1.5%	108	2.5%	37	3.1%	4	1.6%		
100.312 incipient cataract, posterior cortex	23	1.4%	104	2.4%	33	2.7%	3	1.2%		
100.313 incipient cataract, equatorial cortex	28	1.7%	51	1.2%	20	1.7%	1	0.4%		
100.314 incipient cataract, anterior sutures	4	0.2%	2	0.0%	1	0.1%	0			
100.315 incipient cataract, posterior sutures	2	0.1%	10	0.2%	3	0.2%	1	0.4%		
100.316 incipient cataract, nucleus	5	0.3%	7	0.2%	2	0.2%	0			
100.317 incipient cataract, capsular	0		12	0.3%	3	0.2%	0			
100.321 incomplete cataract, anterior cortex	0		0		6	0.5%	2	0.8%		
100.322 incomplete cataract, posterior cortex	0		0		3	0.2%	2	0.8%		
100.323 incomplete cataract, equatorial cortex	0		0		3	0.2%	1	0.4%		
100.326 incomplete cataract, nucleus	0		0		0		1	0.4%		
100.330 generalized/complete cataract	9	0.5%	33	0.8%	6	0.5%	0			
100.375 subluxation/luxation, unspecified	15	0.9%	19	0.4%	1	0.1%	0			

OCULAR DISORDERS REPORT ITALIAN GREYHOUND

	1991-1999	2000-2009	2010-2013	2014
VITREOUS				
110.120 persistant hyaloid artery/remnant	3 0.2%	19 0.4%	0	0
110.135 PHPV/PTVL	1 0.1%	2 0.0%	0	0
110.200 vitritis	0	0	82 6.8%	50 20.2%
110.320 vitreous degeneration syneresis	322 19.1%	1013 23.6%	258 21.3%	42 16.9%
110.330 vitreous degeneration anterior chamber	0	635 14.8%	199 16.4%	0
FUNDUS				
97.110 choroidal hypoplasia	0	1 0.0%	21 1.7%	0
RETINA				
120.170 retinal dysplasia, folds	4 0.2%	10 0.2%	5 0.4%	4 1.6%
120.180 retinal dysplasia, geographic	1 0.1%	3 0.1%	0	0
120.190 retinal dysplasia, detached	0	1 0.0%	0	0
120.200 retinitis	0	0	0	1 0.4%
120.310 generalized progressive retinal atrophy (PRA)	48 2.8%	154 3.6%	32 2.6%	9 3.6%
120.400 retinal hemorrhage	0	0	19 1.6%	0
120.910 retinal detachment without dialysis	2 0.1%	4 0.1%	2 0.2%	0
120.920 retinal detachment with dialysis	0	0	1 0.1%	0
120.960 retinopathy	0	0	3 0.2%	0
OPTIC NERVE				
130.110 micropapilla	0	15 0.4%	0	2 0.8%
130.120 optic nerve hypoplasia	12 0.7%	18 0.4%	4 0.3%	0
130.150 optic disc coloboma	1 0.1%	1 0.0%	2 0.2%	0
OTHER				
900.000 other, unspecified	0	25 0.6%	38 3.1%	0
900.100 other, not inherited	11 0.7%	123 2.9%	7 0.6%	14 5.6%
900.110 other, suspected as inherited	22 1.3%	38 0.9%	4 0.3%	1 0.4%
NORMAL				
0.000 normal globe	1221 72.3%	2767 64.6%	796 65.7%	164 66.1%

OCULAR DISORDERS REPORT

JACK RUSSELL TERRIER - 1

JACK RUSSELL TERRIER

	DISORDER	INHERITANCE	REFERENCE	BREEDING ADVICE
A.	Distichiasis	Not defined	1	Breeder option
B.	Corneal dystrophy - epithelial/stromal	Not defined	2	Breeder option
C.	Persistent pupillary membranes			
	- iris to iris	Not defined	3, 4	Breeder option
	- all other forms	Not defined	4	NO
D.	Lens luxation	Not defined	1, 5-9	NO
E.	Cataract	Not defined	1, 10	NO
F.	Vitreous degeneration	Not defined	4, 10	Breeder option
G.	Glaucoma	Not defined	11	NO

Description and Comments

A. Distichiasis

Eyelashes abnormally located on the eyelid margin which may cause ocular irritation. Distichiasis may occur at any time in the life of a dog. It is difficult to make a strong recommendation with regard to breeding dogs with this entity. The hereditary basis has not been established although it seems probable due to the high incidence in some breeds. Reducing the incidence is a logical goal. When diagnosed, distichiasis should be recorded; breeding discretion is advised.

B. Corneal dystrophy- epithelial/stromal

A non-inflammatory corneal opacity (white to gray) present in one or more of the corneal layers. Corneal dystrophy implies a probable inherited basis and is usually bilateral.

C. Persistent pupillary membranes (PPM)

Persistent blood vessel remnants in the anterior chamber of the eye which fail to regress normally by 3 months of age. These strands may bridge from iris to iris, iris to cornea,

©2014, American College of Veterinary Ophthalmologists

OCULAR DISORDERS REPORT

JACK RUSSELL TERRIER - 2

iris to lens, or form sheets of tissue in the anterior chamber. The last three forms pose the greatest threat to vision and when severe, vision impairment or blindness may occur.

D. Lens luxation

Partial (subluxation) or complete displacement of the lens from its normal anatomic site behind the pupil. Lens luxation not associated with trauma or inflammation is presumed to be inherited. Lens luxation may result in elevated intraocular pressure (glaucoma) causing vision impairment or blindness.

E. Cataract

A partial or complete opacity of the lens and/or its capsule. In cases where cataracts are complete and affect both eyes, blindness results. The prudent approach is to assume cataracts to be hereditary except in cases known to be associated with trauma, other causes of ocular inflammation, specific metabolic diseases, persistent pupillary membrane, persistent hyaloid or nutritional deficiencies. Cataracts may involve the lens completely (diffuse) or in a localized region.

F. Vitreous degeneration

Liquefaction of the vitreous gel which may predispose to retinal detachment.

G. Glaucoma [with pectinate ligament dysplasia]

Glaucoma is characterized by an elevation of intraocular pressure (IOP) which, when sustained, causes intraocular damage resulting in blindness. The elevated IOP occurs because the fluid cannot leave through the iridocorneal angle. Diagnosis and classification of glaucoma requires measurement of the intraocular pressure (tonometry) and examination of the iridocorneal angle (gonioscopy). Neither of these tests is part of a routine breed eye screening exam.

References

1. ACVO Genetics Committee, 1999 and/or Data from CERF All-Breeds Report, 1991-1998.
2. ACVO Genetics Committee, 2006 and/or Data from CERF All Breeds Report, 2001-2005.
3. ACVO Genetics Committee, 2000-2002 and/or Data from CERF All-Breeds Report, 2000-2002.
4. ACVO Genetics Committee, 2005 and/or Data from CERF All-Breeds Report 2003-2004.

OCULAR DISORDERS REPORT

JACK RUSSELL TERRIER - 3

5. Lawson DD. Luxation of the crystalline lens in the dog. *J Small Anim Pract.* 1969; 10: 461.
6. Curtis R, Barnett KC. Primary lens luxation in the dog. *J Small Anim Pract.* 1980; 21: 657-668.
7. Curtis R, Barnett KC, Lewis SJ. Clinical and pathological observations concerning the aetiology of primary lens luxation in the dog. *Vet Rec.* 1983; 112: 238-246.
8. Oberbauer AM, Hollingsworth SR, Belanger JM, et al. Inheritance of cataracts and primary lens luxation in Jack Russell Terriers. *Am J Vet Res.* 2008; 69: 222-227.
9. Farias FH, Johnson GS, Taylor JF, et al. An ADAMTS17 splice donor site mutation in dogs with primary lens luxation. *Invest Ophthalmol Vis Sci.* 2010; 51: 4716-4721.
10. ACVO Genetics Committee, 2009 and/or Data from CERF All-Breeds Report, 2008.
11. Premont JE, Frant J, Daspert SM, et al. Pectinate ligament dysplasia and narrowing of the iridocorneal angle in the Jack Russell and Parson Russell Terrier breeds in Belgium. *Annual Meeting of the European College of Veterinary Ophthalmologists* 2011.

OCULAR DISORDERS REPORT

JACK RUSSELL TERRIER

Diagnostic Name	TOTAL DOGS EXAMINED	1991-1999		2000-2009		2010-2013		2014	
		#	%	#	%	#	%	#	%
GLOBE									
0.110	microphthalmia	1	0.0%	4	0.0%	0		0	
10.000	glaucoma	2	0.1%	1	0.0%	0		0	
EYELIDS									
20.140	ectopic cilia	0		2	0.0%	0		0	
20.160	macropalpebral fissure	0		1	0.0%	0		0	
21.000	entropion, unspecified	2	0.1%	1	0.0%	0		0	
25.110	distichiasis	71	3.1%	242	2.2%	38	2.3%	4	1.3%
NASOLACRIMAL									
40.910	keratoconjunctivitis sicca	0		0		1	0.1%	0	
NICTITANS									
52.110	prolapsed gland of the third eyelid	0		0		1	0.1%	0	
CORNEA									
70.210	corneal pannus	1	0.0%	0		0		0	
70.220	pigmentary keratitis	4	0.2%	3	0.0%	2	0.1%	0	
70.700	corneal dystrophy	9	0.4%	46	0.4%	2	0.1%	1	0.3%
70.730	corneal endothelial degeneration	3	0.1%	4	0.0%	1	0.1%	0	
UVEA									
93.120	iris cyst	1	0.0%	4	0.0%	0		0	
93.140	corneal endothelial pigment without PPM	0		0		1	0.1%	0	
93.150	iris coloboma	1	0.0%	2	0.0%	1	0.1%	0	
93.170	anterior chamber cyst	0		0		1	0.1%	0	
93.710	persistent pupillary membranes, iris to iris	153	6.6%	454	4.2%	67	4.0%	14	4.4%
93.720	persistent pupillary membranes, iris to lens	8	0.3%	31	0.3%	0		0	
93.730	persistent pupillary membranes, iris to cornea	9	0.4%	9	0.1%	0		0	
93.740	persistent pupillary membranes, iris sheets	5	0.2%	5	0.0%	0		0	
93.750	persistent pupillary membranes, lens pigment foci/no strands	0		1	0.0%	2	0.1%	6	1.9%
93.760	persistent pupillary membranes, endothelial opacity/no strands	0		0		6	0.4%	0	
95.120	ciliary body cyst	0		0		1	0.1%	0	
LENS									
100.200	cataract, unspecified	4	0.2%	0		0		0	
100.210	cataract, significance unknown	41	1.8%	420	3.9%	53	3.2%	11	3.5%
100.301	punctate cataract, anterior cortex	9	0.4%	57	0.5%	7	0.4%	1	0.3%
100.302	punctate cataract, posterior cortex	10	0.4%	60	0.6%	7	0.4%	1	0.3%
100.303	punctate cataract, equatorial cortex	1	0.0%	18	0.2%	2	0.1%	0	
100.304	punctate cataract, anterior sutures	4	0.2%	8	0.1%	1	0.1%	1	0.3%
100.305	punctate cataract, posterior sutures	6	0.3%	37	0.3%	4	0.2%	0	
100.306	punctate cataract, nucleus	2	0.1%	14	0.1%	7	0.4%	0	
100.307	punctate cataract, capsular	2	0.1%	12	0.1%	3	0.2%	0	
100.311	incipient cataract, anterior cortex	31	1.3%	139	1.3%	11	0.7%	2	0.6%
100.312	incipient cataract, posterior cortex	48	2.1%	287	2.6%	30	1.8%	5	1.6%
100.313	incipient cataract, equatorial cortex	12	0.5%	48	0.4%	4	0.2%	0	
100.314	incipient cataract, anterior sutures	0		8	0.1%	0		0	
100.315	incipient cataract, posterior sutures	27	1.2%	92	0.8%	8	0.5%	2	0.6%

OCULAR DISORDERS REPORT

JACK RUSSELL TERRIER

LENS CONTINUED	1991-1999	2000-2009	2010-2013	2014
100.316 incipient cataract, nucleus	8 0.3%	19 0.2%	2 0.1%	0
100.317 incipient cataract, capsular	0	23 0.2%	3 0.2%	0
100.321 incomplete cataract, anterior cortex	0	0	1 0.1%	0
100.322 incomplete cataract, posterior cortex	0	0	5 0.3%	1 0.3%
100.330 generalized/complete cataract	10 0.4%	72 0.7%	8 0.5%	1 0.3%
100.375 subluxation/luxation, unspecified	16 0.7%	61 0.6%	2 0.1%	1 0.3%
VITREOUS				
110.120 persistent hyaloid artery/remnant	5 0.2%	12 0.1%	0	1 0.3%
110.130 PHPV/PTVL	0	0	1 0.1%	0
110.135 PHPV/PTVL	0	3 0.0%	1 0.1%	0
110.320 vitreous degeneration syneresis	28 1.2%	156 1.4%	16 1.0%	2 0.6%
110.330 vitreous degeneration anterior chamber	0	16 0.1%	7 0.4%	0
FUNDUS				
97.120 coloboma	0	2 0.0%	0	0
RETINA				
120.170 retinal dysplasia, folds	11 0.5%	41 0.4%	6 0.4%	0
120.180 retinal dysplasia, geographic	3 0.1%	15 0.1%	2 0.1%	0
120.190 retinal dysplasia, detached	0	4 0.0%	0	0
120.310 generalized progressive retinal atrophy (PRA)	7 0.3%	73 0.7%	4 0.2%	0
120.400 retinal hemorrhage	2 0.1%	2 0.0%	0	0
120.910 retinal detachment without dialysis	1 0.0%	5 0.0%	2 0.1%	0
120.960 retinopathy	0	0	2 0.1%	0
OPTIC NERVE				
130.110 micropapilla	1 0.0%	5 0.0%	1 0.1%	0
130.120 optic nerve hypoplasia	3 0.1%	5 0.0%	5 0.3%	0
130.150 optic disc coloboma	0	1 0.0%	0	0
OTHER				
900.000 other, unspecified	0	42 0.4%	71 4.2%	0
900.100 other, not inherited	37 1.6%	606 5.6%	12 0.7%	14 4.4%
900.110 other, suspected as inherited	29 1.3%	35 0.3%	2 0.1%	1 0.3%
NORMAL				
0.000 normal globe	1832 79.3%	9043 83.0%	1509 90.3%	284 89.3%

OCULAR DISORDERS REPORT

JAPANESE CHIN - 1

JAPANESE CHIN (JAPANESE SPANIEL)

	DISORDER	INHERITANCE	REFERENCE	BREEDING ADVICE
A.	Entropion	Not defined	1	Breeder option
B.	Distichiasis	Not defined	2, 3	Breeder option
C.	Exposure/pigmentary keratitis	Not defined	1	Breeder option
D.	Persistent pupillary membranes			
	- iris to iris	Not defined	2, 3	Breeder option
	- iris to sheets	Not defined	4	NO
	- iris to lens	Not defined	5	NO
	- all other forms	Not defined	3	NO
E.	Cataract	Not defined	1	NO
F.	Persistent hyperplastic primary vitreous/Persistent hyperplastic tunica vasculosa lentis (PHPV/PHTVL)	Not defined	4	NO
G.	Vitreous degeneration	Not defined	3	Breeder option
H.	Persistent hyaloid artery	Not defined	1	Breeder option
I.	Retinal atrophy - generalized	Not defined	6	NO

Description and Comments

A. Entropion

A conformational defect resulting in an "in-rolling" of one or more of the eyelids which may cause ocular irritation. It is likely that entropion is influenced by several genes (polygenic), defining the skin and other structures which make up the eyelids, the amount and weight of the skin covering the head and face, the orbital contents, and the conformation of the skull. In the Irish Setter, the entropion usually involves the lower eyelids.

©2014, American College of Veterinary Ophthalmologists

OCULAR DISORDERS REPORT

JAPANESE CHIN - 2

B. Distichiasis

Eyelashes abnormally located on the eyelid margin which may cause ocular irritation. Distichiasis may occur at any time in the life of a dog. It is difficult to make a strong recommendation with regard to breeding dogs with this entity. The hereditary basis has not been established although it seems probable due to the high incidence in some breeds. Reducing the incidence is a logical goal. When diagnosed, distichiasis should be recorded; breeding discretion is advised.

C. Exposure/pigmentary keratitis

A condition characterized by variable degrees of superficial vascularization, fibrosis and/or pigmentation of the cornea. May be associated with excessive exposure/irritation of the globe due to shallow orbits, lower eyelid medial entropion, lagophthalmos and macropalpebral fissure.

D. Persistent pupillary membranes (PPM)

Persistent blood vessel remnants in the anterior chamber of the eye which fail to regress normally by 3 months of age. These strands may bridge from iris to iris, iris to cornea, iris to lens, or from sheets of tissue in the anterior chamber. The last three forms pose the greatest threat to vision and when severe, vision impairment or blindness may occur.

E. Cataract

A partial or complete opacity of the lens and/or its capsule. In cases where cataracts are complete and affect both eyes, blindness results. The prudent approach is to assume cataracts to be hereditary except in cases known to be associated with trauma, other causes of ocular inflammation, specific metabolic diseases, persistent pupillary membrane, persistent hyaloid or nutritional deficiencies. Cataracts may involve the lens completely (diffuse) or in a localized region.

F. Persistent hyperplastic primary vitreous (PHPV)/Persistent hyperplastic tunica vasculosa lentis (PHTVL)

Persistent hyperplastic primary vitreous is a congenital defect resulting from abnormalities in the development and regression of the hyaloid artery (the primary vitreous) and the interaction of this blood vessel with the posterior lens capsule/cortex during embryogenesis. This condition is often associated with persistent hyperplastic tunica vasculosa lentis which results from failure of regression of the embryologic vascular network which surrounds the developing lens.

G. Vitreous degeneration

A liquefaction of the vitreous gel which may predispose to retinal detachment.

H. Persistent hyaloid artery (PHA)

©2014, American College of Veterinary Ophthalmologists

OCULAR DISORDERS REPORT

JAPANESE CHIN - 3

Congenital defect resulting from abnormalities in the development and regression of the hyaloid artery. The blood vessel remnant can be present in the vitreous as a small patent vascular strand (PHA) or as a non-vascular strand that appears gray-white (persistent hyaloid remnant).

I. Retinal atrophy - generalized

A degenerative disease of the retinal visual cells which progresses to blindness. This abnormality, also known as Progressive Retinal Atrophy or PRA, may be detected by electroretinogram (not part of a routine eye screening examination) before it is apparent clinically. Except for X-linked PRA in the Siberian Husky, in all breeds studied to date, PRA is inherited as an autosomal recessive trait.

References

There are no references providing detailed descriptions of hereditary ocular conditions of the Japanese Chin breed. The conditions listed above are generally recognized to exist in this breed, as evidenced by identification on breed eye screening examinations and/or clinical experience of veterinary ophthalmologists.

1. ACVO Genetics Committee, 1999 and/or Data from CERF All-Breeds Report, 1991-1998.
2. ACVO Genetics Committee, 2002-2003 and/or Data from CERF All-Breeds Report, 2002-2003.
3. ACVO Genetics Committee, 2005 and/or Data from CERF All-Breeds Report 2003-2004.
4. ACVO Genetics Committee, 2008 and/or Data from CERF All-Breeds Report, 2003-2007.
5. ACVO Genetics Committee, 2009 and/or Data from CERF All-Breeds Report, 2008.
6. ACVO Genetics Committee, 2014 and/or Data from OFA All-Breeds Report, 2013-2014.

OCULAR DISORDERS REPORT JAPANESE CHIN

Diagnostic Name	TOTAL DOGS EXAMINED		1991-1999		2000-2009		2010-2013		2014	
	#	%	#	%	#	%	#	%	#	%
EYELIDS										
20.160	macropalpebral fissure	1	0.8%	4	0.7%	8	2.6%	0		
21.000	entropion, unspecified	14	10.9%	58	9.9%	14	4.6%	0		
22.000	ectropion, unspecified	0		0		0		1	2.0%	
25.110	distichiasis	8	6.2%	28	4.8%	11	3.6%	2	4.0%	
NASOLACRIMAL										
32.110	imperforate lower nasolacrimal punctum	0		0		0		1	2.0%	
40.910	keratoconjunctivitis sicca	0		0		1	0.3%	0		
NICTITANS										
52.110	prolapsed gland of the third eyelid	0		0		2	0.7%	0		
CORNEA										
70.210	corneal pannus	3	2.3%	6	1.0%	0		0		
70.220	pigmentary keratitis	7	5.4%	18	3.1%	16	5.3%	2	4.0%	
70.700	corneal dystrophy	0		1	0.2%	1	0.3%	0		
70.730	corneal endothelial degeneration	1	0.8%	1	0.2%	0		0		
UVEA										
93.150	iris coloboma	0		1	0.2%	0		0		
93.710	persistent pupillary membranes, iris to iris	1	0.8%	76	12.9%	41	13.5%	2	4.0%	
93.720	persistent pupillary membranes, iris to lens	0		6	1.0%	0		0		
93.730	persistent pupillary membranes, iris to cornea	0		7	1.2%	0		0		
93.740	persistent pupillary membranes, iris sheets	0		6	1.0%	0		0		
93.750	persistent pupillary membranes, lens pigment foci/no strands	0		0		1	0.3%	0		
LENS										
100.200	cataract, unspecified	1	0.8%	0		0		0		
100.210	cataract, significance unknown	2	1.6%	33	5.6%	12	3.9%	1	2.0%	
100.301	punctate cataract, anterior cortex	5	3.9%	5	0.9%	8	2.6%	0		
100.302	punctate cataract, posterior cortex	2	1.6%	5	0.9%	1	0.3%	0		
100.303	punctate cataract, equatorial cortex	1	0.8%	5	0.9%	0		0		
100.304	punctate cataract, anterior sutures	0		3	0.5%	2	0.7%	0		
100.305	punctate cataract, posterior sutures	0		3	0.5%	1	0.3%	0		
100.306	punctate cataract, nucleus	0		1	0.2%	0		0		
100.307	punctate cataract, capsular	0		2	0.3%	0		0		
100.311	incipient cataract, anterior cortex	8	6.2%	18	3.1%	8	2.6%	1	2.0%	
100.312	incipient cataract, posterior cortex	3	2.3%	18	3.1%	2	0.7%	0		
100.313	incipient cataract, equatorial cortex	3	2.3%	16	2.7%	6	2.0%	0		
100.314	incipient cataract, anterior sutures	0		0		0		1	2.0%	
100.315	incipient cataract, posterior sutures	1	0.8%	6	1.0%	0		0		
100.316	incipient cataract, nucleus	1	0.8%	2	0.3%	1	0.3%	0		
100.317	incipient cataract, capsular	0		8	1.4%	2	0.7%	0		
100.321	incomplete cataract, anterior cortex	0		0		2	0.7%	0		
100.330	generalized/complete cataract	0		7	1.2%	0		0		
100.375	subluxation/luxation, unspecified	1	0.8%	5	0.9%	0		0		
VITREOUS										
110.120	persistant hyaloid artery/remnant	3	2.3%	12	2.0%	0		0		
110.135	PHPV/PTVL	0		12	2.0%	1	0.3%	0		

OCULAR DISORDERS REPORT JAPANESE CHIN

VITREOUS CONTINUED	1991-1999	2000-2009	2010-2013	2014
110.200 vitritis	0	0	2 0.7%	2 4.0%
110.320 vitreous degeneration syneresis	2 1.6%	15 2.6%	24 7.9%	3 6.0%
110.330 vitreous degeneration anterior chamber	0	4 0.7%	2 0.7%	0
FUNDUS				
97.120 coloboma	0	1 0.2%	0	0
RETINA				
120.170 retinal dysplasia, folds	0	1 0.2%	0	0
120.180 retinal dysplasia, geographic	0	2 0.3%	0	0
120.310 generalized progressive retinal atrophy (PRA)	5 3.9%	6 1.0%	5 1.6%	0
120.910 retinal detachment without dialysis	1 0.8%	0	0	0
120.920 retinal detachment with dialysis	0	0	2 0.7%	0
OPTIC NERVE				
130.110 micropapilla	0	1 0.2%	0	0
130.150 optic disc coloboma	0	2 0.3%	0	0
OTHER				
900.000 other, unspecified	0	9 1.5%	19 6.2%	0
900.100 other, not inherited	0	38 6.5%	8 2.6%	6 12.0%
900.110 other, suspected as inherited	5 3.9%	6 1.0%	3 1.0%	0
NORMAL				
0.000 normal globe	70 54.3%	384 65.4%	212 69.7%	38 76.0%

OCULAR DISORDERS REPORT

KARELIAN BEAR DOG - 1

KARELIAN BEAR DOG

	DISORDER	INHERITANCE	REFERENCE	BREEDING ADVICE
A.	Retinal atrophy - generalized * a DNA test is available.	Autosomal recessive	1	NO

Description and Comments

A. Retinal atrophy- generalized (PRA)

A degenerative disease of the retinal visual cells which progresses to blindness. This abnormality, also known as progressive retinal atrophy or PRA, may be detected by electroretinogram (not part of a routine eye screening examination) before it is apparent clinically. Except for X-linked PRA in the Siberian Husky, in all breeds studied to date, PRA is inherited as an autosomal recessive trait. A DNA test is available.

References

There are no references providing detailed descriptions of hereditary ocular conditions of the Karelian Bear Dog breed. The conditions listed above are generally recognized to exist in this breed, as evidenced by identification on breed eye screening examinations and/or clinical experience of veterinary ophthalmologists.

1. ACVO Genetics Committee, 2013-2014 and Data from OFA All-Breeds Report, 2013-2014.

OCULAR DISORDERS REPORT KARELIAN BEAR DOG

Diagnostic Name	TOTAL DOGS EXAMINED	1991-1999		2000-2009		2010-2013		2014	
		#	%	#	%	#	%	#	%
EYELIDS									
25.110	distichiasis	0		1	2.6%	1	4.5%	0	
CORNEA									
70.700	corneal dystrophy	2	4.9%	2	5.1%	0		0	
70.730	corneal endothelial degeneration	0		1	2.6%	0		0	
UVEA									
93.710	persistent pupillary membranes, iris to iris	8	19.5%	1	2.6%	1	4.5%	0	
93.730	persistent pupillary membranes, iris to cornea	2	4.9%	1	2.6%	0		0	
LENS									
100.210	cataract, significance unknown	1	2.4%	0		0		0	
100.307	punctate cataract, capsular	2	4.9%	0		0		0	
100.311	incipient cataract, anterior cortex	2	4.9%	1	2.6%	0		0	
100.312	incipient cataract, posterior cortex	0		0		2	9.1%	0	
100.317	incipient cataract, capsular	0		1	2.6%	0		0	
RETINA									
120.170	retinal dysplasia, folds	1	2.4%	2	5.1%	1	4.5%	0	
120.310	generalized progressive retinal atrophy (PRA)	0		1	2.6%	0		0	
120.960	retinopathy	0		0		1	4.5%	0	
OTHER									
900.000	other, unspecified	0		0		1	4.5%	0	
900.100	other, not inherited	0		1	2.6%	0		0	
NORMAL									
0.000	normal globe	29	70.7%	33	84.6%	19	86.4%	1	100.0%

OCULAR DISORDERS REPORT

KEESHOND - 1

KEESHOND

	DISORDER	INHERITANCE	REFERENCE	BREEDING ADVICE
A.	Distichiasis	Not defined	1	Breeder option
B.	Entropion	Not defined	2	Breeder option
C.	Persistent pupillary membranes - iris to iris	Not defined	3	Breeder option
D.	Cataract	Not defined	1	NO

Description and Comments

A. Distichiasis

Eyelashes abnormally located in the eyelid margin which may cause ocular irritation. Distichiasis may occur at any time in the life of a dog. It is difficult to make a strong recommendation with regard to breeding dogs with this entity. The hereditary basis has not been established although it seems probable due to the high incidence in some breeds. Reducing the incidence is a logical goal. When diagnosed, distichiasis should be recorded; breeding discretion is advised.

B. Entropion

A conformational defect resulting in an "in-rolling" of one or both of the eyelids which may cause ocular irritation. It is likely that entropion is influenced by several genes (polygenic), defining the skin and other structures which make up the eyelids, the amount and weight of the skin covering the head and face, the orbital contents, and the conformation of the skull.

C. Persistent pupillary membranes (PPM)

Persistent blood vessel remnants in the anterior chamber of the eye which fail to regress normally by 3 months of age. These strands may bridge from iris to iris, iris to cornea, iris to lens, or form sheets of tissue in the anterior chamber. The last three forms pose the greatest threat to vision and when severe, vision impairment or blindness may occur.

D. Cataract

A partial or complete opacity of the lens and/or its capsule. In cases where cataracts are complete and affect both eyes, blindness results. The prudent approach is to assume cataracts to be hereditary except in cases known to be associated with trauma, other causes

OCULAR DISORDERS REPORT

KEESHOND - 2

of ocular inflammation, specific metabolic diseases, persistent pupillary membrane, persistent hyaloid or nutritional deficiencies. Cataracts may involve the lens completely (diffuse) or in a localized region.

References

There are no references providing detailed descriptions of hereditary ocular conditions of the Keeshond breed. The conditions listed above are generally recognized to exist in this breed, as evidenced by identification on breed eye screening examinations and/or clinical experience of veterinary ophthalmologists.

1. ACVO Genetics Committee, 1999 and/or Data from CERF All-Breeds Report, 1991-1998.
2. ACVO Genetics Committee, 2005 and/or Data from CERF All-Breeds Report 2003-2004.
3. ACVO Genetics Committee, 2008 and/or Data from CERF All-Breeds Report, 2003-2007.

OCULAR DISORDERS REPORT KEESHOND

Diagnostic Name	TOTAL DOGS EXAMINED		1991-1999		2000-2009		2010-2013		2014	
	#	%	#	%	#	%	#	%	#	%
GLOBE										
0.110 microphthalmia	0		0		1	0.2%	0			
EYELIDS										
21.000 entropion, unspecified	0		9	0.6%	0		0		0	
25.110 distichiasis	39	4.2%	83	5.9%	49	8.2%	13	8.5%		
NASOLACRIMAL										
32.110 imperforate lower nasolacrimal punctum	1	0.1%	0		0		0		0	
CORNEA										
70.700 corneal dystrophy	4	0.4%	2	0.1%	3	0.5%	2	1.3%		
70.730 corneal endothelial degeneration	0		1	0.1%	1	0.2%	0			
UVEA										
93.120 iris cyst	1	0.1%	1	0.1%	0		0		0	
93.150 iris coloboma	0		1	0.1%	0		0		0	
93.710 persistent pupillary membranes, iris to iris	4	0.4%	13	0.9%	6	1.0%	7	4.6%		
93.720 persistent pupillary membranes, iris to lens	1	0.1%	1	0.1%	0		0		0	
93.730 persistent pupillary membranes, iris to cornea	0		2	0.1%	0		0		0	
93.750 persistent pupillary membranes, lens pigment foci/no strands	0		0		0		1	0.7%		
93.760 persistent pupillary membranes, endothelial opacity/no strands	0		0		1	0.2%	0			
LENS										
100.200 cataract, unspecified	18	2.0%	0		0		0		0	
100.210 cataract, significance unknown	47	5.1%	114	8.1%	66	11.1%	27	17.6%		
100.301 punctate cataract, anterior cortex	6	0.7%	4	0.3%	3	0.5%	0			
100.302 punctate cataract, posterior cortex	4	0.4%	10	0.7%	2	0.3%	0			
100.303 punctate cataract, equatorial cortex	3	0.3%	7	0.5%	1	0.2%	0			
100.304 punctate cataract, anterior sutures	0		0		2	0.3%	0			
100.305 punctate cataract, posterior sutures	12	1.3%	27	1.9%	16	2.7%	2	1.3%		
100.306 punctate cataract, nucleus	0		1	0.1%	0		0			
100.307 punctate cataract, capsular	0		1	0.1%	1	0.2%	0			
100.311 incipient cataract, anterior cortex	2	0.2%	2	0.1%	3	0.5%	0			
100.312 incipient cataract, posterior cortex	13	1.4%	11	0.8%	8	1.3%	0			
100.313 incipient cataract, equatorial cortex	1	0.1%	8	0.6%	0		0			
100.314 incipient cataract, anterior sutures	0		0		2	0.3%	0			
100.315 incipient cataract, posterior sutures	7	0.8%	8	0.6%	4	0.7%	0			
100.316 incipient cataract, nucleus	1	0.1%	6	0.4%	5	0.8%	1	0.7%		
100.317 incipient cataract, capsular	0		1	0.1%	1	0.2%	0			
100.322 incomplete cataract, posterior cortex	0		0		1	0.2%	0			
100.325 incomplete cataract, posterior sutures	0		0		2	0.3%	0			
100.326 incomplete cataract, nucleus	0		0		0		1	0.7%		
100.327 incomplete cataract, capsular	0		0		0		1	0.7%		
100.330 generalized/complete cataract	5	0.5%	2	0.1%	0		0			
100.375 subluxation/luxation, unspecified	1	0.1%	0		0		0			
VITREOUS										
110.120 persistent hyaloid artery/remnant	1	0.1%	0		0		0		0	
110.320 vitreous degeneration syneresis	2	0.2%	2	0.1%	1	0.2%	2	1.3%		

OCULAR DISORDERS REPORT KEESHOND

	1991-1999	2000-2009	2010-2013	2014
FUNDUS				
97.120 coloboma	0	1 0.1%	0	0
RETINA				
120.170 retinal dysplasia, folds	4 0.4%	1 0.1%	1 0.2%	0
120.180 retinal dysplasia, geographic	0	2 0.1%	0	0
120.190 retinal dysplasia, detached	1 0.1%	0	0	0
120.310 generalized progressive retinal atrophy (PRA)	1 0.1%	5 0.4%	3 0.5%	1 0.7%
120.400 retinal hemorrhage	1 0.1%	0	0	0
120.910 retinal detachment without dialysis	2 0.2%	0	0	0
120.960 retinopathy	0	0	2 0.3%	0
OPTIC NERVE				
130.110 micropapilla	0	5 0.4%	0	1 0.7%
130.120 optic nerve hypoplasia	5 0.5%	5 0.4%	1 0.2%	1 0.7%
130.150 optic disc coloboma	1 0.1%	0	0	0
OTHER				
900.000 other, unspecified	0	5 0.4%	16 2.7%	0
900.100 other, not inherited	6 0.7%	37 2.6%	7 1.2%	10 6.5%
900.110 other, suspected as inherited	6 0.7%	1 0.1%	1 0.2%	0
NORMAL				
0.000 normal globe	753 82.0%	1174 83.1%	489 82.2%	117 76.5%

OCULAR DISORDERS REPORT

KERRY BLUE TERRIER - 1

KERRY BLUE TERRIER

	DISORDER	INHERITANCE	REFERENCE	BREEDING ADVICE
A.	Distichiasis	Not defined	1	Breeder option
B.	Corneal dystrophy - epithelial/stromal	Not defined	1	Breeder option
C.	Persistent pupillary membranes - iris to iris	Not defined	1	Breeder option
D.	Cataract	Not defined	2	NO
E.	Vitreous degeneration	Not defined	3	Breeder option

Description and Comments

A. Distichiasis

Eyelashes abnormally located on the eyelid margin which may cause ocular irritation. Distichiasis may occur at any time in the life of a dog. It is difficult to make a strong recommendation with regard to breeding dogs with this entity. The hereditary basis has not been established although it seems probable due to the high incidence in some breeds. Reducing the incidence is a logical goal. When diagnosed, distichiasis should be recorded; breeding discretion is advised.

B. Corneal dystrophy - epithelial/stromal

A non-inflammatory corneal opacity (white to gray) present in one or more of the corneal layers. Corneal dystrophy implies a probable inherited basis and is usually bilateral.

C. Persistent pupillary membranes (PPM)

Persistent blood vessel remnants in the anterior chamber of the eye which fail to regress normally by 3 months of age. These strands may bridge from iris to iris, iris to cornea, iris to lens, or form sheets of tissue in the anterior chamber. The last three forms pose the greatest threat to vision and when severe, vision impairment or blindness may occur.

OCULAR DISORDERS REPORT

KERRY BLUE TERRIER - 2

D. Cataract

A partial or complete opacity of the lens and/or its capsule. In cases where cataracts are complete and affect both eyes, blindness results. The prudent approach is to assume cataracts to be hereditary except in cases known to be associated with trauma, other causes of ocular inflammation, specific metabolic diseases, persistent pupillary membrane, persistent hyaloid or nutritional deficiencies. Cataracts may involve the lens completely (diffuse) or in a localized region.

E. Vitreous degeneration

A liquefaction of the vitreous gel which may predispose to retinal detachment.

References

There are no references providing detailed descriptions of hereditary ocular conditions of the Kerry Blue Terrier breed. The conditions listed above are generally recognized to exist in this breed, as evidenced by identification on breed eye screening examinations and/or clinical experience of veterinary ophthalmologists.

1. ACVO Genetics Committee, 2006 and/or Data from CERF All-Breeds Report, 2001-2005.
2. ACVO Genetics Committee, 1999 and/or Data from CERF All-Breeds Report, 1991-1998.
3. ACVO Genetics Committee, 2005 and/or Data from CERF All-Breeds Report 2003-2004.

OCULAR DISORDERS REPORT KERRY BLUE TERRIER

Diagnostic Name	TOTAL DOGS EXAMINED	1991-1999		2000-2009		2010-2013		2014	
		#	%	#	%	#	%	#	%
EYELIDS									
25.110	distichiasis	1	0.4%	4	1.1%	6	5.7%	1	7.1%
CORNEA									
70.210	corneal pannus	0		1	0.3%	0		0	
70.700	corneal dystrophy	0		2	0.5%	0		0	
UVEA									
93.710	persistent pupillary membranes, iris to iris	2	0.8%	5	1.4%	3	2.9%	1	7.1%
93.720	persistent pupillary membranes, iris to lens	2	0.8%	0		0		0	
93.730	persistent pupillary membranes, iris to cornea	0		1	0.3%	0		0	
LENS									
100.200	cataract, unspecified	6	2.5%	0		0		0	
100.210	cataract, significance unknown	5	2.1%	20	5.5%	1	1.0%	2	14.3%
100.301	punctate cataract, anterior cortex	1	0.4%	12	3.3%	2	1.9%	0	
100.302	punctate cataract, posterior cortex	0		2	0.5%	1	1.0%	0	
100.306	punctate cataract, nucleus	0		0		2	1.9%	1	7.1%
100.312	incipient cataract, posterior cortex	0		4	1.1%	0		0	
100.313	incipient cataract, equatorial cortex	1	0.4%	1	0.3%	1	1.0%	0	
100.330	generalized/complete cataract	1	0.4%	5	1.4%	0		0	
VITREOUS									
110.320	vitreous degeneration syneresis	3	1.2%	3	0.8%	1	1.0%	0	
110.330	vitreous degeneration anterior chamber	0		2	0.5%	1	1.0%	0	
RETINA									
120.310	generalized progressive retinal atrophy (PRA)	0		2	0.5%	0		0	
OTHER									
900.000	other, unspecified	0		0		1	1.0%	0	
900.100	other, not inherited	1	0.4%	20	5.5%	0		0	
900.110	other, suspected as inherited	2	0.8%	0		0		0	
NORMAL									
0.000	normal globe	226	93.0%	316	86.3%	94	89.5%	10	71.4%

OCULAR DISORDERS REPORT

KOMONDOR - 1

KOMONDOR

	DISORDER	INHERITANCE	REFERENCE	BREEDING ADVICE
A.	Entropion	Not defined	1	Breeder option
B.	Persistent pupillary membranes - iris to iris	Not defined	1	Breeder option
C.	Cataract	Not defined	2	NO

Description and Comments

A. Entropion

A conformational defect resulting in an "in-rolling" of one or both of the eyelids which may cause ocular irritation. It is likely that entropion is influenced by several genes (polygenic), defining the skin and other structures which make up the eyelids, the amount and weight of the skin covering the head and face, the orbital contents, and the conformation of the skull.

B. Persistent pupillary membranes (PPM)

Persistent blood vessel remnants in the anterior chamber of the eye which fail to regress normally by 3 months of age. These strands may bridge from iris to iris, iris to cornea, iris to lens, or form sheets of tissue in the anterior chamber. The last three forms pose the greatest threat to vision and when severe, vision impairment or blindness may occur.

C. Cataract

A partial or complete opacity of the lens and/or its capsule. In cases where cataracts are complete and affect both eyes, blindness results. The prudent approach is to assume cataracts to be hereditary except in cases known to be associated with trauma, other causes of ocular inflammation, specific metabolic diseases, persistent pupillary membrane, persistent hyaloid or nutritional deficiencies. Cataracts may involve the lens completely (diffuse) or in a localized region.

Appears to be relatively young age for onset in the Komondor (<4yr) and mainly anterior cortical.

OCULAR DISORDERS REPORT

KOMONDOR - 2

References

There are no references providing detailed descriptions of hereditary ocular conditions of the Komondor breed. The conditions listed above are generally recognized to exist in this breed, as evidenced by identification on breed eye screening examinations and/or clinical experience of veterinary ophthalmologists.

1. ACVO Genetics Committee, 2006 and/or Data from CERF All-Breeds Report, 2001-2005.
2. ACVO Genetics Committee, 1999 and/or Data from CERF All-Breeds Report, 1991-1998.

OCULAR DISORDERS REPORT KOMONDOR

Diagnostic Name	TOTAL DOGS EXAMINED	1991-1999		2000-2009		2010-2013		2014	
		#	%	#	%	#	%	#	%
EYELIDS									
21.000	entropion, unspecified	0		1	0.6%	0		0	
22.000	ectropion, unspecified	1	1.1%	0		0		0	
NICTITANS									
51.100	third eyelid cartilage anomaly	0		1	0.6%	0		0	
CORNEA									
70.700	corneal dystrophy	0		0		0		1	11.1%
UVEA									
93.710	persistent pupillary membranes, iris to iris	1	1.1%	3	1.8%	0		1	11.1%
93.760	persistent pupillary membranes, endothelial opacity/no strands	0		0		1	1.6%	0	
LENS									
100.200	cataract, unspecified	14	15.4%	0		0		0	
100.210	cataract, significance unknown	8	8.8%	13	7.6%	7	10.9%	0	
100.303	punctate cataract, equatorial cortex	1	1.1%	1	0.6%	0		0	
100.304	punctate cataract, anterior sutures	0		0		1	1.6%	0	
100.306	punctate cataract, nucleus	0		0		3	4.7%	0	
100.307	punctate cataract, capsular	0		2	1.2%	1	1.6%	0	
100.312	incipient cataract, posterior cortex	0		3	1.8%	0		0	
100.313	incipient cataract, equatorial cortex	0		4	2.4%	1	1.6%	0	
100.314	incipient cataract, anterior sutures	0		1	0.6%	0		0	
100.315	incipient cataract, posterior sutures	0		3	1.8%	0		0	
100.316	incipient cataract, nucleus	1	1.1%	1	0.6%	3	4.7%	0	
100.326	incomplete cataract, nucleus	0		0		0		1	11.1%
100.330	generalized/complete cataract	1	1.1%	0		0		0	
RETINA									
120.170	retinal dysplasia, folds	0		1	0.6%	0		0	
OTHER									
900.000	other, unspecified	0		3	1.8%	4	6.2%	0	
900.100	other, not inherited	0		6	3.5%	0		0	
900.110	other, suspected as inherited	1	1.1%	0		0		0	
NORMAL									
0.000	normal globe	69	75.8%	147	86.5%	50	78.1%	8	88.9%

OCULAR DISORDERS REPORT

KUVASZ - 1

KUVASZ

	DISORDER	INHERITANCE	REFERENCE	BREEDING ADVICE
A.	Distichiasis	Not defined	1	Breeder option
B.	Corneal dystrophy - epithelial/stromal	Not defined	5	Breeder option
C.	Corneal dystrophy - endothelial	Not defined	2	NO
D.	Persistent pupillary membranes			
	- iris to iris	Not defined	1,3	Breeder option
	- all other forms	Not defined	3	NO
E.	Cataract	Not defined	1	NO
F.	Vitreous degeneration	Not defined	2	Breeder option
G.	Retinal atrophy - generalized (<i>prcd</i>) * a DNA test is available	Autosomal recessive	1,4	NO

Description and Comments

A. Distichiasis

Eyelashes abnormally located on the eyelid margin which may cause ocular irritation. Distichiasis may occur at any time in the life of a dog. It is difficult to make a strong recommendation with regard to breeding dogs with this entity. The hereditary basis has not been established although it seems probable due to the high incidence in some breeds. Reducing the incidence is a logical goal. When diagnosed, distichiasis should be recorded; breeding discretion is advised.

B. Corneal dystrophy - epithelial/stromal

A non-inflammatory corneal opacity (white to gray) present in one or more of the corneal layers. Corneal dystrophy implies a probable inherited basis and is usually bilateral.

OCULAR DISORDERS REPORT

KUVASZ - 2

C. Corneal dystrophy - endothelial

Corneal endothelial dystrophy is an abnormal loss of the inner lining of the cornea that causes progressive fluid retention (edema). With time the edema results in keratitis and decreased vision. This usually does not occur until the animal is older. In the Basenji, this condition is less common than corneal endothelial disease caused by attachment of persistent pupillary membranes.

D. Persistent pupillary membranes (PPM)

Persistent blood vessel remnants in the anterior chamber of the eye which fail to regress normally by 3 months of age. These strands may bridge from iris to iris, iris to cornea, iris to lens, or form sheets of tissue in the anterior chamber. The last three forms pose the greatest threat to vision and when severe, vision impairment or blindness may occur.

E. Cataract

A partial or complete opacity of the lens and/or its capsule. In cases where cataracts are complete and affect both eyes, blindness results. The prudent approach is to assume cataracts to be hereditary except in cases known to be associated with trauma, other causes of ocular inflammation, specific metabolic diseases, persistent pupillary membrane, persistent hyaloid or nutritional deficiencies. Cataracts may involve the lens completely (diffuse) or in a localized region. In the Kuvasz cataracts reported are predominantly posterior cortical, punctate.

G. Vitreous degeneration

Liquefaction of the vitreous gel which may predispose to retinal detachment.

G. Retinal atrophy, generalized (*prcd*)

A degenerative disease of the retinal visual cells which progresses to blindness. This abnormality, also known as progressive retinal atrophy or PRA, may be detected by electroretinogram (not part of a routine eye screening examination) before it is apparent clinically. Except for X-linked PRA in the Siberian Husky, in all breeds studied to date, PRA is inherited as an autosomal recessive trait. A DNA test is available.

References

There are few references providing detailed descriptions of hereditary ocular conditions of the Kuvasz breed. The conditions listed above are generally recognized to exist in this breed, as evidenced by identification on breed eye screening examinations and/or clinical experience of veterinary ophthalmologists.

1. ACVO Genetics Committee, 1999 and/or Data from CERF All-Breeds Report, 1991-1998.
2. ACVO Genetics Committee, 2006 and/or Data from CERF All-Breeds Report, 2001-2005.

OCULAR DISORDERS REPORT

KUVASZ - 3

3. ACVO Genetics Committee, 2005 and/or Data from CERF All-Breeds Report 2003-2004.
4. Zangerl B, Goldstein O, Philp AR, et al. Identical mutation in a novel retinal gene causes progressive rod-cone degeneration in dogs and retinitis pigmentosa in humans. *Genomics*. 2006 Nov;88:551-563.
5. ACVO Genetics Committee, 2014 and/or Data from OFA All-Breeds Report, 2013-2014.

OCULAR DISORDERS REPORT KUVASZ

Diagnostic Name	TOTAL DOGS EXAMINED		1991-1999		2000-2009		2010-2013		2014	
	#	%	#	%	#	%	#	%	#	%
GLOBE										
0.110 microphthalmia	1	0.3%	0		1	3.4%	0			
EYELIDS										
20.140 ectopic cilia	1	0.3%	0		0		0		0	
20.160 macropalpebral fissure	0		0		1	3.4%	0		0	
22.000 ectropion, unspecified	2	0.6%	0		0		0		0	
25.110 distichiasis	12	3.9%	9	4.5%	0		0		0	
NICTITANS										
51.100 third eyelid cartilage anomaly	1	0.3%	0		0		0		0	
CORNEA										
70.700 corneal dystrophy	1	0.3%	5	2.5%	0		0		0	
70.730 corneal endothelial degeneration	0		1	0.5%	0		0		0	
UVEA										
93.150 iris coloboma	2	0.6%	0		0		0		0	
93.710 persistent pupillary membranes, iris to iris	16	5.2%	7	3.5%	0		0		0	
93.720 persistent pupillary membranes, iris to lens	3	1.0%	0		0		0		0	
93.730 persistent pupillary membranes, iris to cornea	2	0.6%	1	0.5%	0		0		0	
LENS										
100.200 cataract, unspecified	2	0.6%	0		0		0		0	
100.210 cataract, significance unknown	6	1.9%	7	3.5%	2	6.9%	0		0	
100.301 punctate cataract, anterior cortex	0		1	0.5%	0		0		0	
100.302 punctate cataract, posterior cortex	1	0.3%	0		0		0		0	
100.303 punctate cataract, equatorial cortex	1	0.3%	0		0		0		0	
100.305 punctate cataract, posterior sutures	1	0.3%	0		0		0		0	
100.312 incipient cataract, posterior cortex	0		1	0.5%	0		0		0	
100.313 incipient cataract, equatorial cortex	1	0.3%	0		0		0		0	
100.316 incipient cataract, nucleus	2	0.6%	0		1	3.4%	0		0	
100.330 generalized/complete cataract	2	0.6%	3	1.5%	0		0		0	
VITREOUS										
110.320 vitreous degeneration syneresis	0		1	0.5%	0		0		0	
RETINA										
120.310 generalized progressive retinal atrophy (PRA)	2	0.6%	2	1.0%	0		0		0	
OTHER										
900.000 other, unspecified	0		1	0.5%	0		0		0	
900.100 other, not inherited	1	0.3%	11	5.5%	1	3.4%	0		0	
900.110 other, suspected as inherited	1	0.3%	1	0.5%	0		0		0	
NORMAL										
0.000 normal globe	258	83.2%	167	83.5%	26	89.7%	5	100.0%		

LABRADOODLE (AUSTRALIAN)

	DISORDER	INHERITANCE	REFERENCE	BREEDING ADVICE
A.	Distichiasis	Not defined	1	Breeder option
B.	Ectropion	Not defined	1	Breeder option
C.	Entropion	Not defined	1-3	Breeder option
D.	Corneal dystrophy - epithelial/stromal	Not defined	1	Breeder option
E.	Limbal melanoma	Not defined	4	NO
F.	Uveal cysts	Not defined	5	Breeder option
G.	Persistent pupillary membranes			
	- iris to iris	Not defined	1, 5	Breeder option
	- iris to cornea	Not defined	6	NO
	- iris sheets	Not defined	5	NO
	- all other forms	Not defined	5	NO
H.	Iris melanoma	Presumed autosomal recessive	7	NO
I.	Glaucoma	Not defined	8	NO
J.	Cataract			
	- presumed dominant with incomplete penetrance		1-3, 9-11	NO
	- autosomal recessive		12	NO
	- not defined		13	NO
K.	Persistent hyaloid artery	Not defined	1	Breeder option
L.	Persistent hyperplastic primary vitreous/ persistent hyperplastic tunica vasculosa lentis (PHPV/PHTVL)	Not defined	1	NO
M.	Vitreous degeneration	Not defined	14, 15	Breeder option

OCULAR DISORDERS REPORT LABRADOODLE (AUSTRALIAN) - 2

N.	Retinal atrophy - generalized (<i>prcd</i>) * a DNA test is available	Autosomal recessive	1, 16-24	NO
O.	Central progressive retinal atrophy	Not defined	25, 26	NO
P.	Retinal dysplasia - folds * a DNA test is available	Presumed autosomal Recessive	1, 27-38	NO (Breeder option with "Normal")
Q.	Retinal dysplasia - geographic detached (without skeletal defects)	Presumed autosomal recessive	1, 27-38	NO
R.	Retinal dysplasia - folds/geographic/ detached (with skeletal defects)	Presumed incomplete dominant	1, 27-37, 39	NO

Description and Comments

A. Distichiasis

Eyelashes abnormally located on the eyelid margin which may cause ocular irritation. Distichiasis may occur at any time in the life of a dog. It is difficult to make a strong recommendation with regard to breeding dogs with this entity. The hereditary basis has not been established, although it seems probable due to the high incidence in some breeds. Reducing the incidence is a logical goal. When diagnosed, distichiasis should be recorded; breeding discretion is advised.

B. Ectropion

A conformational defect resulting in eversion of the eyelid(s), which may cause ocular irritation due to exposure. It is likely that ectropion is influenced by several genes (polygenic) defining the skin and other structures which make up the eyelids, the amount and weight of the skin covering the head and face, the orbital contents and the conformation of the skull.

C. Entropion

A conformational defect resulting in an "in-rolling" of one or both of the eyelids which may cause ocular irritation. It is likely that entropion is influenced by several genes (polygenic), defining the skin and other structures which make up the eyelids, the amount and weight of the skin covering the head and face, the orbital contents, and the conformation of the skull. Selection should be directed against entropion and toward a head conformation that reduces or eliminates the likelihood of the defect.

D. Corneal dystrophy - epithelial/stromal

A non-inflammatory corneal opacity (white to gray) present in one or more of the corneal layers; usually inherited and bilateral.

E. Limbal melanoma

Most limbal melanomas are really epibulbar melanocytomas, but there is a possibility of an extension of an intraocular melanoma extending outward and presenting as a limbal melanoma. An epibulbar melanocytoma originates from the superficial pigment lining the limbus and the lesion may eventually extend into the eye. Metastasis has not been documented and the mass is characterized by large epithelioid cells. The lesion presents as a subconjunctival smooth mass most commonly in the dorsolateral limbal region and extends later into the cornea and posterior on the sclera. Breed predisposition have been noted in the German shepherd, Labrador and Golden Retriever.

F. Uveal cysts

Fluid filled sacs arising from the posterior surface of the iris, to which they may remain attached or break free and float into the anterior chamber. Usually occur in mature dogs.

This disorder may be observed in any breed but retriever breeds tend to be predisposed. There is usually no effect on vision unless the cysts are heavily clustered and impinge on the pupillary area. Less frequently, the cysts may rupture and adhere to the cornea or anterior lens capsule. Multiple cysts may occlude the iridocorneal angle and cause glaucoma.

G. Persistent pupillary membranes (PPM)

Persistent blood vessel remnants in the anterior chamber of the eye which fail to regress normally by 3 months of age. These strands may bridge from iris to iris, iris to cornea, iris to lens, or form sheets of tissue in the anterior chamber. The last three forms pose the greatest threat to vision and when severe, vision impairment or blindness may occur.

In the Labrador Retriever, this is a potentially serious problem as many of the ppm's identified on routine screening examinations bridge from the iris to the cornea and/or from iris sheets bridging the pupils. These forms may cause vision impairment.

H. Iris melanoma

A locally invasive cancer of melanocyte (pigment) cell origin within the iris. Occurs with a higher than normal incidence in the Labrador Retriever. Left untreated it will result in secondary glaucoma.

I. Glaucoma

Glaucoma is characterized by an elevation of intraocular pressure which, when sustained even for a brief period of time, causes intraocular damage resulting in

blindness. The elevated intraocular pressure occurs because the fluid cannot leave through the iridocorneal angle. Diagnosis and classification of glaucoma requires measurement of IOP (tonometry) and examination of the iridocorneal angle (gonioscopy). Neither of these tests is part of a routine breed eye screening examination.

J. Cataract

A partial or complete opacity of the lens and/or its capsule. In cases where cataracts are complete and affect both eyes, blindness results. The prudent approach is to assume cataracts to be hereditary except in cases known to be associated with trauma, other causes of ocular inflammation, specific metabolic diseases, persistent pupillary membrane, persistent hyaloid or nutritional deficiencies. Cataracts may involve the lens completely (diffuse) or in a localized region.

The most frequently reported cataracts in the breed are bilateral or unilateral, focal, posterior polar (posterior cortical)/subcapsular cataracts usually present between 1-3 years of age. These are generally stationary or very slowly progressive and generally do not interfere with vision. It has been suggested that these cataracts are inherited as dominant with incomplete penetrance, but definitive breeding studies are still required to verify this hypothesis.

A second type of cataract is a progressive cortical cataract which may involve the entire lens. It is not clear whether this is a distinct entity, or an aberrant form of the posterior polar cataract.

K. Persistent hyaloid artery (PHA)

A congenital defect resulting from abnormalities in the development and regression of the hyaloid artery. The blood vessel remnant can be present in the vitreous as a small vascular strand (PHA) or as a non-vascular strand that appears gray-white (**persistent hyaloid remnant**).

L. Persistent hyperplastic primary vitreous (PHPV)/Persistent hyperplastic tunica vasculosa lentis (PHTVL)

A congenital defect resulting from abnormalities in the development and regression of the hyaloid artery (the primary vitreous) and the interaction of this blood vessel with the posterior lens capsule/cortex during embryogenesis. This condition is often associated with **persistent hyperplastic tunica vasculosa lentis (PHTVL)** which results from failure of regression of the embryologic vascular network which surrounds the developing lens.

The majority of affected dogs have a retrolental fibrovascular plaque and variable lenticular defects which include posterior lenticonus/globus, colobomata, intralenticular hemorrhage and/or secondary cataracts. Vision impairment may result.

M. Vitreous degeneration

Liquefaction of the vitreous gel, which may predispose to retinal detachment.

N. Retinal atrophy - generalized (*prcd*)

A degenerative disease of the retinal visual cells which progresses to blindness. This abnormality, also known as progressive retinal atrophy or PRA, may be detected by electroretinogram (not part of a routine eye screening examination) before it is apparent clinically. Except for X-linked PRA in the Siberian Husky, in all breeds studied to date, PRA is inherited as an autosomal recessive trait. A DNA test is available.

In the Labrador Retriever, early fundus abnormalities usually appear after 4 years of age. The electroretinogram (ERG) shows marked functional abnormalities indicative of a progressive rod-cone degeneration. The age for early diagnosis by ERG is after 18 months of age. Studies have shown that PRA in the Labrador Retriever is inherited as autosomal recessive.

O. Central progressive retinal atrophy (CPRA)

A progressive retinal degeneration in which photoreceptor death occurs secondary to disease of the underlying pigment epithelium. Progression is slow and some animals never lose vision. CPRA occurs in England, but is uncommon elsewhere.

The lesions first appear in the posterior pole (central retina), enlarge, coalesce and result in secondary retinal atrophy; progression from the posterior pole to the periphery occurs later. The age of onset varies from young adults to older animals but usually before 5 years of age. Although reported to be dominant with incomplete penetrance, the mode of inheritance of CPRA remains undetermined. The disease has rarely been seen in dogs bred and raised in the U.S. This limited geographic distribution has led some to speculate about a nutritional basis.

P. Retinal dysplasia - folds

Linear, triangular, curved or curvilinear foci of retinal folding that may be single or multiple. When seen in puppies, this condition may partially or completely resolve with maturity. Its significance to vision is unknown. There are two other forms of retinal dysplasia (geographic, detached) which are known to be inherited in other breeds and, in their most severe form, cause blindness.

In the Labrador Retriever, the presence of retinal folds may be seen in the heterozygous state described in "R" below thus the recommendation against breeding.

The breeding advice for Labradoodles diagnosed with "retinal dysplasia - folds" will be changed from "No" to "Breeder option" if the owner of the dog provides the registering office with results of the DNA test for the affected dog, showing that it is not a carrier of the oculoskeletal dysplasia (OSD) mutation.

Q. Retinal dysplasia without skeletal defects

Abnormal development of the retina present at birth and recognized to have three forms:

- 1) Retinal dysplasia - **folds**: linear, triangular, curved or curvilinear foci of retinal folding that may be single or multiple. (see R.)
- 2) Retinal dysplasia - **geographic**: any irregularly shaped area of abnormal retinal

development, representing changes not accountable by simple folding.

- 3) Retinal dysplasia - **detachment**: either of the above described forms of retinal dysplasia associated with separation (detachment) of the retina.

The two latter forms are associated with vision impairment or blindness. Retinal dysplasia is known to be inherited in many breeds. The genetic relationship between the 3 forms of the disease is not known for all breeds.

In Europe, this condition has been documented as an autosomal recessive condition and results in early retinal detachment and blindness. Lens and corneal opacities can also be present, but skeletal abnormalities (see below) are not present. The condition of generalized retinal dysplasia with retinal detachment but without skeletal abnormalities has been reported primarily in Europe, and is rarely if ever seen in the United States.

In the United States, the milder forms of retinal dysplasia (folds/geographic) are seen in Labradors. These may represent the heterozygous form of the condition in which the homozygote also displays skeletal malformations (see "R" below) or it may represent a genetically distinct entity with an undetermined mode of inheritance. It is not possible clinically to make this distinction. Thus, Labradors with any form of retinal dysplasia should not be used for breeding.

R. Retinal dysplasia - folds/geographic/detachment (with skeletal defects)

An inherited defect of the Labrador Retriever which can affect both the eye and the forelimbs. The gene has recessive effects on the skeleton and incompletely dominant effects on the eye. Dogs homozygous recessive for the gene defect have retinal dysplasia (detachment), cataracts and corneal pigmentation, associated with abnormalities of the appendicular skeleton (a form of short-limbed dwarfism). The ocular abnormalities result in blindness in most dogs. Heterozygous dogs have a bilateral/unilateral congenital retinal defect resulting in ophthalmoscopically visible retinal dysplasia (folds and/or geographic lesions) present in the central tapetal region near the major retinal vessels. Vision can be normal to impaired. The condition in the heterozygous dog is stationary although, in rare cases, progressive retinal detachments have developed. The term "incompletely dominant" in regard to the ocular lesions refers to the difference in phenotype between the homozygous and heterozygous state. This condition has been found primarily in field trial lines.

References

1. ACVO Genetics Committee, 1999 and/or Data from CERF All Breeds Report, 1991-1998.
2. Hodgman SFJ. Abnormalities and defects in pedigree dogs: I. An investigation into the existence of abnormalities in pedigree dogs in British Isles. *J Small Anim Pract.* 1963;4:447.
3. Johnston DE and Cox B. The incidence in purebred dogs in Australia of abnormalities that may be inherited. *Aust Vet J.* 1970 Oct;46:465-474.
4. Donaldson D, Sansom J, Scase T, et al. Canine limbal melanoma: 30 cases (1992-

OCULAR DISORDERS REPORT LABRADOODLE (AUSTRALIAN) - 7

- 2004). Part 1. Signalment, clinical and histological features and pedigree analysis. *Vet Ophthalmol.* 2006 Mar-Apr;9:115-119.
5. ACVO Genetics Committee, 2005 and/or Data from CERF All-Breeds Report 2003-2004.
 6. ACVO Genetics Committee, 2007 and/or Data from CERF All-Breeds Report 2002-2006.
 7. Cook CS. Inherited iris melanoma in Labrador Retriever dogs. *Proc Am Coll Vet Ophthalmol.* 1997;27:106.
 8. Strom AR, Hassig M, Iburg TM, et al. Epidemiology of canine glaucoma presented to University of Zurich from 1995 to 2009. Part 1: Congenital and primary glaucoma (4 and 123 cases). *Vet Ophthalmol.* 2011 Mar;14:121-126.
 9. Curtis R and Barnett KC. A survey of cataracts in Golden and Labrador Retrievers. *J Small Anim Pract.* 1989;30:277.
 10. Barnett KC. Hereditary cataract in the dog. *J Small Anim Pract.* 1978 Feb;19:109-120.
 11. Barnett KC. The diagnosis and differential diagnosis of cataract in the dog. *J Small Anim Pract.* 1985;26:305.
 12. Aguirre GD, et al. A Re-Examination of the Mode of Inheritance of Posterior Cortical Cataracts in Labrador Retrievers and Golden Retrievers. *ACVO Proceedings.* 2004.
 13. Kraijer-Huver IM, Gubbels EJ, Scholten J, et al. Characterization and prevalence of cataracts in Labrador Retrievers in The Netherlands. *Am J Vet Res.* 2008 Oct;69:1336-1340.
 14. ACVO Genetics Committee, 2002-2003 and/or Data from CERF All-Breeds Report, 2002-2003.
 15. ACVO Genetics Committee, 2009 and/or Data from CERF All-Breeds Report, 2008.
 16. Barnett KC. Two forms of hereditary and progressive retinal atrophy in the dog. I. The miniature poodle. II. The Labrador Retriever. *J Am Anim Hosp Assoc.* 1965:234.
 17. Goebel HH and Koppang N. Ultrastructural studies on the progressive retinal atrophy of the Labrador dog. *J Neuropathol Exp Neurol.* 1984;43:310.
 18. Aguirre GD and Acland GM. Variation in retinal degeneration phenotype inherited at the prcd locus. *Exp Eye Res.* 1988 May;46:663-687.
 19. Aguirre GD and Acland GM. Progressive retinal atrophy in the Labrador Retriever is a progressive rod-cone degeneration (prcd). *Trans Am Coll Vet Ophthalmol.* 1989;20:150.
 20. Kommonen B and Karhunen U. A late receptor dystrophy in the Labrador Retriever. *Vision Res.* 1990;30:207-213.
 21. Aguirre GD and Acland GM. Inherited retinal degeneration in the Labrador Retriever dog. A new animal model of RP. *Invest Ophthalmol Vis Sci (Supp).* 1991;32.

22. Kommonen B, Penn JS, Kylma T, et al. Early ultrastructural changes in photoreceptor degeneration in Labrador Retrievers. *Proc European Society of Veterinary Ophthalmology*. 1993;26.
23. Kommonen B, Kylma T, Karhunen U, et al. Impaired retinal function in young Labrador Retriever dogs heterozygous for late onset rod-cone degeneration. *Vision Res*. 1997 Feb;37:365-370.
24. Zangerl B, Goldstein O, Philp AR, et al. Identical mutation in a novel retinal gene causes progressive rod-cone degeneration in dogs and retinitis pigmentosa in humans. *Genomics*. 2006 Nov;88:551-563.
25. Aguirre GD and Acland GM. Use and misuse of electroretinography in the diagnosis of inherited retinal diseases in dogs. *Proc Am Coll Vet Ophthalmol*. 1997;27:37.
26. Barnett KC. Central progressive retinal atrophy in the Labrador Retriever. *Vet Ann*. 1969;17:142.
27. Hereditary eye abnormalities in the dog #2. Central progressive retinal atrophy. *The Animal Health Trust, Small Animals Centre*. November. 1977.
28. Barnett KC, et al. Hereditary retinal dysplasia in the Labrador Retriever in England and Sweden. *J Small Anim Pract*. 1970;10:755.
29. Kock E. Retinal dysplasia. Thesis, Stockholm, 1974.
30. Carrig CB, MacMillan A, Brundage S, et al. Retinal dysplasia associated with skeletal abnormalities in Labrador Retrievers. *J Am Vet Med Assoc*. 1977 Jan 1;170:49-57.
31. Carrig CB, Schmidt GM and Tvedten HML. Growth of the radius and ulna in Labrador Retriever dogs with ocular and skeletal dysplasia. *Vet Radiol*. 1990;31:165.
32. Carrig CB, Sponenberg DP, Schmidt GM, et al. Inheritance of associated ocular and skeletal dysplasia in Labrador Retrievers. *J Am Vet Med Assoc*. 1988 Nov 15;193:1269-1272.
33. Tvedten HW. Ocular and osseous dysplasia associated with skeletal abnormalities in Labrador Retrievers. *Proc Am Coll Vet Pathol*. 1980;31:80.
34. Nelson D and MacMilan A. Multifocal retinal dysplasia in the field trial Labrador Retriever. *J Am Anim Hosp Assoc*. 1983;19:388.
35. Blair NP, Dodge JT and Schmidt GM. Rhegmatogenous retinal detachment in Labrador Retrievers. I. Development of retinal tears and detachment. *Arch Ophthalmol*. 1985 Jun;103:842-847.
36. Blair NP, Dodge JT and Schmidt GM. Rhegmatogenous retinal detachment in Labrador Retrievers. II. Proliferative vitreoretinopathy. *Arch Ophthalmol*. 1985 Jun;103:848-854.
37. Gionfriddo JR, Betts DM and Niyo Y. Retinal and skeletal dysplasia in a field trial Labrador puppy. *Canine Pract*. 1992;17:25.

OCULAR DISORDERS REPORT

LABRADOODLE (AUSTRALIAN) - 9

38. Acland GM and Aguirre GD. Oculoskeletal dysplasia in the Samoyed and Labrador Retriever dogs: 2 nonallelic disorders akin to Stickler-like syndrome affecting humans. Presented at the 2nd international DOGMAP Meeting, Cambridge, Great Britain. 1995.
39. Goldstein O, Guyon R, Kukekova A, et al. COL9A2 and COL9A3 mutations in canine autosomal recessive oculoskeletal dysplasia. *Mamm Genome*. 2010 Aug;21:398-408.

OCULAR DISORDERS REPORT LABRADOODLE AUSTRALIAN

Diagnostic Name	TOTAL DOGS EXAMINED	1991-1999		2000-2009		2010-2013		2014		
		#	%	#	%	#	%	#	%	
EYELIDS										
21.000	entropion, unspecified	0		0		1	0.1%	0		
25.110	distichiasis	0		0		10	1.3%	11	1.8%	
NASOLACRIMAL										
32.110	imperforate lower nasolacrimal punctum	0		0		1	0.1%	0		
CORNEA										
70.700	corneal dystrophy	0		0		4	0.5%	11	1.8%	
UVEA										
93.710	persistent pupillary membranes, iris to iris	0		0		45	6.0%	40	6.5%	
93.720	persistent pupillary membranes, iris to lens	0		0		4	0.5%	0		
93.730	persistent pupillary membranes, iris to cornea	0		0		1	0.1%	0		
93.750	persistent pupillary membranes, lens pigment foci/no strands	0		0		10	1.3%	19	3.1%	
LENS										
100.210	cataract, significance unknown	0		0		22	2.9%	37	6.0%	
100.301	punctate cataract, anterior cortex	0		0		3	0.4%	1	0.2%	
100.303	punctate cataract, equatorial cortex	0		0		1	0.1%	0		
100.304	punctate cataract, anterior sutures	0		0		0		1	0.2%	
100.305	punctate cataract, posterior sutures	0		0		6	0.8%	3	0.5%	
100.306	punctate cataract, nucleus	0		0		2	0.3%	0		
100.307	punctate cataract, capsular	0		0		4	0.5%	0		
100.311	incipient cataract, anterior cortex	0		0		1	0.1%	3	0.5%	
100.313	incipient cataract, equatorial cortex	0		0		1	0.1%	1	0.2%	
100.323	incomplete cataract, equatorial cortex	0		0		1	0.1%	0		
100.326	incomplete cataract, nucleus	0		0		1	0.1%	0		
VITREOUS										
110.120	persistant hyaloid artery/remnant	0		0		1	0.1%	3	0.5%	
110.320	vitreous degeneration syneresis	0		0		0		1	0.2%	
RETINA										
120.170	retinal dysplasia, folds	0		0		8	1.1%	6	1.0%	
120.200	retinitis	0		0		0		1	0.2%	
120.960	retinopathy	0		0		1	0.1%	0		
OPTIC NERVE										
130.110	micropapilla	0		0		2	0.3%	1	0.2%	
OTHER										
900.100	other, not inherited	0		0		26	3.4%	20	3.2%	
900.110	other, suspected as inherited	0		0		2	0.3%	1	0.2%	
NORMAL										
0.000	normal globe	0		0		672	89.1%	546	88.1%	

LABRADOR RETRIEVER

	DISORDER	INHERITANCE	REFERENCE	BREEDING ADVICE
A.	Distichiasis	Not defined	1	Breeder option
B.	Ectropion	Not defined	1	Breeder option
C.	Entropion	Not defined	1-3	Breeder option
D.	Corneal dystrophy - epithelial/stromal	Not defined	1	Breeder option
E.	Limbal melanoma	Not defined	4	NO
F.	Uveal cysts	Not defined	5	Breeder option
G.	Persistent pupillary membranes			
	- iris to iris	Not defined	1, 5	Breeder option
	- iris to cornea	Not defined	6	NO
	- iris sheets	Not defined	5	NO
	- all other forms	Not defined	5	NO
H.	Iris melanoma	Presumed autosomal recessive	7	NO
I.	Glaucoma	Not defined	8	NO
J.	Cataract			
	- presumed dominant with incomplete penetrance		1-3, 9-11	NO
	- autosomal recessive		12	NO
	- not defined		13	NO
K.	Persistent hyaloid artery	Not defined	1	Breeder option
L.	Persistent hyperplastic primary vitreous/ persistent hyperplastic tunica vasculosa lentis (PHPV/PHTVL)	Not defined	1	NO
M.	Vitreous degeneration	Not defined	14, 15	Breeder option

OCULAR DISORDERS REPORT LABRADOR RETRIEVER - 2

N.	Retinal atrophy - generalized (<i>prcd</i>) * a DNA test is available	Autosomal recessive	1, 16-24	NO
O.	Central progressive retinal atrophy	Not defined	25, 26	NO
P.	Retinal dysplasia - folds * a DNA test is available	Presumed autosomal Recessive	1, 27-38 DNA test)	NO (Breeder option with "Normal"
Q.	Retinal dysplasia - geographic detached (without skeletal defects)	Presumed autosomal recessive	1, 27-38	NO
R.	Retinal dysplasia - folds/geographic/ detached (with skeletal defects)	Presumed incomplete dominant	1, 27-37, 39	NO

Description and Comments

A. Distichiasis

Eyelashes abnormally located on the eyelid margin which may cause ocular irritation. Distichiasis may occur at any time in the life of a dog. It is difficult to make a strong recommendation with regard to breeding dogs with this entity. The hereditary basis has not been established, although it seems probable due to the high incidence in some breeds. Reducing the incidence is a logical goal. When diagnosed, distichiasis should be recorded; breeding discretion is advised.

B. Ectropion

A conformational defect resulting in eversion of the eyelid(s), which may cause ocular irritation due to exposure. It is likely that ectropion is influenced by several genes (polygenic) defining the skin and other structures which make up the eyelids, the amount and weight of the skin covering the head and face, the orbital contents and the conformation of the skull.

C. Entropion

A conformational defect resulting in an "in-rolling" of one or both of the eyelids which may cause ocular irritation. It is likely that entropion is influenced by several genes (polygenic), defining the skin and other structures which make up the eyelids, the amount and weight of the skin covering the head and face, the orbital contents, and the conformation of the skull. Selection should be directed against entropion and toward a head conformation that reduces or eliminates the likelihood of the defect.

OCULAR DISORDERS REPORT LABRADOR RETRIEVER - 3

D. Corneal dystrophy - epithelial/stromal

A non-inflammatory corneal opacity (white to gray) present in one or more of the corneal layers; usually inherited and bilateral.

E. Limbal melanoma

Most limbal melanomas are really epibulbar melanocytomas, but there is a possibility of an extension of an intraocular melanoma extending outward and presenting as a limbal melanoma. An epibulbar melanocytoma originates from the superficial pigment lining the limbus and the lesion may eventually extend into the eye. Metastasis has not been documented and the mass is characterized by large epithelioid cells. The lesion presents as a subconjunctival smooth mass most commonly in the dorsolateral limbal region and extends later into the cornea and posterior on the sclera. Breed predisposition have been noted in the German Shepherd, Labrador and Golden Retriever.

F. Uveal cysts

Fluid filled sacs arising from the posterior surface of the iris, to which they may remain attached or break free and float into the anterior chamber. Usually occur in mature dogs.

This disorder may be observed in any breed but retriever breeds tend to be predisposed. There is usually no effect on vision unless the cysts are heavily clustered and impinge on the pupillary area. Less frequently, the cysts may rupture and adhere to the cornea or anterior lens capsule. Multiple cysts may occlude the iridocorneal angle and cause glaucoma.

G. Persistent pupillary membranes (PPM)

Persistent blood vessel remnants in the anterior chamber of the eye which fail to regress normally by 3 months of age. These strands may bridge from iris to iris, iris to cornea, iris to lens, or form sheets of tissue in the anterior chamber. The last three forms pose the greatest threat to vision and when severe, vision impairment or blindness may occur.

In the Labrador Retriever, this is a potentially serious problem as many of the ppm's identified on routine screening examinations bridge from the iris to the cornea and/or from iris sheets bridging the pupils. These forms may cause vision impairment.

H. Iris melanoma

A locally invasive cancer of melanocyte (pigment) cell origin within the iris. Occurs with a higher than normal incidence in the Labrador Retriever. Left untreated it will result in secondary glaucoma.

I. Glaucoma

Glaucoma is characterized by an elevation of intraocular pressure which, when sustained even for a brief period of time, causes intraocular damage resulting in

OCULAR DISORDERS REPORT LABRADOR RETRIEVER - 4

blindness. The elevated intraocular pressure occurs because the fluid cannot leave through the iridocorneal angle. Diagnosis and classification of glaucoma requires measurement of IOP (tonometry) and examination of the iridocorneal angle (gonioscopy). Neither of these tests is part of a routine breed eye screening examination.

J. Cataract

A partial or complete opacity of the lens and/or its capsule. In cases where cataracts are complete and affect both eyes, blindness results. The prudent approach is to assume cataracts to be hereditary except in cases known to be associated with trauma, other causes of ocular inflammation, specific metabolic diseases, persistent pupillary membrane, persistent hyaloid or nutritional deficiencies. Cataracts may involve the lens completely (diffuse) or in a localized region.

The most frequently reported cataracts in the breed are bilateral or unilateral, focal, posterior polar (posterior cortical)/subcapsular cataracts usually present between 1-3 years of age. These are generally stationary or very slowly progressive and generally do not interfere with vision. It has been suggested that these cataracts are inherited as dominant with incomplete penetrance, but definitive breeding studies are still required to verify this hypothesis.

A second type of cataract is a progressive cortical cataract which may involve the entire lens. It is not clear whether this is a distinct entity, or an aberrant form of the posterior polar cataract.

K. Persistent hyaloid artery (PHA)

A congenital defect resulting from abnormalities in the development and regression of the hyaloid artery. The blood vessel remnant can be present in the vitreous as a small vascular strand (PHA) or as a non-vascular strand that appears gray-white (**persistent hyaloid remnant**).

L. Persistent hyperplastic primary vitreous (PHPV)/Persistent hyperplastic tunica vasculosa lentis (PHTVL)

A congenital defect resulting from abnormalities in the development and regression of the hyaloid artery (the primary vitreous) and the interaction of this blood vessel with the posterior lens capsule/cortex during embryogenesis. This condition is often associated with **persistent hyperplastic tunica vasculosa lentis (PHTVL)** which results from failure of regression of the embryologic vascular network which surrounds the developing lens.

The majority of affected dogs have a retrolental fibrovascular plaque and variable lenticular defects which include posterior lenticonus/globus, colobomata, intralenticular hemorrhage and/or secondary cataracts. Vision impairment may result.

M. Vitreous degeneration

Liquefaction of the vitreous gel, which may predispose to retinal detachment.

N. Retinal atrophy - generalized (*prcd*)

A degenerative disease of the retinal visual cells which progresses to blindness. This abnormality, also known as progressive retinal atrophy or PRA, may be detected by electroretinogram (not part of a routine eye screening examination) before it is apparent clinically. Except for X-linked PRA in the Siberian Husky, in all breeds studied to date, PRA is inherited as an autosomal recessive trait. A DNA test is available.

In the Labrador Retriever, early fundus abnormalities usually appear after 4 years of age. The electroretinogram (ERG) shows marked functional abnormalities indicative of a progressive rod-cone degeneration. The age for early diagnosis by ERG is after 18 months of age. Studies have shown that PRA in the Labrador Retriever is inherited as autosomal recessive.

O. Central progressive retinal atrophy (CPRA)

A progressive retinal degeneration in which photoreceptor death occurs secondary to disease of the underlying pigment epithelium. Progression is slow and some animals never lose vision. CPRA occurs in England, but is uncommon elsewhere.

The lesions first appear in the posterior pole (central retina), enlarge, coalesce and result in secondary retinal atrophy; progression from the posterior pole to the periphery occurs later. The age of onset varies from young adults to older animals but usually before 5 years of age. Although reported to be dominant with incomplete penetrance, the mode of inheritance of CPRA remains undetermined. The disease has rarely been seen in dogs bred and raised in the U.S. This limited geographic distribution has led some to speculate about a nutritional basis.

P. Retinal dysplasia - folds

Linear, triangular, curved or curvilinear foci of retinal folding that may be single or multiple. When seen in puppies, this condition may partially or completely resolve with maturity. Its significance to vision is unknown. There are two other forms of retinal dysplasia (geographic, detached) which are known to be inherited in other breeds and, in their most severe form, cause blindness.

In the Labrador Retriever, the presence of retinal folds may be seen in the heterozygous state described in "R" below thus the recommendation against breeding.

The breeding advice for Labrador Retrievers and Samoyeds diagnosed with "retinal dysplasia - folds" will be changed from "No" to "Breeder option" if the owner of the dog provides the registering office with results of the DNA test for the affected dog, showing that it is not a carrier of the oculoskeletal dysplasia (OSD) mutation.

Q. Retinal dysplasia without skeletal defects

Abnormal development of the retina present at birth and recognized to have three forms:

- 1) Retinal dysplasia - **folds**: linear, triangular, curved or curvilinear foci of retinal folding that may be single or multiple. (see R.)
- 2) Retinal dysplasia - **geographic**: any irregularly shaped area of abnormal retinal

OCULAR DISORDERS REPORT LABRADOR RETRIEVER - 6

development, representing changes not accountable by simple folding.

- 3) Retinal dysplasia - **detachment**: either of the above described forms of retinal dysplasia associated with separation (detachment) of the retina.

The two latter forms are associated with vision impairment or blindness. Retinal dysplasia is known to be inherited in many breeds. The genetic relationship between the 3 forms of the disease is not known for all breeds.

In Europe, this condition has been documented as an autosomal recessive condition and results in early retinal detachment and blindness. Lens and corneal opacities can also be present, but skeletal abnormalities (see below) are not present. The condition of generalized retinal dysplasia with retinal detachment but without skeletal abnormalities has been reported primarily in Europe, and is rarely if ever seen in the United States.

In the United States, the milder forms of retinal dysplasia (folds/geographic) are seen in Labradors. These may represent the heterozygous form of the condition in which the homozygote also displays skeletal malformations (see "R" below) or it may represent a genetically distinct entity with an undetermined mode of inheritance. It is not possible clinically to make this distinction. Thus, Labradors with any form of retinal dysplasia should not be used for breeding.

R. Retinal dysplasia - folds/geographic/detachment (with skeletal defects)

An inherited defect of the Labrador Retriever which can affect both the eye and the forelimbs. The gene has recessive effects on the skeleton and incompletely dominant effects on the eye. Dogs homozygous recessive for the gene defect have retinal dysplasia (detachment), cataracts and corneal pigmentation, associated with abnormalities of the appendicular skeleton (a form of short-limbed dwarfism). The ocular abnormalities result in blindness in most dogs. Heterozygous dogs have a bilateral/unilateral congenital retinal defect resulting in ophthalmoscopically visible retinal dysplasia (folds and/or geographic lesions) present in the central tapetal region near the major retinal vessels. Vision can be normal to impaired. The condition in the heterozygous dog is stationary although, in rare cases, progressive retinal detachments have developed. The term "incompletely dominant" in regard to the ocular lesions refers to the difference in phenotype between the homozygous and heterozygous state. This condition has been found primarily in field trial lines.

References

1. ACVO Genetics Committee, 1999 and/or Data from CERF All Breeds Report, 1991-1998.
2. Hodgman SFJ. Abnormalities and defects in pedigree dogs: I. An investigation into the existence of abnormalities in pedigree dogs in British Isles. *J Small Anim Pract.* 1963;4:447.
3. Johnston DE and Cox B. The incidence in purebred dogs in Australia of abnormalities that may be inherited. *Aust Vet J.* 1970 Oct;46:465-474.
4. Donaldson D, Sansom J, Scase T, et al. Canine limbal melanoma: 30 cases (1992-

OCULAR DISORDERS REPORT LABRADOR RETRIEVER - 7

- 2004). Part 1. Signalment, clinical and histological features and pedigree analysis. *Vet Ophthalmol.* 2006 Mar-Apr;9:115-119.
5. ACVO Genetics Committee, 2005 and/or Data from CERF All-Breeds Report 2003-2004.
 6. ACVO Genetics Committee, 2007 and/or Data from CERF All-Breeds Report 2002-2006.
 7. Cook CS. Inherited iris melanoma in Labrador Retriever dogs. *Proc Am Coll Vet Ophthalmol.* 1997;27:106.
 8. Strom AR, Hassig M, Iburg TM, et al. Epidemiology of canine glaucoma presented to University of Zurich from 1995 to 2009. Part 1: Congenital and primary glaucoma (4 and 123 cases). *Vet Ophthalmol.* 2011 Mar;14:121-126.
 9. Curtis R and Barnett KC. A survey of cataracts in Golden and Labrador Retrievers. *J Small Anim Pract.* 1989;30:277.
 10. Barnett KC. Hereditary cataract in the dog. *J Small Anim Pract.* 1978 Feb;19:109-120.
 11. Barnett KC. The diagnosis and differential diagnosis of cataract in the dog. *J Small Anim Pract.* 1985;26:305.
 12. Aguirre GD, et al. A Re-Examination of the Mode of Inheritance of Posterior Cortical Cataracts in Labrador Retrievers and Golden Retrievers. *ACVO Proceedings.* 2004.
 13. Kraijer-Huver IM, Gubbels EJ, Scholten J, et al. Characterization and prevalence of cataracts in Labrador Retrievers in The Netherlands. *Am J Vet Res.* 2008 Oct;69:1336-1340.
 14. ACVO Genetics Committee, 2002-2003 and/or Data from CERF All-Breeds Report, 2002-2003.
 15. ACVO Genetics Committee, 2009 and/or Data from CERF All-Breeds Report, 2008.
 16. Barnett KC. Two forms of hereditary and progressive retinal atrophy in the dog. I. The miniature poodle. II. The Labrador Retriever. *J Am Anim Hosp Assoc.* 1965:234.
 17. Goebel HH and Koppang N. Ultrastructural studies on the progressive retinal atrophy of the Labrador dog. *J Neuropathol Exp Neurol.* 1984;43:310.
 18. Aguirre GD and Acland GM. Variation in retinal degeneration phenotype inherited at the prcd locus. *Exp Eye Res.* 1988 May;46:663-687.
 19. Aguirre GD and Acland GM. Progressive retinal atrophy in the Labrador Retriever is a progressive rod-cone degeneration (prcd). *Trans Am Coll Vet Ophthalmol.* 1989;20:150.
 20. Kommonen B and Karhunen U. A late receptor dystrophy in the Labrador Retriever. *Vision Res.* 1990;30:207-213.
 21. Aguirre GD and Acland GM. Inherited retinal degeneration in the Labrador Retriever dog. A new animal model of RP. *Invest Ophthalmol Vis Sci (Supp).* 1991;32.

22. Kommonen B, Penn JS, Kylma T, et al. Early ultrastructural changes in photoreceptor degeneration in Labrador Retrievers. *Proc European Society of Veterinary Ophthalmology*. 1993;26.
23. Kommonen B, Kylma T, Karhunen U, et al. Impaired retinal function in young Labrador Retriever dogs heterozygous for late onset rod-cone degeneration. *Vision Res*. 1997 Feb;37:365-370.
24. Zangerl B, Goldstein O, Philp AR, et al. Identical mutation in a novel retinal gene causes progressive rod-cone degeneration in dogs and retinitis pigmentosa in humans. *Genomics*. 2006 Nov;88:551-563.
25. Aguirre GD and Acland GM. Use and misuse of electroretinography in the diagnosis of inherited retinal diseases in dogs. *Proc Am Coll Vet Ophthalmol*. 1997;27:37.
26. Barnett KC. Central progressive retinal atrophy in the Labrador Retriever. *Vet Ann*. 1969;17:142.
27. Hereditary eye abnormalities in the dog #2. Central progressive retinal atrophy. *The Animal Health Trust, Small Animals Centre*. November. 1977.
28. Barnett KC, et al. Hereditary retinal dysplasia in the Labrador Retriever in England and Sweden. *J Small Anim Pract*. 1970;10:755.
29. Kock E. Retinal dysplasia. Thesis, Stockholm, 1974.
30. Carrig CB, MacMillan A, Brundage S, et al. Retinal dysplasia associated with skeletal abnormalities in Labrador Retrievers. *J Am Vet Med Assoc*. 1977 Jan 1;170:49-57.
31. Carrig CB, Schmidt GM and Tvedten HML. Growth of the radius and ulna in Labrador Retriever dogs with ocular and skeletal dysplasia. *Vet Radiol*. 1990;31:165.
32. Carrig CB, Sponenberg DP, Schmidt GM, et al. Inheritance of associated ocular and skeletal dysplasia in Labrador Retrievers. *J Am Vet Med Assoc*. 1988 Nov 15;193:1269-1272.
33. Tvedten HW. Ocular and osseous dysplasia associated with skeletal abnormalities in Labrador Retrievers. *Proc Am Coll Vet Pathol*. 1980;31:80.
34. Nelson D and MacMilan A. Multifocal retinal dysplasia in the field trial Labrador Retriever. *J Am Anim Hosp Assoc*. 1983;19:388.
35. Blair NP, Dodge JT and Schmidt GM. Rhegmatogenous retinal detachment in Labrador Retrievers. I. Development of retinal tears and detachment. *Arch Ophthalmol*. 1985 Jun;103:842-847.
36. Blair NP, Dodge JT and Schmidt GM. Rhegmatogenous retinal detachment in Labrador Retrievers. II. Proliferative vitreoretinopathy. *Arch Ophthalmol*. 1985 Jun;103:848-854.
37. Gionfriddo JR, Betts DM and Niyo Y. Retinal and skeletal dysplasia in a field trial Labrador puppy. *Canine Pract*. 1992;17:25.

OCULAR DISORDERS REPORT LABRADOR RETRIEVER - 9

38. Acland GM and Aguirre GD. Oculoskeletal dysplasia in the Samoyed and Labrador Retriever dogs: 2 nonallelic disorders akin to Stickler-like syndrome affecting humans. Presented at the 2nd international DOGMAP Meeting, Cambridge, Great Britain. 1995.
39. Goldstein O, Guyon R, Kukekova A, et al. COL9A2 and COL9A3 mutations in canine autosomal recessive oculoskeletal dysplasia. *Mamm Genome*. 2010 Aug;21:398-408.

OCULAR DISORDERS REPORT LABRADOR RETRIEVER

Diagnostic Name	TOTAL DOGS EXAMINED		1991-1999 75917		2000-2009 106986		2010-2013 33881		2014 7747	
	#	%	#	%	#	%	#	%	#	%
GLOBE										
0.110	microphthalmia	36	0.0%	19	0.0%	3	0.0%	0		
10.000	glaucoma	16	0.0%	4	0.0%	7	0.0%	1	0.0%	
EYELIDS										
20.140	ectopic cilia	11	0.0%	5	0.0%	0		0		
20.160	macropalpebral fissure	28	0.0%	43	0.0%	15	0.0%	0		
21.000	entropion, unspecified	361	0.5%	431	0.4%	130	0.4%	28	0.4%	
22.000	ectropion, unspecified	190	0.3%	224	0.2%	47	0.1%	6	0.1%	
25.110	distichiasis	877	1.2%	984	0.9%	309	0.9%	56	0.7%	
NASOLACRIMAL										
32.110	imperforate lower nasolacrimal punctum	5	0.0%	4	0.0%	8	0.0%	3	0.0%	
40.910	keratoconjunctivitis sicca	3	0.0%	0		2	0.0%	0		
NICTITANS										
51.100	third eyelid cartilage anomaly	4	0.0%	3	0.0%	3	0.0%	0		
52.110	prolapsed gland of the third eyelid	11	0.0%	10	0.0%	17	0.1%	1	0.0%	
CORNEA										
70.210	corneal pannus	6	0.0%	2	0.0%	1	0.0%	0		
70.220	pigmentary keratitis	3	0.0%	9	0.0%	2	0.0%	0		
70.700	corneal dystrophy	650	0.9%	1033	1.0%	394	1.2%	93	1.2%	
70.730	corneal endothelial degeneration	45	0.1%	29	0.0%	6	0.0%	0		
UVEA										
90.250	pigmentary uveitis	0		1	0.0%	0		1	0.0%	
93.110	iris hypoplasia	0		0		2	0.0%	4	0.1%	
93.120	iris cyst	68	0.1%	198	0.2%	77	0.2%	5	0.1%	
93.140	corneal endothelial pigment without PPM	0		7	0.0%	5	0.0%	0		
93.150	iris coloboma	2	0.0%	9	0.0%	0		0		
93.170	anterior chamber cyst	0		0		15	0.0%	5	0.1%	
93.710	persistent pupillary membranes, iris to iris	1395	1.8%	3601	3.4%	1283	3.8%	279	3.6%	
93.720	persistent pupillary membranes, iris to lens	53	0.1%	79	0.1%	6	0.0%	5	0.1%	
93.730	persistent pupillary membranes, iris to cornea	57	0.1%	84	0.1%	12	0.0%	0		
93.740	persistent pupillary membranes, iris sheets	65	0.1%	109	0.1%	1	0.0%	0		
93.750	persistent pupillary membranes, lens pigment foci/no strands	0		12	0.0%	154	0.5%	75	1.0%	
93.760	persistent pupillary membranes, endothelial opacity/no strands	0		4	0.0%	24	0.1%	1	0.0%	
93.810	uveal melanoma	0		12	0.0%	21	0.1%	7	0.1%	
95.120	ciliary body cyst	0		0		5	0.0%	4	0.1%	
LENS										
100.200	cataract, unspecified	727	1.0%	0		1	0.0%	0		
100.210	cataract, significance unknown	2569	3.4%	5134	4.8%	1526	4.5%	415	5.4%	
100.301	punctate cataract, anterior cortex	341	0.4%	379	0.4%	187	0.6%	26	0.3%	
100.302	punctate cataract, posterior cortex	527	0.7%	535	0.5%	178	0.5%	35	0.5%	
100.303	punctate cataract, equatorial cortex	62	0.1%	81	0.1%	33	0.1%	3	0.0%	
100.304	punctate cataract, anterior sutures	38	0.1%	52	0.0%	28	0.1%	3	0.0%	
100.305	punctate cataract, posterior sutures	277	0.4%	285	0.3%	126	0.4%	30	0.4%	
100.306	punctate cataract, nucleus	53	0.1%	74	0.1%	48	0.1%	6	0.1%	

OCULAR DISORDERS REPORT LABRADOR RETRIEVER

LENS CONTINUED	1991-1999	2000-2009	2010-2013	2014
100.307 punctate cataract, capsular	12 0.0%	149 0.1%	73 0.2%	27 0.3%
100.311 incipient cataract, anterior cortex	220 0.3%	369 0.3%	80 0.2%	13 0.2%
100.312 incipient cataract, posterior cortex	636 0.8%	896 0.8%	234 0.7%	55 0.7%
100.313 incipient cataract, equatorial cortex	173 0.2%	245 0.2%	60 0.2%	11 0.1%
100.314 incipient cataract, anterior sutures	21 0.0%	33 0.0%	5 0.0%	0
100.315 incipient cataract, posterior sutures	192 0.3%	195 0.2%	43 0.1%	15 0.2%
100.316 incipient cataract, nucleus	96 0.1%	155 0.1%	37 0.1%	6 0.1%
100.317 incipient cataract, capsular	12 0.0%	162 0.2%	38 0.1%	16 0.2%
100.321 incomplete cataract, anterior cortex	0	0	5 0.0%	1 0.0%
100.322 incomplete cataract, posterior cortex	0	0	23 0.1%	12 0.2%
100.323 incomplete cataract, equatorial cortex	0	0	5 0.0%	3 0.0%
100.324 incomplete cataract, anterior sutures	0	0	0	1 0.0%
100.325 incomplete cataract, posterior sutures	0	0	4 0.0%	0
100.326 incomplete cataract, nucleus	0	0	1 0.0%	2 0.0%
100.327 incomplete cataract, capsular	0	0	1 0.0%	0
100.330 generalized/complete cataract	147 0.2%	161 0.2%	30 0.1%	3 0.0%
100.375 subluxation/luxation, unspecified	21 0.0%	22 0.0%	6 0.0%	3 0.0%
VITREOUS				
110.120 persistent hyaloid artery/remnant	242 0.3%	254 0.2%	36 0.1%	15 0.2%
110.130 PHPV/PTVL	0	0	2 0.0%	0
110.135 PHPV/PTVL	42 0.1%	71 0.1%	30 0.1%	2 0.0%
110.200 vitritis	0	0	5 0.0%	4 0.1%
110.320 vitreous degeneration syneresis	296 0.4%	335 0.3%	114 0.3%	38 0.5%
110.330 vitreous degeneration anterior chamber	0	19 0.0%	8 0.0%	0
FUNDUS				
97.110 choroidal hypoplasia	4 0.0%	9 0.0%	1 0.0%	0
97.120 coloboma	6 0.0%	5 0.0%	0	0
RETINA				
120.170 retinal dysplasia, folds	2033 2.7%	2290 2.1%	495 1.5%	107 1.4%
120.180 retinal dysplasia, geographic	814 1.1%	908 0.8%	185 0.5%	49 0.6%
120.190 retinal dysplasia, detached	85 0.1%	86 0.1%	7 0.0%	0
120.200 retinitis	0	0	2 0.0%	15 0.2%
120.310 generalized progressive retinal atrophy (PRA)	490 0.6%	419 0.4%	66 0.2%	4 0.1%
120.400 retinal hemorrhage	18 0.0%	15 0.0%	1 0.0%	0
120.910 retinal detachment without dialysis	47 0.1%	23 0.0%	3 0.0%	0
120.920 retinal detachment with dialysis	0	0	2 0.0%	1 0.0%
120.960 retinopathy	0	0	25 0.1%	0
OPTIC NERVE				
130.110 micropapilla	7 0.0%	58 0.1%	26 0.1%	7 0.1%
130.120 optic nerve hypoplasia	53 0.1%	30 0.0%	2 0.0%	0
130.150 optic disc coloboma	25 0.0%	12 0.0%	4 0.0%	1 0.0%
OTHER				
900.000 other, unspecified	0	496 0.5%	1201 3.5%	0
900.100 other, not inherited	311 0.4%	3961 3.7%	345 1.0%	311 4.0%
900.110 other, suspected as inherited	626 0.8%	283 0.3%	132 0.4%	10 0.1%

OCULAR DISORDERS REPORT LABRADOR RETRIEVER

	1991-1999	2000-2009	2010-2013	2014
NORMAL 0.000 normal globe	64261 84.6%	93663 87.5%	31034 91.6%	6988 90.2%

OCULAR DISORDERS REPORT

LAGOTTO ROMAGNOLO - 1

LAGOTTO ROMAGNOLO

	DISORDER	INHERITANCE	REFERENCE	BREEDING ADVICE
A.	Distichiasis	Not defined	1	Breeder option
B.	Persistent pupillary membranes			
	- iris to iris	Not defined	1,2	Breeder option
	- all other forms	Not defined	2	NO
C.	Cataract	Not defined	1	NO

Description and Comments

A. Distichiasis

Eyelashes abnormally located on the eyelid margin which may cause ocular irritation. Distichiasis may occur at any time in the life of a dog. It is difficult to make a strong recommendation with regard to breeding dogs with this entity. The hereditary basis has not been established, although it seems probable due to the high incidence in some breeds. Reducing the incidence is a logical goal. When diagnosed, distichiasis should be recorded; breeding discretion is advised.

B. Persistent pupillary membranes

Persistent blood vessel remnants in the anterior chamber of the eye which fail to regress normally by 3 months of age. These strands may bridge from iris to iris, iris to cornea, iris to lens, or form sheets of tissue in the anterior chamber. The last three forms pose the greatest threat to vision and when severe, vision impairment or blindness may occur.

C. Cataract

A partial or complete opacity of the lens and/or its capsule. In cases where cataracts are complete and affect both eyes, blindness results. The prudent approach is to assume cataracts to be hereditary except in cases known to be associated with trauma, other causes of ocular inflammation, specific metabolic diseases, persistent pupillary membrane, persistent hyaloid or nutritional deficiencies. Cataracts may involve the lens completely (diffuse) or in a localized region.

OCULAR DISORDERS REPORT

LAGOTTO ROMAGNOLO - 2

References

There are no references providing detailed descriptions of hereditary conditions of the Lagotto Romagnolo breed. The conditions listed above are generally recognized to exist in this breed, as evidenced by identification on breed eye screening examinations and/or clinical experience of veterinary ophthalmologists.

1. ACVO Genetics Committee, 1999 and/or Data from CERF All-Breeds Report, 1991-1998.
2. ACVO Genetics Committee, 2005 and/or Data from CERF All-Breeds Report 2003-2004.

OCULAR DISORDERS REPORT LAGOTTO ROMAGNOLO

Diagnostic Name	TOTAL DOGS EXAMINED	1991-1999		2000-2009		2010-2013		2014	
		#	%	#	%	#	%	#	%
EYELIDS									
25.110	distichiasis	0		3	15.8%	12	7.6%	4	7.8%
NICTITANS									
51.100	third eyelid cartilage anomaly	0		0		1	0.6%	0	
52.110	prolapsed gland of the third eyelid	0		0		1	0.6%	0	
UVEA									
93.710	persistent pupillary membranes, iris to iris	0		0		6	3.8%	4	7.8%
93.750	persistent pupillary membranes, lens pigment foci/no strands	0		0		1	0.6%	0	
LENS									
100.210	cataract, significance unknown	0		0		4	2.5%	1	2.0%
100.301	punctate cataract, anterior cortex	0		1	5.3%	0		0	
100.303	punctate cataract, equatorial cortex	0		0		0		1	2.0%
100.305	punctate cataract, posterior sutures	0		1	5.3%	0		0	
100.313	incipient cataract, equatorial cortex	0		0		1	0.6%	1	2.0%
100.321	incomplete cataract, anterior cortex	0		0		2	1.3%	0	
100.322	incomplete cataract, posterior cortex	0		0		2	1.3%	0	
100.326	incomplete cataract, nucleus	0		0		2	1.3%	0	
RETINA									
120.170	retinal dysplasia, folds	0		0		3	1.9%	0	
OTHER									
900.000	other, unspecified	0		2	10.5%	1	0.6%	0	
900.100	other, not inherited	0		0		1	0.6%	3	5.9%
900.110	other, suspected as inherited	0		0		1	0.6%	0	
NORMAL									
0.000	normal globe	0		16	84.2%	149	94.3%	46	90.2%

OCULAR DISORDERS REPORT

LAKELAND TERRIER - 1

LAKELAND TERRIER

	DISORDER	INHERITANCE	REFERENCE	BREEDING ADVICE
A.	Persistent pupillary membranes			
	- iris to iris	Not defined	1, 2	Breeder option
	- all other forms	Not defined	2	NO

Description and Comments

A. Persistent pupillary membranes (PPM)

Persistent blood vessel remnants in the anterior chamber of the eye which fail to regress normally by 3 months of age. These strands may bridge from iris to iris, iris to cornea, iris to lens, or form sheets of tissue in the anterior chamber. The last three forms pose the greatest threat to vision and when severe, vision impairment or blindness may occur.

References

There are no references providing detailed descriptions of hereditary ocular conditions of the Lakeland Terrier breed. The conditions listed above are generally recognized to exist in this breed, as evidenced by identification on breed eye screening examinations and/or clinical experience of veterinary ophthalmologists.

1. ACVO Genetics Committee, 1999 and/or Data from CERF All-Breeds Report, 1991-1998.
2. ACVO Genetics Committee, 2005 and/or Data from CERF All-Breeds Report 2003-2004.

OCULAR DISORDERS REPORT LAKELAND TERRIER

Diagnostic Name	TOTAL DOGS EXAMINED	1991-1999		2000-2009		2010-2013		2014	
		#	%	#	%	#	%	#	%
EYELIDS									
25.110	distichiasis	4	4.7%	0		4	11.4%	0	
CORNEA									
70.730	corneal endothelial degeneration	2	2.4%	0		0		0	
UVEA									
93.710	persistent pupillary membranes, iris to iris	15	17.6%	12	13.6%	4	11.4%	0	
93.720	persistent pupillary membranes, iris to lens	0		1	1.1%	1	2.9%	0	
93.730	persistent pupillary membranes, iris to cornea	4	4.7%	0		0		0	
93.740	persistent pupillary membranes, iris sheets	1	1.2%	0		0		0	
93.750	persistent pupillary membranes, lens pigment foci/no strands	0		0		5	14.3%	2	11.8%
LENS									
100.210	cataract, significance unknown	2	2.4%	1	1.1%	1	2.9%	0	
100.311	incipient cataract, anterior cortex	2	2.4%	0		0		1	5.9%
100.312	incipient cataract, posterior cortex	1	1.2%	2	2.3%	0		1	5.9%
100.330	generalized/complete cataract	0		1	1.1%	0		2	11.8%
RETINA									
120.180	retinal dysplasia, geographic	0		1	1.1%	0		0	
OTHER									
900.000	other, unspecified	0		0		2	5.7%	0	
900.100	other, not inherited	0		6	6.8%	0		0	
NORMAL									
0.000	normal globe	61	71.8%	74	84.1%	26	74.3%	14	82.4%

OCULAR DISORDERS REPORT

LANCASHIRE HEELER - 1

LANCASHIRE HEELER

	DISORDER	INHERITANCE	REFERENCE	BREEDING ADVICE
A.	Persistent pupillary membrane - iris to iris	Not defined	1	Breeder option
B.	Lens luxation * a DNA test is available	Not defined	2, 3	NO
C.	Choroidal hypoplasia (Collie Eye Anomaly) - staphyloma/coloboma - retinal detachment - retinal hemorrhage - optic nerve coloboma * a DNA test is available	Autosomal recessive	4-6	NO

Description and Comments

A. Persistent pupillary membrane (PPM)

Persistent blood vessel remnants in the anterior chamber of the eye which fail to regress normally by 3 months of age. These strands may bridge from iris to iris, iris to cornea, iris to lens, or from sheets of tissue in the anterior chamber. The last three forms pose the greatest threat to vision and when severe, vision impairment or blindness may occur.

B. Lens luxation

Partial (subluxation) or complete displacement of the lens from the normal anatomic site behind the pupil. Lens luxation not associated with trauma or inflammation is presumed to be inherited. Lens luxation may result in elevated intraocular pressure (glaucoma) causing vision impairment or blindness.

OCULAR DISORDERS REPORT

LANCASHIRE HEELER – 2

- C. Choroidal hypoplasia (Collie Eye Anomaly)
 - staphyloma/coloboma
 - retinal detachment
 - retinal hemorrhage
 - optic nerve coloboma

A spectrum of malformations present at birth and ranging from inadequate development of the choroid (choroidal hypoplasia) to defects of the choroid, retina, or optic nerve (coloboma/staphyloma) to complete retinal detachment (with or without hemorrhage). Mildly affected animals will have no detectable vision deficit. This disorder is collectively referred to as "Collie Eye Anomaly". A DNA test is available.

References

1. ACVO Genetics Committee, 2006 and/or Data from CERF All-Breeds Report, 2001-2005.
2. Sargan DR, Withers D, Pettitt L, et al. Mapping the mutation causing lens luxation in several terrier breeds. *J Hered.* 2007;98:534-538.
3. Farias FH, Johnson GS, Taylor JF, et al. An ADAMTS17 splice donor site mutation in dogs with primary lens luxation. *Invest Ophthalmol Vis Sci.* 2010 Sep;51:4716-4721.
4. Bedford PG. Collie eye anomaly in the Lancashire heeler. *Vet Rec.* 1998 Sep 26;143:354-356.
5. Parker HG, Kukekova AV, Akey DT, et al. Breed relationships facilitate fine-mapping studies: a 7.8-kb deletion cosegregates with Collie eye anomaly across multiple dog breeds. *Genome Res.* 2007 Nov;17:1562-1571.
6. Lowe JK, Kukekova AV, Kirkness EF, et al. Linkage mapping of the primary disease locus for collie eye anomaly. *Genomics.* 2003;82:86-95.

OCULAR DISORDERS REPORT LANCASHIRE HEELER

Diagnostic Name	TOTAL DOGS EXAMINED	1991-1999		2000-2009		2010-2013		2014	
		#	%	#	%	#	%	#	%
EYELIDS									
25.110	distichiasis	0		1	0.8%	0		0	
UVEA									
93.710	persistent pupillary membranes, iris to iris	0		55	42.0%	3	30.0%	0	
93.720	persistent pupillary membranes, iris to lens	0		0		1	10.0%	0	
93.730	persistent pupillary membranes, iris to cornea	0		2	1.5%	0		0	
LENS									
100.210	cataract, significance unknown	0		1	0.8%	0		0	
100.317	incipient cataract, capsular	0		1	0.8%	0		0	
100.375	subluxation/luxation, unspecified	0		0		1	10.0%	0	
VITREOUS									
110.120	persistant hyaloid artery/remnant	0		2	1.5%	0		0	
110.200	vitritis	0		0		1	10.0%	0	
110.320	vitreous degeneration syneresis	0		2	1.5%	0		0	
110.330	vitreous degeneration anterior chamber	0		2	1.5%	0		0	
RETINA									
120.170	retinal dysplasia, folds	0		1	0.8%	0		0	
120.310	generalized progressive retinal atrophy (PRA)	0		1	0.8%	0		0	
NORMAL									
0.000	normal globe	0		85	64.9%	8	80.0%	0	

OCULAR DISORDERS REPORT

LEONBERGER - 1

LEONBERGER

	DISORDER	INHERITANCE	REFERENCE	BREEDING ADVICE
A.	Distichiasis	Not defined	1, 2	Breeder option
B.	Ectropion	Not defined	2	Breeder option
C.	Entropion	Not defined	1-3	Breeder option
D.	Eury/Macroblepharon	Not defined	1, 3	Breeder option
E.	Nictitans cartilage anomaly/eversion	Not defined	4	Breeder option
F.	Ciliary body cysts	Not defined	5	Breeder option
G.	Persistent pupillary membranes			
	- iris to iris	Not defined	2, 3, 6	Breeder option
	- all other forms	Not defined	2	NO
H.	Cataract	Not defined	3, 6	NO

Description and Comments

A. Distichiasis

Eyelashes abnormally located on the eyelid margin which may cause ocular irritation. Distichiasis may occur at any time in the life of a dog. It is difficult to make a strong recommendation with regard to breeding dogs with this entity. The hereditary basis has not been established although it seems probable due to the high incidence in some breeds. Reducing the incidence is a logical goal. When diagnosed, distichiasis should be recorded; breeding discretion is advised.

B. Ectropion

A conformational defect resulting in eversion of the eyelid(s), which may cause ocular irritation due to exposure. It is likely that ectropion is influenced by several genes (polygenic) defining the skin and other structures which make up the eyelids, the amount and weight of the skin covering the head and face, the orbital contents and the conformation of the skull.

OCULAR DISORDERS REPORT

LEONBERGER - 2

C. Entropion

A conformational defect resulting in an "in-rolling" of one or both of the eyelids which may cause ocular irritation. It is likely that entropion is influenced by several genes (polygenic), defining the skin and other structures which make up the eyelids, the amount and weight of the skin covering the head and face, the orbital contents, and the conformation of the skull.

D. Eury/Macroblepharon

Defined as an exceptionally large palpebral fissure, macroblepharon in conjunction with laxity of the lateral canthal structures may lead to lower lid ectropion and upper lid entropion. Either of these conditions may lead to severe ocular irritation.

E. Nictitans cartilage anomaly/eversion

A scroll-like curling of the cartilage of the third eyelid, usually everting the margin. This condition may occur in one or both eyes and may cause mild ocular irritation.

F. Ciliary body cysts

Pigmented cysts arise from pigmented epithelial cells of the ciliary body.

G. Persistent pupillary membranes (PPM)

Persistent blood vessel remnants in the anterior chamber of the eye which fail to regress normally by 3 months of age. These strands may bridge from iris to iris, iris to cornea, iris to lens, or form sheets of tissue in the anterior chamber. The last three forms pose the greatest threat to vision and when severe, vision impairment or blindness may occur.

H. Cataract

A partial or complete opacity of the lens and/or its capsule. In cases where cataracts are complete and affect both eyes, blindness results. The prudent approach is to assume cataracts to be hereditary except in cases known to be associated with trauma, other causes of ocular inflammation, specific metabolic diseases, persistent pupillary membrane, persistent hyaloid or nutritional deficiencies. Cataracts may involve the lens completely (diffuse) or in a localized region.

References

1. ACVO Genetics Committee, 2002-2003 and/or Data from CERF All-Breeds Report, 2002-2003.
2. ACVO Genetics Committee, 2005 and/or Data from CERF All-Breeds Report 2003-2004.
3. Heinrich CL, Lakhani KH, Featherstone HJ, et al. Cataract in the UK Leonberger population. *Vet Ophthalmol.* 2006 Sep-Oct;9:350-356.

OCULAR DISORDERS REPORT

LEONBERGER - 3

4. ACVO Genetics Committee, 2006 and/or Data from CERF All-Breeds Report, 2001-2005.
5. ACVO Genetics Committee, 2008 and/or Data from CERF All-Breeds Report, 2003-2007.
6. ACVO Genetics Committee, 1999 and/or Data from CERF All-Breeds Report, 1991-1998.

OCULAR DISORDERS REPORT LEONBERGER

Diagnostic Name	TOTAL DOGS EXAMINED		1991-1999 285		2000-2009 881		2010-2013 503		2014 117	
	#	%	#	%	#	%	#	%	#	%
EYELIDS										
20.160	macropalpebral fissure	5	1.8%	23	2.6%	7	1.4%	0		
21.000	entropion, unspecified	7	2.5%	29	3.3%	17	3.4%	1	0.9%	
22.000	ectropion, unspecified	2	0.7%	16	1.8%	5	1.0%	2	1.7%	
25.110	distichiasis	5	1.8%	22	2.5%	11	2.2%	5	4.3%	
NASOLACRIMAL										
32.110	imperforate lower nasolacrimal punctum	0		0		0		1	0.9%	
NICTITANS										
51.100	third eyelid cartilage anomaly	1	0.4%	5	0.6%	8	1.6%	5	4.3%	
52.110	prolapsed gland of the third eyelid	0		0		1	0.2%	0		
CORNEA										
70.700	corneal dystrophy	0		3	0.3%	2	0.4%	0		
UVEA										
93.110	iris hypoplasia	0		0		1	0.2%	0		
93.120	iris cyst	1	0.4%	6	0.7%	6	1.2%	2	1.7%	
93.710	persistent pupillary membranes, iris to iris	50	17.5%	187	21.2%	117	23.3%	29	24.8%	
93.720	persistent pupillary membranes, iris to lens	0		1	0.1%	1	0.2%	0		
93.730	persistent pupillary membranes, iris to cornea	0		1	0.1%	0		0		
93.740	persistent pupillary membranes, iris sheets	0		1	0.1%	0		0		
93.750	persistent pupillary membranes, lens pigment foci/no strands	0		0		1	0.2%	3	2.6%	
93.760	persistent pupillary membranes, endothelial opacity/no strands	0		0		1	0.2%	0		
93.810	uveal melanoma	0		1	0.1%	0		0		
LENS										
100.200	cataract, unspecified	2	0.7%	0		0		0		
100.210	cataract, significance unknown	17	6.0%	79	9.0%	29	5.8%	12	10.3%	
100.301	punctate cataract, anterior cortex	4	1.4%	15	1.7%	3	0.6%	1	0.9%	
100.302	punctate cataract, posterior cortex	4	1.4%	11	1.2%	7	1.4%	2	1.7%	
100.303	punctate cataract, equatorial cortex	2	0.7%	1	0.1%	0		0		
100.304	punctate cataract, anterior sutures	2	0.7%	1	0.1%	1	0.2%	0		
100.305	punctate cataract, posterior sutures	1	0.4%	7	0.8%	5	1.0%	0		
100.306	punctate cataract, nucleus	3	1.1%	1	0.1%	2	0.4%	0		
100.307	punctate cataract, capsular	0		3	0.3%	2	0.4%	0		
100.311	incipient cataract, anterior cortex	1	0.4%	6	0.7%	3	0.6%	0		
100.312	incipient cataract, posterior cortex	5	1.8%	16	1.8%	4	0.8%	6	5.1%	
100.313	incipient cataract, equatorial cortex	0		0		1	0.2%	0		
100.314	incipient cataract, anterior sutures	2	0.7%	3	0.3%	0		0		
100.315	incipient cataract, posterior sutures	5	1.8%	2	0.2%	1	0.2%	0		
100.316	incipient cataract, nucleus	7	2.5%	9	1.0%	2	0.4%	0		
100.317	incipient cataract, capsular	0		0		3	0.6%	0		
100.322	incomplete cataract, posterior cortex	0		0		0		1	0.9%	
100.330	generalized/complete cataract	0		3	0.3%	1	0.2%	0		
100.375	subluxation/luxation, unspecified	2	0.7%	0		2	0.4%	0		

OCULAR DISORDERS REPORT LEONBERGER

	1991-1999	2000-2009	2010-2013	2014
VITREOUS				
110.120 persistant hyaloid artery/remnant	1 0.4%	1 0.1%	0	1 0.9%
110.135 PHPV/PTVL	0	0	3 0.6%	1 0.9%
110.320 vitreous degeneration syneresis	1 0.4%	3 0.3%	0	0
110.330 vitreous degeneration anterior chamber	0	2 0.2%	0	0
RETINA				
120.170 retinal dysplasia, folds	1 0.4%	4 0.5%	2 0.4%	0
120.180 retinal dysplasia, geographic	0	1 0.1%	1 0.2%	1 0.9%
120.310 generalized progressive retinal atrophy (PRA)	1 0.4%	4 0.5%	0	0
120.960 retinopathy	0	0	1 0.2%	0
OPTIC NERVE				
130.110 micropapilla	0	1 0.1%	0	0
130.120 optic nerve hypoplasia	1 0.4%	0	1 0.2%	0
130.150 optic disc coloboma	0	1 0.1%	0	0
OTHER				
900.000 other, unspecified	0	7 0.8%	25 5.0%	0
900.100 other, not inherited	5 1.8%	45 5.1%	7 1.4%	5 4.3%
900.110 other, suspected as inherited	3 1.1%	5 0.6%	3 0.6%	0
NORMAL				
0.000 normal globe	171 60.0%	597 67.8%	383 76.1%	82 70.1%

OCULAR DISORDERS REPORT

LHASA APSO - 1

LHASA APSO

	DISORDER	INHERITANCE	REFERENCE	BREEDING ADVICE
A.	Distichiasis	Not defined	1	Breeder option
B.	Ectopic cilia	Not defined	1	Breeder option
C.	Prolapsed gland of third eyelid	Not defined	1, 2	Breeder option
D.	Imperforate lacrimal punctum	Not defined	1	Breeder option
E.	Keratoconjunctivitis sicca (dry eye)	Not defined	1	NO
F.	Exposure keratopathy syndrome/ macroblepharon	Not defined	1	Breeder option
G.	Persistent pupillary membranes			
	- iris to iris	Not defined	1, 3	Breeder option
	- all other forms	Not defined	3	NO
H.	Cataract	Not defined	1, 4	NO

Description and Comments

A. Distichiasis

Eyelashes abnormally located on the eyelid margin which may cause ocular irritation. Distichiasis may occur at any time in the life of a dog. It is difficult to make a strong recommendation with regard to breeding dogs with this entity. The hereditary basis has not been established although it seems probable due to the high incidence in some breeds. Reducing the incidence is a logical goal. When diagnosed, distichiasis should be recorded; breeding discretion is advised.

OCULAR DISORDERS REPORT

LHASA APSO - 2

B. Ectopic cilia

Aberrant hair emerging through the eyelid conjunctiva. Ectopic cilia occur more frequently in younger dogs. They may cause discomfort and corneal disease.

C. Prolapsed gland of the third eyelid

Protrusion of the tear gland associated with the third eyelid. The mode of inheritance of this disorder is unknown. The exposed gland may become irritated. Commonly referred to as "cherry eye".

D. Imperforate lacrimal punctum

A developmental anomaly resulting in failure of opening of the lacrimal duct located at the medial lid margins. The lower punctum is more frequently affected. This defect usually results in epiphora, an overflow of tears onto the face.

E. Keratoconjunctivitis sicca (dry eye)

An abnormality of the tear film, most commonly a deficiency of the aqueous portion, although the mucin and/or lipid layers may be affected; results in ocular irritation and/or vision impairment.

F. Exposure keratopathy syndrome/macrophthalmos

A corneal disease involving all or part of the cornea, resulting from inadequate blinking. This results from a combination of anatomic features including shallow orbits, exophthalmos, a large eyelid opening (macroblepharon), and lagophthalmos.

G. Persistent pupillary membranes (PPM)

Persistent blood vessel remnants in the anterior chamber of the eye which fail to regress normally by 3 months of age. These strands may bridge from iris to iris, iris to cornea, iris to lens, or form sheets of tissue in the anterior chamber. The last three forms pose the greatest threat to vision and when severe, vision impairment or blindness may occur.

H. Cataract

A partial or complete opacity of the lens and/or its capsule. In cases where cataracts are complete and affect both eyes, blindness results. The prudent approach is to assume cataracts to be hereditary except in cases known to be associated with trauma, other causes of ocular inflammation, specific metabolic diseases, persistent pupillary membrane, persistent hyaloid or nutritional deficiencies. Cataracts may involve the lens completely (diffuse) or in a localized region.

OCULAR DISORDERS REPORT

LHASA APSO - 3

References

1. ACVO Genetics Committee, 1999 and/or Data from CERF All Breeds Report, 1991-1998.
2. Morgan RV, Duddy JM and McClurg K. Prolapse of the gland of the third eyelid in the dog: A retrospective study of 89 cases (1980-1990). *J Am Anim Hosp Assoc.* 1993;29:56.
3. ACVO Genetics Committee, 2005 and/or Data from CERF All-Breeds Report 2003-2004.
4. Gelatt KN and Mackay EO. Prevalence of primary breed-related cataracts in the dog in North America. *Vet Ophthalmol.* 2005 Mar-Apr;8:101-111.

OCULAR DISORDERS REPORT LHASA APSO

Diagnostic Name	TOTAL DOGS EXAMINED	1991-1999		2000-2009		2010-2013		2014	
		#	%	#	%	#	%	#	%
GLOBE									
0.110 microphthalmia		1	0.2%	0		0		0	
EYELIDS									
20.160 macropalpebral fissure		2	0.4%	0		1	2.3%	0	
21.000 entropion, unspecified		6	1.3%	4	1.3%	0		0	
25.110 distichiasis		19	4.3%	8	2.7%	3	6.8%	0	
NASOLACRIMAL									
32.110 imperforate lower nasolacrimal punctum		1	0.2%	0		0		0	
40.910 keratoconjunctivitis sicca		2	0.4%	1	0.3%	0		0	
NICTITANS									
51.100 third eyelid cartilage anomaly		1	0.2%	0		0		0	
52.110 prolapsed gland of the third eyelid		1	0.2%	3	1.0%	0		0	
CORNEA									
70.210 corneal pannus		5	1.1%	3	1.0%	0		0	
70.220 pigmentary keratitis		7	1.6%	11	3.7%	0		0	
70.700 corneal dystrophy		6	1.3%	8	2.7%	2	4.5%	0	
UVEA									
93.110 iris hypoplasia		0		1	0.3%	0		0	
93.120 iris cyst		0		1	0.3%	0		0	
93.710 persistent pupillary membranes, iris to iris		6	1.3%	4	1.3%	0		0	
93.730 persistent pupillary membranes, iris to cornea		1	0.2%	0		0		0	
LENS									
100.200 cataract, unspecified		6	1.3%	0		0		0	
100.210 cataract, significance unknown		17	3.8%	8	2.7%	1	2.3%	0	
100.301 punctate cataract, anterior cortex		5	1.1%	1	0.3%	1	2.3%	0	
100.302 punctate cataract, posterior cortex		3	0.7%	1	0.3%	0		0	
100.303 punctate cataract, equatorial cortex		3	0.7%	0		0		0	
100.306 punctate cataract, nucleus		1	0.2%	0		0		0	
100.311 incipient cataract, anterior cortex		4	0.9%	8	2.7%	0		0	
100.312 incipient cataract, posterior cortex		9	2.0%	5	1.7%	0		0	
100.313 incipient cataract, equatorial cortex		1	0.2%	2	0.7%	0		0	
100.314 incipient cataract, anterior sutures		3	0.7%	1	0.3%	0		0	
100.315 incipient cataract, posterior sutures		1	0.2%	1	0.3%	0		0	
100.316 incipient cataract, nucleus		2	0.4%	1	0.3%	0		0	
100.330 generalized/complete cataract		15	3.4%	3	1.0%	0		0	
100.375 subluxation/luxation, unspecified		0		1	0.3%	0		0	
VITREOUS									
110.200 vitritis		0		0		1	2.3%	0	
110.320 vitreous degeneration syneresis		2	0.4%	4	1.3%	0		0	
110.330 vitreous degeneration anterior chamber		0		3	1.0%	0		0	
FUNDUS									
97.110 choroidal hypoplasia		0		1	0.3%	0		0	

OCULAR DISORDERS REPORT LHASA APSO

	1991-1999	2000-2009	2010-2013	2014
RETINA				
120.170 retinal dysplasia, folds	2 0.4%	2 0.7%	0	0
120.180 retinal dysplasia, geographic	1 0.2%	2 0.7%	0	0
120.310 generalized progressive retinal atrophy (PRA)	3 0.7%	4 1.3%	0	0
OPTIC NERVE				
130.110 micropapilla	0	1 0.3%	0	0
130.120 optic nerve hypoplasia	1 0.2%	0	1 2.3%	0
130.150 optic disc coloboma	1 0.2%	0	0	0
OTHER				
900.100 other, not inherited	0	12 4.0%	0	0
900.110 other, suspected as inherited	12 2.7%	7 2.3%	0	0
NORMAL				
0.000 normal globe	340 76.1%	231 77.5%	40 90.9%	3 100.0%

OCULAR DISORDERS REPORT

LOUISIANA CATAHOULA LEOPARD DOG - 1

LOUISIANA CATAHOULA LEOPARD DOG

	DISORDER	INHERITANCE	REFERENCE	BREEDING ADVICE
A.	Persistent pupillary membranes - iris to iris	Not defined	1	Breeder option
B.	Iris coloboma	Not defined	2	NO
C.	Retinal dysplasia - folds	Not defined	2	Breeder option

It is recommended that this breed be examined prior to pharmacological dilation to best facilitate identification of persistent pupillary membranes.

Description and Comments

A. Persistent pupillary membranes (PPM)

Persistent blood vessel remnants in the anterior chamber of the eye which fail to regress normally by 3 months of age. These strands may bridge from iris to iris, iris to cornea, iris to lens, or form sheets of tissue in the anterior chamber. The last three forms pose the greatest threat to vision and when severe, vision impairment or blindness may occur.

B. Iris coloboma

A congenital abnormality in iris development usually characterized by a full-thickness defect in iris tissue, commonly (though not exclusively) located at the 6 o'clock position associated with failure of closure of the optic fissure. A partial-thickness defect in iris tissue should be recorded as iris hypoplasia on the OFA form.

C. Retinal dysplasia - folds

Linear, triangular, curved or curvilinear foci of retinal folding that may be single or multiple. When seen in puppies, this condition may partially or completely resolve with maturity. Its significance to vision is unknown. There are two other forms of retinal dysplasia (geographic, detached) which are known to be inherited in other breeds and, in their most severe form, cause blindness. The genetic relationship between folds and more severe forms of retinal dysplasia is undetermined.

OCULAR DISORDERS REPORT

LOUISIANA CATAHOULA LEOPARD DOG- 2

References

There are no references providing detailed descriptions of hereditary ocular conditions of the Louisiana Catahoula Leopard Dog breed. The conditions listed above are generally recognized to exist in this breed, as evidenced by identification on breed eye screening examinations and/or clinical experience of veterinary ophthalmologists.

1. ACVO Genetics Committee, 2005 and/or Data from CERF All-Breeds Report 2003-2004.
2. ACVO Genetics Committee, 2014 and/or Data from OFA All-Breeds Report 2013-2104.

OCULAR DISORDERS REPORT LOUISIANA CATAHOULA LEOPARD

Diagnostic Name	TOTAL DOGS EXAMINED	1991-1999		2000-2009		2010-2013		2014	
		#	%	#	%	#	%	#	%
GLOBE									
0.110 microphthalmia		2	2.9%	1	0.6%	1	0.9%	0	
EYELIDS									
25.110 distichiasis		0		1	0.6%	2	1.7%	1	3.2%
CORNEA									
70.700 corneal dystrophy		0		1	0.6%	0		0	
UVEA									
93.110 iris hypoplasia		0		0		3	2.6%	0	
93.150 iris coloboma		4	5.9%	2	1.3%	5	4.3%	0	
93.710 persistent pupillary membranes, iris to iris		1	1.5%	7	4.4%	19	16.5%	6	19.4%
93.720 persistent pupillary membranes, iris to lens		0		1	0.6%	0		0	
LENS									
100.200 cataract, unspecified		1	1.5%	0		0		0	
100.210 cataract, significance unknown		0		2	1.3%	3	2.6%	0	
100.302 punctate cataract, posterior cortex		0		1	0.6%	0		0	
100.311 incipient cataract, anterior cortex		1	1.5%	3	1.9%	0		0	
100.312 incipient cataract, posterior cortex		1	1.5%	0		1	0.9%	0	
VITREOUS									
110.120 persistent hyaloid artery/remnant		1	1.5%	0		1	0.9%	0	
110.320 vitreous degeneration syneresis		0		0		4	3.5%	0	
FUNDUS									
97.110 choroidal hypoplasia		0		1	0.6%	0		0	
97.120 coloboma		1	1.5%	1	0.6%	0		0	
RETINA									
120.170 retinal dysplasia, folds		3	4.4%	3	1.9%	5	4.3%	0	
120.910 retinal detachment without dialysis		1	1.5%	0		1	0.9%	0	
OPTIC NERVE									
130.150 optic disc coloboma		0		2	1.3%	0		0	
OTHER									
900.100 other, not inherited		0		3	1.9%	2	1.7%	2	6.5%
900.110 other, suspected as inherited		0		9	5.7%	2	1.7%	0	
NORMAL									
0.000 normal globe		60	88.2%	135	85.4%	97	84.3%	26	83.9%

OCULAR DISORDERS REPORT

LOWCHEN - 1

LOWCHEN

	DISORDER	INHERITANCE	REFERENCE	BREEDING ADVICE
A.	Distichiasis	Not defined	1, 2	Breeder option
B.	Chronic superficial keratitis/pannus	Not defined	2	NO
C.	Persistent pupillary membranes			
	- iris to iris	Not defined	1, 3	Breeder option
	- all other forms	Not defined	3	NO
D.	Cataract	Not defined	1	NO
E.	Vitreous degeneration	Not defined	1,4	Breeder option
F.	Retinal atrophy - generalized	Not defined	1	NO

Description and Comments

A. Distichiasis

Eyelashes abnormally located on the eyelid margin which may cause ocular irritation. Distichiasis may occur at any time in the life of a dog. It is difficult to make a strong recommendation with regard to breeding dogs with this entity. The hereditary basis has not been established although it seems probable due to the high incidence in some breeds. Reducing the incidence is a logical goal. When diagnosed, distichiasis should be recorded; breeding discretion is advised.

B. Chronic superficial keratitis/Pannus

A bilateral disease of the cornea which usually starts as a grayish haze to the ventral or ventrolateral cornea, followed by the formation of a vascularized subepithelial growth that begins to spread toward the central cornea; pigmentation follows the vascularization. If severe, vision impairment occurs. Pannus may be associated with plasma cell infiltration of the nictitans.

OCULAR DISORDERS REPORT

LOWCHEN - 2

C. Persistent pupillary membranes (PPM)

Persistent blood vessel remnants in the anterior chamber of the eye which fail to regress normally by 3 months of age. These strands may bridge from iris to iris, iris to cornea, iris to lens, or form sheets of tissue in the anterior chamber. The last three forms pose the greatest threat to vision and when severe, vision impairment or blindness may occur.

D. Cataract

A partial or complete opacity of the lens and/or its capsule. In cases where cataracts are complete and affect both eyes, blindness results. The prudent approach is to assume cataracts to be hereditary except in cases known to be associated with trauma, other causes of ocular inflammation, specific metabolic diseases, persistent pupillary membrane, persistent hyaloid or nutritional deficiencies. Cataracts may involve the lens completely (diffuse) or in a localized region.

E. Vitreous degeneration

A liquefaction of the vitreous gel which may predispose to retinal detachment and/or glaucoma.

F. Retinal atrophy - generalized

A degenerative disease of the retinal visual cells which progresses to blindness. This abnormality, also known as progressive retinal atrophy or PRA, may be detected by electroretinogram (not part of a routine eye screening examination) before it is apparent clinically. Except for X-linked PRA in the Siberian Husky, in all breeds studied to date, PRA is inherited as an autosomal recessive trait.

References

There are no references providing detailed descriptions of hereditary ocular conditions of the Lowchen breed. The conditions listed above are generally recognized to exist in this breed, as evidenced by identification on breed eye screening examinations and/or clinical experience of veterinary ophthalmologists.

1. ACVO Genetics Committee, 1999 and/or Data from CERF All-Breeds Report, 1991-1998.
2. ACVO Genetics Committee, 2000-2002 and/or Data from CERF All-Breeds Report, 2000-2002.
3. ACVO Genetics Committee, 2005 and/or Data from CERF All-Breeds Report 2003-2004.
4. ACVO Genetics Committee, 2011 and/or Data from CERF All-Breeds Report, 2010.

OCULAR DISORDERS REPORT LOWCHEN

Diagnostic Name	TOTAL DOGS EXAMINED		1991-1999		2000-2009		2010-2013		2014	
	#	%	#	%	#	%	#	%	#	%
EYELIDS										
20.140	ectopic cilia	0		1	0.1%	0		0		0
21.000	entropion, unspecified	0		1	0.1%	0		0		0
25.110	distichiasis	13	2.6%	48	5.4%	10	5.8%	4	6.2%	
CORNEA										
70.210	corneal pannus	0		1	0.1%	0		0		0
70.730	corneal endothelial degeneration	2	0.4%	0		0		0		0
UVEA										
93.120	iris cyst	0		0		1	0.6%	0		0
93.150	iris coloboma	0		1	0.1%	0		0		0
93.710	persistent pupillary membranes, iris to iris	23	4.6%	77	8.6%	17	9.8%	9	14.1%	
93.720	persistent pupillary membranes, iris to lens	1	0.2%	1	0.1%	1	0.6%	0		0
93.730	persistent pupillary membranes, iris to cornea	0		2	0.2%	0		0		0
93.750	persistent pupillary membranes, lens pigment foci/no strands	0		0		3	1.7%	1	1.6%	
93.760	persistent pupillary membranes, endothelial opacity/no strands	0		0		1	0.6%	0		0
LENS										
100.200	cataract, unspecified	21	4.2%	0		0		0		0
100.210	cataract, significance unknown	11	2.2%	32	3.6%	8	4.6%	1	1.6%	
100.301	punctate cataract, anterior cortex	1	0.2%	4	0.4%	2	1.2%	0		0
100.302	punctate cataract, posterior cortex	6	1.2%	5	0.6%	1	0.6%	0		0
100.303	punctate cataract, equatorial cortex	2	0.4%	2	0.2%	0		0		0
100.304	punctate cataract, anterior sutures	0		1	0.1%	0		0		0
100.305	punctate cataract, posterior sutures	2	0.4%	3	0.3%	1	0.6%	0		0
100.306	punctate cataract, nucleus	0		1	0.1%	1	0.6%	0		0
100.307	punctate cataract, capsular	0		1	0.1%	0		0		0
100.311	incipient cataract, anterior cortex	8	1.6%	11	1.2%	1	0.6%	1	1.6%	
100.312	incipient cataract, posterior cortex	9	1.8%	13	1.5%	1	0.6%	0		0
100.313	incipient cataract, equatorial cortex	1	0.2%	3	0.3%	1	0.6%	0		0
100.314	incipient cataract, anterior sutures	1	0.2%	1	0.1%	0		0		0
100.315	incipient cataract, posterior sutures	3	0.6%	1	0.1%	0		0		0
100.316	incipient cataract, nucleus	0		1	0.1%	0		0		0
100.317	incipient cataract, capsular	0		2	0.2%	0		0		0
100.323	incomplete cataract, equatorial cortex	0		0		1	0.6%	0		0
100.330	generalized/complete cataract	9	1.8%	5	0.6%	1	0.6%	0		0
100.375	subluxation/luxation, unspecified	1	0.2%	1	0.1%	0		0		0
VITREOUS										
110.120	persistant hyaloid artery/remnant	3	0.6%	0		0		0		0
110.135	PHPV/PTVL	0		1	0.1%	0		0		0
110.200	vitritis	0		0		0		1	1.6%	
110.320	vitreous degeneration syneresis	15	3.0%	24	2.7%	6	3.5%	2	3.1%	
110.330	vitreous degeneration anterior chamber	0		3	0.3%	0		0		0
FUNDUS										
97.110	choroidal hypoplasia	2	0.4%	0		0		0		0

OCULAR DISORDERS REPORT LOWCHEN

	1991-1999	2000-2009	2010-2013	2014
RETINA				
120.170 retinal dysplasia, folds	1 0.2%	2 0.2%	0	0
120.190 retinal dysplasia, detached	1 0.2%	0	0	0
120.200 retinitis	0	0	0	2 3.1%
120.310 generalized progressive retinal atrophy (PRA)	23 4.6%	13 1.5%	1 0.6%	1 1.6%
120.910 retinal detachment without dialysis	2 0.4%	0	0	0
120.960 retinopathy	0	0	1 0.6%	0
OPTIC NERVE				
130.110 micropapilla	1 0.2%	0	0	0
130.150 optic disc coloboma	1 0.2%	0	0	0
OTHER				
900.000 other, unspecified	0	6 0.7%	7 4.0%	0
900.100 other, not inherited	2 0.4%	35 3.9%	1 0.6%	2 3.1%
900.110 other, suspected as inherited	2 0.4%	0	2 1.2%	0
NORMAL				
0.000 normal globe	384 76.3%	737 82.5%	153 88.4%	55 85.9%

OCULAR DISORDERS REPORT

MALTESE - 1

MALTESE

	DISORDER	INHERITANCE	REFERENCE	BREEDING ADVICE
A.	Entropion	Not defined	1	Breeder option
B.	Distichiasis	Not defined	4	Breeder option
C.	Persistent pupillary membranes - iris to iris	Not defined	2	Breeder option
D.	Cataract	Not defined	1, 3	NO
E.	Retinal atrophy - generalized	Presumed autosomal recessive	1	NO

Description and Comments

A. Entropion

A conformational defect resulting in an "in-rolling" of one or more of the eyelids which may cause ocular irritation. It is likely that entropion is influenced by several genes (polygenic), defining the skin and other structures which make up the eyelids, the amount and weight of the skin covering the head and face, the orbital contents, and the conformation of the skull.

B. Distichiasis

Eyelashes abnormally located on the eyelid margin which may cause ocular irritation. Distichiasis may occur at any time in the life of a dog. It is difficult to make a strong recommendation with regard to breeding dogs with this entity. The hereditary basis has not been established although it seems probable due to the high incidence in some breeds. Reducing the incidence is a logical goal. When diagnosed, distichiasis should be recorded; breeding discretion is advised.

C. Persistent pupillary membranes (PPM)

Persistent blood vessel remnants in the anterior chamber of the eye which fail to regress normally by 3 months of age. These strands may bridge from iris to iris, iris to cornea, iris to lens, or form sheets of tissue in the anterior chamber. The last three forms pose the greatest threat to vision and when severe, vision impairment or blindness may occur.

OCULAR DISORDERS REPORT

MALTESE - 2

D. Cataract

A partial or complete opacity of the lens and/or its capsule. In cases where cataracts are complete and affect both eyes, blindness results. The prudent approach is to assume cataracts to be hereditary except in cases known to be associated with trauma, other causes of ocular inflammation, specific metabolic diseases, persistent pupillary membrane, persistent hyaloid or nutritional deficiencies. Cataracts may involve the lens completely (diffuse) or in a localized region.

E. Retinal atrophy - generalized

A degenerative disease of the retinal visual cells which progresses to blindness. This abnormality, also known as progressive retinal atrophy or PRA, may be detected by electroretinogram (not part of a routine eye screening examination) before it is apparent clinically. Except for X-linked PRA in the Siberian Husky, in all breeds studied to date, PRA is inherited as an autosomal recessive trait.

References

There are no references providing detailed descriptions of hereditary ocular conditions of the Maltese breed. The conditions listed above are generally recognized to exist in this breed, as evidenced by identification on breed eye screening examinations and/or clinical experience of veterinary ophthalmologists.

1. ACVO Genetics Committee, 1999 and/or Data from CERF All-Breeds Report, 1991-1998.
2. ACVO Genetics Committee, 2006 and/or Data from CERF All-Breeds Report, 2001-2005.
3. Gelatt KN and Mackay EO. Prevalence of primary breed-related cataracts in the dog in North America. *Vet Ophthalmol.* 2005 Mar-Apr;8:101-111.
4. ACVO Genetics Committee, 2014, and/or Data from OFA All-Breeds Report, 2013-2104

OCULAR DISORDERS REPORT MALTESE

Diagnostic Name	TOTAL DOGS EXAMINED	1991-1999		2000-2009		2010-2013		2014	
		#	%	#	%	#	%	#	%
GLOBE									
0.110 microphthalmia		0		0		1	1.5%	0	
EYELIDS									
21.000 entropion, unspecified		2	3.3%	2	1.5%	0		0	
25.110 distichiasis		2	3.3%	3	2.2%	4	6.1%	1	12.5%
NASOLACRIMAL									
32.110 imperforate lower nasolacrimal punctum		1	1.7%	0		0		0	
40.910 keratoconjunctivitis sicca		0		1	0.7%	1	1.5%	0	
NICTITANS									
52.110 prolapsed gland of the third eyelid		0		0		2	3.0%	0	
CORNEA									
70.700 corneal dystrophy		0		0		1	1.5%	0	
UVEA									
93.710 persistent pupillary membranes, iris to iris		1	1.7%	10	7.4%	4	6.1%	0	
LENS									
100.210 cataract, significance unknown		0		9	6.6%	4	6.1%	1	12.5%
100.301 punctate cataract, anterior cortex		0		1	0.7%	0		0	
100.302 punctate cataract, posterior cortex		2	3.3%	1	0.7%	0		0	
100.303 punctate cataract, equatorial cortex		0		2	1.5%	0		0	
100.304 punctate cataract, anterior sutures		0		1	0.7%	0		0	
100.305 punctate cataract, posterior sutures		0		1	0.7%	1	1.5%	0	
100.307 punctate cataract, capsular		0		1	0.7%	0		0	
100.311 incipient cataract, anterior cortex		1	1.7%	5	3.7%	0		0	
100.312 incipient cataract, posterior cortex		2	3.3%	6	4.4%	0		0	
100.313 incipient cataract, equatorial cortex		1	1.7%	1	0.7%	0		0	
100.315 incipient cataract, posterior sutures		0		1	0.7%	0		0	
100.316 incipient cataract, nucleus		1	1.7%	1	0.7%	0		0	
100.317 incipient cataract, capsular		0		1	0.7%	0		0	
100.330 generalized/complete cataract		1	1.7%	2	1.5%	0		1	12.5%
VITREOUS									
110.120 persistent hyaloid artery/remnant		1	1.7%	0		0		0	
110.320 vitreous degeneration syneresis		1	1.7%	0		4	6.1%	0	
110.330 vitreous degeneration anterior chamber		0		1	0.7%	0		0	
RETINA									
120.170 retinal dysplasia, folds		0		2	1.5%	0		0	
120.180 retinal dysplasia, geographic		0		1	0.7%	0		1	12.5%
120.310 generalized progressive retinal atrophy (PRA)		3	5.0%	1	0.7%	0		0	
OTHER									
900.000 other, unspecified		0		1	0.7%	7	10.6%	0	
900.100 other, not inherited		0		5	3.7%	0		1	12.5%

OCULAR DISORDERS REPORT MALTESE

	1991-1999	2000-2009	2010-2013	2014
NORMAL 0.000 normal globe	47 78.3%	104 76.5%	52 78.8%	6 75.0%

OCULAR DISORDERS REPORT

MAREMMA SHEEPDOG - 1

MAREMMA SHEEPDOG (Pastore Maremmano-Abruzzese)

	DISORDER	INHERITANCE	REFERENCE	BREEDING ADVICE
A.	Persistent pupillary membranes - iris to iris	Not defined	1	Breeder Option
B.	Cataract	Not defined	1	NO
C.	Retinal atrophy - generalized	Not defined	1	NO
D.	Retinal dysplasia - folds	Not defined	1	Breeder Option

Description and Comments

A. Persistent pupillary membranes (PPM)

Persistent blood vessel remnants in the anterior chamber of the eye which fail to regress normally by 3 months of age. These strands may bridge from iris to iris, iris to cornea, iris to lens, or form sheets of tissue in the anterior chamber. The last three forms pose the greatest threat to vision and when severe, vision impairment or blindness may occur.

B. Cataract

A partial or complete opacity of the lens and/or its capsule. In cases where cataracts are complete and affect both eyes, blindness results. The prudent approach is to assume cataracts to be hereditary except in cases known to be associated with trauma, other causes of ocular inflammation, specific metabolic diseases, persistent pupillary membrane, persistent hyaloid or nutritional deficiencies. Cataracts may involve the lens completely (diffuse) or in a localized region.

C. Retinal atrophy - generalized

A degenerative disease of the retinal visual cells which progresses to blindness. This abnormality, also known as progressive retinal atrophy or PRA, may be detected by electroretinogram (not part of a routine eye screening examination) before it is apparent clinically. Except for X-linked PRA in the Siberian Husky, in all breeds studied to date, PRA is inherited as an autosomal recessive trait.

OCULAR DISORDERS REPORT

MAREMMA SHEEPDOG - 2

D. Retinal dysplasia - folds

Linear, triangular, curved or curvilinear foci of retinal folding that may be single or multiple. When seen in puppies, this condition may partially or completely resolve with maturity. Its significance to vision is unknown. There are two other forms of retinal dysplasia (geographic, detached) which are known to be inherited in other breeds and, in their most severe form, cause blindness. The genetic relationship between folds and more severe forms of retinal dysplasia is undetermined.

References

1. Randini M, editor Ocular disorders assumed to be inherited in the Pastore Maremmano-Abruzzese. *European College of Veterinary Ophthalmologists/ESVO Annual Meeting Proceedings*; 2001.

OCULAR DISORDERS REPORT MAREMMA SHEEPDOG

TOTAL DOGS EXAMINED	1991-1999		2000-2009		2010-2013		2014	
Diagnostic Name	0		3		7		3	
	#	%	#	%	#	%	#	%
UVEA 93.710 persistent pupillary membranes, iris to iris	0		0		2	28.6%	0	
LENS 100.210 cataract, significance unknown	0		2	66.7%	0		0	
VITREOUS 110.320 vitreous degeneration syneresis	0		0		0		1	33.3%
OTHER 900.000 other, unspecified	0		0		1	14.3%	0	
NORMAL 0.000 normal globe	0		1	33.3%	7	100.0%	2	66.7%

OCULAR DISORDERS REPORT

MASTIFF - 1

MASTIFF (ENGLISH)

	DISORDER	INHERITANCE	REFERENCE	BREEDING ADVICE
A.	Entropion	Not defined	2, 3	Breeder option
B.	Ectropion	Not defined	2	Breeder option
C.	Macroblepharon	Not defined	2	Breeder option
D.	Distichiasis	Not defined	1	Breeder option
E.	Corneal dystrophy - epithelial/stromal	Not defined	4	Breeder option
F.	Corneal dystrophy - endothelial	Not defined	5, 6	NO
G.	Uveal cysts	Not defined	7	Breeder option
H.	Persistent pupillary membranes			
	- iris to iris	Not defined	1, 2, 7	Breeder option
	- iris to lens	Not defined	1	NO
	- iris to cornea	Not defined	1	NO
	- all other forms	Not defined	7	NO
I.	Cataract	Not defined	2	NO
J.	Retinal dysplasia - folds	Not defined	2	Breeder option
K.	Retinal atrophy - generalized * a DNA test is available	Dominant	2, 8-11	NO
L.	Multifocal retinopathy - cmr1 * a DNA test is available	Autosomal recessive	12	NO

It is recommended that this breed be examined prior to pharmacological dilation to best facilitate identification of persistent pupillary membranes.

OCULAR DISORDERS REPORT

MASTIFF - 2

Description and Comments

A. Entropion

A conformational defect resulting in an "in-rolling" of one or both of the eyelids which may cause ocular irritation. It is likely that entropion is influenced by several genes (polygenic), defining the skin and other structures which make up the eyelids, the amount and weight of the skin covering the head and face, the orbital contents, and the conformation of the skull. Entropion in the Mastiff is severe and may require multiple surgical corrections.

B. Ectropion

A conformational defect resulting in eversion of the eyelids, which may cause ocular irritation due to exposure. It is likely that ectropion is influenced by several genes (polygenic), defining the skin and other structures which make up the eyelids, the amount and weight of the skin covering the head and face, the orbital contents and the conformation of the skull.

C. Macoblepharon

Defined as an exceptionally large palpebral fissure, macoblepharon in conjunction with laxity of the lateral canthal structures may lead to lower lid ectropion and upper lid entropion. Either of these conditions may lead to severe ocular irritation.

D. Distichiasis

Eyelashes abnormally located on the eyelid margin which may cause ocular irritation. Distichiasis may occur at any time in the life of a dog. It is difficult to make a strong recommendation with regard to breeding dogs with this entity. The hereditary basis has not been established although it seems probable due to the high incidence in some breeds. Reducing the incidence is a logical goal. When diagnosed, distichiasis should be recorded; breeding discretion is advised.

E. Corneal dystrophy - epithelial/stromal

A non-inflammatory corneal opacity (white to gray) present in one or more of the corneal layers. Corneal dystrophy implies a probable inherited basis and is usually bilateral.

F. Corneal dystrophy - endothelial

Corneal endothelial dystrophy is an abnormal loss of the inner lining of the cornea that causes progressive fluid retention (edema). With time the edema results in keratitis and decreased vision. This usually does not occur until the animal is older.

G. Uveal cysts

Fluid filled sacs arising from the posterior surface of the iris, to which they may remain attached or break free and float into the anterior chamber. Usually occur in mature dogs.

OCULAR DISORDERS REPORT

MASTIFF - 3

There is usually no effect on vision unless the cysts are heavily clustered and impinge on the pupillary area. Less frequently, the cysts may rupture and adhere to the cornea or anterior lens capsule. Multiple cysts may occlude the iridocorneal angle and cause glaucoma.

H. Persistent pupillary membranes (PPM)

Persistent blood vessel remnants in the anterior chamber of the eye which fail to regress normally by 3 months of age. These strands may bridge from iris to iris, iris to cornea, iris to lens, or form sheets of tissue in the anterior chamber. The last three forms pose the greatest threat to vision and when severe, vision impairment or blindness may occur.

In the Mastiff, the strands most often bridge from the iris to the cornea and may potentially cause vision impairment. Thus, the strong recommendations against breeding animals with any form of this abnormality.

I. Cataract

A partial or complete opacity of the lens and/or its capsule. In cases where cataracts are complete and affect both eyes, blindness results. The prudent approach is to assume cataracts to be hereditary except in cases known to be associated with trauma, other causes of ocular inflammation, specific metabolic diseases, persistent pupillary membrane, persistent hyaloid or nutritional deficiencies. Cataracts may involve the lens completely (diffuse) or in a localized region.

J. Retinal dysplasia - folds

Linear, triangular, curved or curvilinear foci of retinal folding that may be single or multiple. When seen in puppies, this condition may partially or completely resolve with maturity. Its significance to vision is unknown. There are two other forms of retinal dysplasia (geographic, detached) which are known to be inherited in other breeds and, in their most severe form, cause blindness. The genetic relationship between folds and more severe forms of retinal dysplasia is undetermined.

K. Retinal atrophy - generalized

A degenerative disease of the retinal visual cells which progresses to blindness. This abnormality, also known as progressive retinal atrophy or PRA, may be detected by electroretinogram (not part of a routine eye screening examination) before it is apparent clinically. PRA in the Mastiff is inherited as an autosomal dominant trait. A DNA test is available.

OCULAR DISORDERS REPORT

MASTIFF - 4

L. Multifocal retinopathy

Canine Multi-focal Retinopathy type 1 (cmr1) is characterized by numerous distinct (i.e. multi-focal), roughly circular patches of elevated retina (multifocal bullous retinal detachments). There may be a serous subretinal fluid, or accumulation of subretinal material that produces gray-tan-pink colored lesions. These lesions, looking somewhat like blisters, vary in location and size, although typically they are present in both eyes of the affected dog.

The disease generally develops in young dogs between 11-20 weeks of age and there is minimal progression after 1 year of age. The lesions may flatten, leaving areas of retinal thinning and RPE hypertrophy, hyperplasia, and pigmentation. Discrete areas of tapetal hyper-reflectivity may be seen in areas of previous retinal and RPE detachments. Most dogs exhibit no noticeable problem with vision or electroretinographic abnormalities despite their abnormal appearing retinas.

Canine Multi-focal Retinopathy type 1 is caused by a mutation in the Bestrophin 1 gene (BEST1) and is described to be recessively inherited in the Great Pyrenees, Dogue de Bordeaux, Bullmastiff, and Mastiff. A DNA test is available.

References

1. ACVO Genetics Committee, 2000-2002 and/or Data from CERF All-Breeds Report, 2000-2002.
2. ACVO Genetics Committee, 1999 and/or Data from CERF All-Breeds Report, 1991-1998.
3. ACVO Genetics Committee, 2001 and/or Data from CERF All-Breeds Report, 2001.
4. ACVO Genetics Committee, 2006 and/or Data from CERF All-Breeds Report, 2001-2005.
5. ACVO Genetics Committee, 2007 and/or Data from CERF All-Breeds Report 2002-2006.
6. ACVO Genetics Committee, 2008 and/or Data from CERF All Breeds Report, 2003-2007.
7. ACVO Genetics Committee, 2005 and/or Data from CERF All-Breeds Report 2003-2004.
8. Kijas JW, Cideciyan AV, Aleman TS, et al. Naturally occurring rhodopsin mutation in the dog causes retinal dysfunction and degeneration mimicking human dominant retinitis pigmentosa. *Proc Natl Acad Sci U S A*. 2002 Apr 30;99:6328-6333.
9. Cideciyan AV, Jacobson SG, Aleman TS, et al. In vivo dynamics of retinal injury and repair in the rhodopsin mutant dog model of human retinitis pigmentosa. *Proc Natl Acad Sci U S A*. 2005 Apr 5;102:5233-5238.
10. Kijas JW, Miller BJ, Pearce-Kelling SE, et al. Canine models of ocular disease: outcross breedings define a dominant disorder present in the English Mastiff and Bullmastiff dog breeds. *J Hered*. 2003 Jan-Feb;94:27-30.

OCULAR DISORDERS REPORT

MASTIFF - 5

11. Miyadera K, Acland GM and Aguirre GD. Genetic and phenotypic variations of inherited retinal diseases in dogs: the power of within- and across-breed studies. *Mamm Genome*. 2012 Feb;23:40-61.
12. Guziewicz KE, Zangerl B, Lindauer SJ, et al. Bestrophin gene mutations cause canine multifocal retinopathy: a novel animal model for best disease. *Invest Ophthalmol Vis Sci*. 2007 May;48:1959-1967.

OCULAR DISORDERS REPORT MASTIFF

Diagnostic Name	TOTAL DOGS EXAMINED		1991-1999 3366		2000-2009 4005		2010-2013 1107		2014 232	
	#	%	#	%	#	%	#	%	#	%
GLOBE										
0.110	microphthalmia	9	0.3%	9	0.2%	1	0.1%	0		
10.000	glaucoma	1	0.0%	1	0.0%	0		0		
EYELIDS										
20.160	macropalpebral fissure	110	3.3%	200	5.0%	34	3.1%	0		
21.000	entropion, unspecified	127	3.8%	199	5.0%	47	4.2%	12	5.2%	
22.000	ectropion, unspecified	248	7.4%	288	7.2%	71	6.4%	12	5.2%	
25.110	distichiasis	38	1.1%	40	1.0%	8	0.7%	2	0.9%	
NASOLACRIMAL										
40.910	keratoconjunctivitis sicca	3	0.1%	1	0.0%	0		0		
NICTITANS										
51.100	third eyelid cartilage anomaly	3	0.1%	6	0.1%	1	0.1%	1	0.4%	
52.110	prolapsed gland of the third eyelid	4	0.1%	12	0.3%	2	0.2%	0		
CORNEA										
70.210	corneal pannus	2	0.1%	1	0.0%	0		0		
70.220	pigmentary keratitis	2	0.1%	1	0.0%	0		0		
70.700	corneal dystrophy	14	0.4%	19	0.5%	2	0.2%	2	0.9%	
70.730	corneal endothelial degeneration	17	0.5%	29	0.7%	3	0.3%	2	0.9%	
UVEA										
90.250	pigmentary uveitis	0		0		0		1	0.4%	
93.120	iris cyst	21	0.6%	48	1.2%	14	1.3%	1	0.4%	
93.140	corneal endothelial pigment without PPM	0		7	0.2%	0		0		
93.150	iris coloboma	1	0.0%	2	0.0%	0		0		
93.170	anterior chamber cyst	0		0		3	0.3%	2	0.9%	
93.710	persistent pupillary membranes, iris to iris	75	2.2%	148	3.7%	34	3.1%	15	6.5%	
93.720	persistent pupillary membranes, iris to lens	31	0.9%	21	0.5%	4	0.4%	2	0.9%	
93.730	persistent pupillary membranes, iris to cornea	166	4.9%	223	5.6%	52	4.7%	12	5.2%	
93.740	persistent pupillary membranes, iris sheets	9	0.3%	10	0.2%	0		0		
93.750	persistent pupillary membranes, lens pigment foci/no strands	0		2	0.0%	3	0.3%	1	0.4%	
93.760	persistent pupillary membranes, endothelial opacity/no strands	0		10	0.2%	26	2.3%	5	2.2%	
93.810	uveal melanoma	0		0		2	0.2%	1	0.4%	
95.120	ciliary body cyst	0		0		0		2	0.9%	
LENS										
100.200	cataract, unspecified	19	0.6%	0		0		0		
100.210	cataract, significance unknown	161	4.8%	170	4.2%	50	4.5%	18	7.8%	
100.301	punctate cataract, anterior cortex	27	0.8%	25	0.6%	11	1.0%	1	0.4%	
100.302	punctate cataract, posterior cortex	5	0.1%	3	0.1%	7	0.6%	0		
100.303	punctate cataract, equatorial cortex	4	0.1%	1	0.0%	2	0.2%	0		
100.304	punctate cataract, anterior sutures	4	0.1%	6	0.1%	1	0.1%	0		
100.305	punctate cataract, posterior sutures	0		5	0.1%	7	0.6%	0		
100.306	punctate cataract, nucleus	5	0.1%	5	0.1%	2	0.2%	0		
100.307	punctate cataract, capsular	3	0.1%	10	0.2%	1	0.1%	1	0.4%	
100.311	incipient cataract, anterior cortex	30	0.9%	29	0.7%	9	0.8%	0		
100.312	incipient cataract, posterior cortex	16	0.5%	19	0.5%	6	0.5%	0		

OCULAR DISORDERS REPORT MASTIFF

LENS CONTINUED	1991-1999	2000-2009	2010-2013	2014
100.313 incipient cataract, equatorial cortex	10 0.3%	9 0.2%	1 0.1%	0
100.314 incipient cataract, anterior sutures	2 0.1%	6 0.1%	0	0
100.315 incipient cataract, posterior sutures	3 0.1%	3 0.1%	0	0
100.316 incipient cataract, nucleus	12 0.4%	18 0.4%	6 0.5%	0
100.317 incipient cataract, capsular	0	7 0.2%	3 0.3%	0
100.321 incomplete cataract, anterior cortex	0	0	1 0.1%	0
100.326 incomplete cataract, nucleus	0	0	1 0.1%	0
100.330 generalized/complete cataract	17 0.5%	22 0.5%	1 0.1%	0
100.375 subluxation/luxation, unspecified	4 0.1%	1 0.0%	0	0
VITREOUS				
110.120 persistant hyaloid artery/remnant	7 0.2%	2 0.0%	0	0
110.135 PHPV/PTVL	2 0.1%	3 0.1%	0	0
110.320 vitreous degeneration syneresis	4 0.1%	6 0.1%	0	0
110.330 vitreous degeneration anterior chamber	0	1 0.0%	0	0
FUNDUS				
97.110 choroidal hypoplasia	0	1 0.0%	0	0
RETINA				
120.170 retinal dysplasia, folds	268 8.0%	311 7.8%	55 5.0%	10 4.3%
120.180 retinal dysplasia, geographic	16 0.5%	30 0.7%	2 0.2%	1 0.4%
120.190 retinal dysplasia, detached	3 0.1%	2 0.0%	0	0
120.310 generalized progressive retinal atrophy (PRA)	114 3.4%	37 0.9%	0	0
120.910 retinal detachment without dialysis	1 0.0%	3 0.1%	0	0
120.920 retinal detachment with dialysis	0	0	0	1 0.4%
120.960 retinopathy	0	0	8 0.7%	0
OPTIC NERVE				
130.110 micropapilla	1 0.0%	2 0.0%	1 0.1%	0
130.120 optic nerve hypoplasia	2 0.1%	0	0	0
130.150 optic disc coloboma	2 0.1%	2 0.0%	0	0
OTHER				
900.000 other, unspecified	0	22 0.5%	37 3.3%	0
900.100 other, not inherited	12 0.4%	149 3.7%	9 0.8%	6 2.6%
900.110 other, suspected as inherited	43 1.3%	24 0.6%	7 0.6%	1 0.4%
NORMAL				
0.000 normal globe	2191 65.1%	2776 69.3%	848 76.6%	176 75.9%

OCULAR DISORDERS REPORT

MI-KI - 1

MI-KI

	DISORDER	INHERITANCE	REFERENCE	BREEDING ADVICE
A.	Entropion	Not defined	1	Breeder Option
B.	Distichiasis	Not defined	2	Breeder option
C.	Corneal dystrophy - epithelial/stromal	Not defined	1	Breeder option
D.	Persistent pupillary membranes - iris to iris	Not defined	3	Breeder option
E.	Cataract	Not defined	3	NO
F.	Vitreous degeneration	Not defined	3, 4	Breeder Option
G.	Retinal dysplasia - folds	Not defined	5	Breeder option

Description and Comments

A. Entropion

A conformational defect resulting in an "in-rolling" of one or both of the eyelids which may cause ocular irritation. It is likely that entropion is influenced by several genes (polygenic), defining the skin and other structures which make up the eyelids, the amount and weight of the skin covering the head and face, the orbital contents, and the conformation of the skull.

B. Distichiasis

Eyelashes abnormally located on the eyelid margin which may cause ocular irritation. Distichiasis may occur at any time in the life of a dog. It is difficult to make strong recommendations with regard to breeding dogs with this entity. The hereditary basis has not been established, although it seems probable due to the high incidence in some breeds. Reducing the incidence is a logical goal. When diagnosed, distichiasis should be recorded; breeding discretion is advised.

OCULAR DISORDERS REPORT

MI-KI - 2

C. Corneal dystrophy - epithelial/stromal

A non-inflammatory corneal opacity (white to gray) present in one or more of the corneal layers; usually inherited and bilateral. In these dogs, lesions are circular or semicircular central crystalline deposits in the anterior corneal stroma that appear between 2 and 5 years of age. It may be associated with exophthalmos and lagophthalmos common in these dogs.

D. Persistent pupillary membranes (PPM)

Persistent blood vessel remnants in the anterior chamber of the eye which fail to regress normally by 3 months of age. These strands may bridge from iris to iris, iris to cornea, iris to lens, or form sheets of tissue in the anterior chamber. The last three forms pose the greatest threat to vision and when severe, vision impairment or blindness may occur.

E. Cataract

A partial or complete opacity of the lens and/or its capsule. In cases where cataracts are complete and affect both eyes, blindness results. The prudent approach is to assume cataracts to be hereditary except in cases known to be associated with trauma, other causes of ocular inflammation, specific metabolic diseases, persistent pupillary membrane, persistent hyaloid or nutritional deficiencies. Cataracts may involve the lens completely (diffuse) or in a localized region.

F. Vitreous degeneration

Liquefaction of the vitreous gel which may predispose to retinal detachment.

G. Retinal dysplasia - folds

Linear, triangular, curved or curvilinear foci of retinal folding that may be single or multiple. When seen in puppies, this condition may partially or completely resolve with maturity. Its significance to vision is unknown. There are two other forms of retinal dysplasia (geographic, detached) which are known to be inherited in other breeds and, in their most severe form, cause blindness. The genetic relationship between folds and more severe forms of retinal dysplasia is undetermined.

References

There are no references providing detailed descriptions of hereditary ocular conditions of the Mi-Ki breed. The conditions listed above are generally recognized to exist in this breed, as evidenced by identification on breed eye screening examinations and/or clinical experience of veterinary ophthalmologists.

1. ACVO Genetics Committee, 2008 and/or Data from CERF All-Breeds Report, 2003-2007.

OCULAR DISORDERS REPORT

MI-KI - 3

2. ACVO Genetics Committee, 2006 and/or Data from CERF All-Breeds Report, 2001-2005.
3. ACVO Genetics Committee, 2002-2003 and/or Data from CERF All-Breeds Report, 2002-2003.
4. ACVO Genetics Committee, 2005 and/or Data from CERF All-Breeds Report 2003-2004.
5. ACVO Genetics Committee, 2014 and/or Data from OFA All-Breeds Report 2013-2014.

OCULAR DISORDERS REPORT

MIKI

Diagnostic Name	TOTAL DOGS EXAMINED	1991-1999		2000-2009		2010-2013		2014	
		#	%	#	%	#	%	#	%
EYELIDS									
20.160 macropalpebral fissure		0		2	0.2%	0		0	
21.000 entropion, unspecified		0		9	1.0%	0		0	
25.110 distichiasis		0		118	13.4%	43	13.0%	9	13.4%
NASOLACRIMAL									
40.910 keratoconjunctivitis sicca		0		2	0.2%	2	0.6%	0	
NICTITANS									
52.110 prolapsed gland of the third eyelid		0		1	0.1%	0		0	
CORNEA									
70.210 corneal pannus		0		1	0.1%	0		0	
70.220 pigmentary keratitis		0		2	0.2%	1	0.3%	0	
70.700 corneal dystrophy		0		15	1.7%	8	2.4%	0	
70.730 corneal endothelial degeneration		0		1	0.1%	0		0	
UVEA									
93.710 persistent pupillary membranes, iris to iris		0		98	11.2%	49	14.8%	14	20.9%
93.750 persistent pupillary membranes, lens pigment foci/no strands		0		0		4	1.2%	0	
LENS									
100.200 cataract, unspecified		0		0		1	0.3%	0	
100.210 cataract, significance unknown		0		77	8.8%	21	6.3%	11	16.4%
100.301 punctate cataract, anterior cortex		0		4	0.5%	1	0.3%	0	
100.302 punctate cataract, posterior cortex		0		3	0.3%	1	0.3%	0	
100.305 punctate cataract, posterior sutures		0		11	1.3%	8	2.4%	1	1.5%
100.311 incipient cataract, anterior cortex		0		2	0.2%	1	0.3%	0	
100.312 incipient cataract, posterior cortex		0		2	0.2%	2	0.6%	2	3.0%
100.313 incipient cataract, equatorial cortex		0		8	0.9%	2	0.6%	0	
100.315 incipient cataract, posterior sutures		0		12	1.4%	5	1.5%	3	4.5%
100.330 generalized/complete cataract		0		0		1	0.3%	0	
VITREOUS									
110.120 persistent hyaloid artery/remnant		0		0		1	0.3%	0	
110.135 PHPV/PTVL		0		0		1	0.3%	0	
110.200 vitritis		0		0		0		2	3.0%
110.320 vitreous degeneration syneresis		0		58	6.6%	27	8.2%	7	10.4%
110.330 vitreous degeneration anterior chamber		0		22	2.5%	10	3.0%	0	
FUNDUS									
97.110 choroidal hypoplasia		0		0		1	0.3%	0	
RETINA									
120.170 retinal dysplasia, folds		0		5	0.6%	3	0.9%	1	1.5%
120.180 retinal dysplasia, geographic		0		3	0.3%	2	0.6%	1	1.5%
120.200 retinitis		0		0		0		2	3.0%
120.310 generalized progressive retinal atrophy (PRA)		0		3	0.3%	2	0.6%	0	
120.920 retinal detachment with dialysis		0		0		0		1	1.5%
120.960 retinopathy		0		0		2	0.6%	0	

OCULAR DISORDERS REPORT

MIKI

	1991-1999	2000-2009	2010-2013	2014
OPTIC NERVE				
130.110 micropapilla	0	2 0.2%	0	0
130.120 optic nerve hypoplasia	0	1 0.1%	1 0.3%	0
130.150 optic disc coloboma	0	2 0.2%	0	0
OTHER				
900.000 other, unspecified	0	6 0.7%	18 5.4%	0
900.100 other, not inherited	0	55 6.3%	4 1.2%	10 14.9%
900.110 other, suspected as inherited	0	7 0.8%	0	0
NORMAL				
0.000 normal globe	0	600 68.3%	210 63.4%	29 43.3%

OCULAR DISORDERS REPORT

MINIATURE AMERICAN/AUSTRALIAN SHEPHERD - 1

MINIATURE AMERICAN SHEPHERD (AKC) / MINIATURE AUSTRALIAN SHEPHERD

	DISORDER	INHERITANCE	REFERENCE	BREEDING ADVICE
A.	Microphthalmia with multiple ocular defects	Presumed autosomal recessive with incomplete penetrance	1-6	NO
B.	Distichiasis	Not defined	1, 7	Breeder option
C.	Corneal dystrophy - epithelial/stromal	Not defined	8	Breeder option
D.	Iris coloboma	Not defined	1	NO
E.	Iris hypoplasia	Not defined	9	Breeder option
F.	Persistent pupillary membranes - iris to iris - all other forms	Not defined Not defined	1 1, 8	Breeder option NO
G.	Cataract *a DNA test is available	Suspect autosomal dominant	1, 10, 11	NO
H.	Persistent hyaloid artery	Not defined	8	Breeder option
I.	Retinal atrophy - generalized (<i>prcd</i>) * a DNA test is available	Autosomal recessive	1, 7,8, 9, 18	NO
J.	Cone degeneration - day blindness * a DNA test is available	Autosomal recessive	Optigen test	NO
K.	Multifocal retinopathy - <i>cmr1</i> * a DNA test is available	Autosomal	17	Breeder option

©2014, American College of Veterinary Ophthalmologists

OCULAR DISORDERS REPORT

MINIATURE AMERICAN/AUSTRALIAN SHEPHERD - 2

L.	Retinal dysplasia - folds	Not defined	8	Breeder option
M.	Choroidal hypoplasia, +/- coloboma, +/- retinal detachment *a DNA test is available	Simple recessive	1, 7, 12-15	NO
N.	Coloboma/ staphyloma without microphthalmia	Not defined	1	NO
O.	Micropapilla	Not defined	16	Breeder option

It is recommended that this breed be examined prior to pharmacological dilation to best facilitate identification of iris coloboma.

Description and Comments

A. Microphthalmia with multiple ocular defects

Microphthalmia is a congenital defect characterized by a small eye with associated defects of the cornea, iris (coloboma), anterior chamber, lens (cataract) and/or retina (dysplasia). In the Australian Shepherd, microphthalmia has long been suspected to be associated with merled coat coloration but a definitive genetic relationship has not been established. The eyes of affected homozygous merle (usually white) dogs have extreme forms of this entity and are usually blind at birth. Affected heterozygous merle-coated dogs demonstrate less severe manifestations.

B. Distichiasis

Eyelashes abnormally located on the eyelid margin which may cause ocular irritation. Distichiasis may occur at any time in the life of a dog. It is difficult to make a strong recommendation with regard to breeding dogs with this entity. The hereditary basis has not been established although it seems probable due to the high incidence in some breeds. Reducing the incidence is a logical goal. When diagnosed, distichiasis should be recorded; breeding discretion is advised.

C. Corneal Dystrophy - epithelial/stromal

A non-inflammatory corneal opacity (white to gray) present in one or more of the corneal layers. Corneal dystrophy implies a probable inherited basis and is usually bilateral.

OCULAR DISORDERS REPORT

MINIATURE AMERICAN/AUSTRALIAN SHEPHERD - 3

D. Iris coloboma

A congenital abnormality in iris development usually characterized by a full-thickness defect in iris tissue, commonly (though not exclusively) located at the 6 o'clock position associated with failure of closure of the optic fissure. A partial-thickness defect in iris tissue should be recorded as iris hypoplasia on the OFA form.

E. Iris hypoplasia

A congenital abnormality in iris development usually characterized by a reduced quantity of tissue identified as a partial-thickness defect in iris tissue. Full-thickness iris hypoplasia is rare and should be recorded as an iris coloboma on the OFA form.

F. Persistent pupillary membranes (PPM)

Persistent blood vessel remnants in the anterior chamber of the eye which fail to regress normally by 3 months of age. These strands may bridge from iris to iris, iris to cornea, iris to lens, or form sheets of tissue in the anterior chamber. The last three forms pose the greatest threat to vision and when severe, vision impairment or blindness may occur.

G. Cataract

A partial or complete opacity of the lens and/or its capsule. In cases where cataracts are complete and affect both eyes, blindness results. The prudent approach is to assume cataracts to be hereditary except in cases known to be associated with trauma, other causes of ocular inflammation, specific metabolic diseases, persistent pupillary membrane, persistent hyaloid or nutritional deficiencies. Cataracts may involve the lens completely (diffuse) or in a localized region. The condition is inherited as a co-dominant mutation in the HSF4 gene (HSF4-2). Genetic testing is available. Please refer to Genetic Testing for Canine Ocular Disorders Section.

H. Persistent hyaloid artery (PHA)

Congenital defect resulting from abnormalities in the development and regression of the hyaloid artery. The blood vessel remnant can be present in the vitreous as a small patent vascular strand (PHA) or as a non-vascular strand that appears gray-white (persistent hyaloid remnant).

I. Retinal atrophy - generalized (PRA)

A degenerative disease of the retinal visual cells which progresses to blindness. This abnormality may be detected by electroretinogram before it is apparent clinically. In

OCULAR DISORDERS REPORT

MINIATURE AMERICAN/AUSTRALIAN SHEPHERD - 4
most breeds studied to date, PRA is recessively inherited. The disease in the Australian Shepherd has not been characterized sufficiently to establish the disease frequency, the disease mechanism, or the age when early diagnosis by ophthalmoscopy and/or electroretinography is possible. A DNA test is available.

J. Cone degeneration - day blindness or hemeralopia

Autosomal recessively inherited early degeneration of the cone photoreceptors. Affected puppies develop day-blindness, colorblindness, and photophobia between 8 and 12 weeks of age. Affected dogs remain ophthalmoscopically normal their entire life. Electroretinography is required to definitively diagnose the disorder. A DNA test is available.

K. Multifocal retinopathy

Canine Multi-focal Retinopathy type 1 (cmr1) is characterized by numerous distinct (i.e. multi-focal), roughly circular patches of elevated retina (multifocal bullous retinal detachments). There may be a serous subretinal fluid, or accumulation of subretinal material that produces gray-tan-pink colored lesions. These lesions, looking somewhat like blisters, vary in location and size, although typically they are present in both eyes of the affected dog.

The disease generally develops in young dogs between 11-20 weeks of age and there is minimal progression after 1 year of age. The lesions may flatten, leaving areas of retinal thinning and RPE hypertrophy, hyperplasia, and pigmentation. Discrete areas of tapetal hyper-reflectivity may be seen in areas of previous retinal and RPE detachments. Most dogs exhibit no noticeable problem with vision or electroretinographic abnormalities despite their abnormal appearing retinas.

Canine Multi-focal Retinopathy type 1 is caused by a mutation in the Bestrophin 1 gene (BEST1) and is described to be recessively inherited in the Great Pyrenees, Dogue de Bordeaux, Bullmastiff, and Mastiff. A DNA test is available.

L. Retinal dysplasia - folds

Linear, triangular, curved or curvilinear foci of retinal folding that may be single or multiple. When seen in puppies, this condition may partially or completely resolve with maturity. Its significance to vision is unknown. There are two other forms of retinal dysplasia (geographic, detached) which are known to be inherited in other breeds and, in their most severe form, cause blindness. The genetic relationship between folds and more severe forms of retinal dysplasia is undetermined.

OCULAR DISORDERS REPORT

MINIATURE AMERICAN/AUSTRALIAN SHEPHERD - 5

M. Choroidal hypoplasia (with or without coloboma and retinal detachment)

A congenital defect in which the choroid develops incompletely. The clinical appearance is similar to the same condition reported in Collies and Shetland Sheepdogs.

This disorder is collectively referred to as "Collie Eye Anomaly". Although there is a lack of scientific evidence, it is believed that the incidence and severity of this entity in Collies was decreased by breeding only "mildly affected" animals. At this time, the Genetics Committee of the ACVO recommends against breeding dogs with any form of the Collie Eye anomaly.

N. Coloboma/staphyloma (unassociated with microphthalmia)

A coloboma is a congenital defect which may affect the iris, choroid or optic disc. Iris colobomas are seen as notches in the pupillary margin. Scleral ectasia is defined as a congenital thinning and secondary distention of the sclera; when lined by uveal tissue it is called a staphyloma. These may be anteriorly located, apparent as a bulge beneath the upper eyelid or posteriorly located, requiring visualization with an ophthalmoscope. These conditions may or may not be genetically related to the same anomalies seen associated with microphthalmia (entity "A" above).

O. Micropapilla

Micropapilla refers to a small optic disc which is not associated with vision impairment. Optic nerve hypoplasia refers to a congenital defect of the optic nerve which causes blindness and abnormal pupil response in the affected eye. It may be difficult to differentiate between micropapilla and optic nerve hypoplasia on a routine (dilated) screening ophthalmoscopic exam.

References

1. ACVO Genetics Committee, 1999 and/or Data from CERF All-Breeds Report, 1991-1998.
2. Gelatt KN, McGill LD. Clinical characteristics of microphthalmia with colobomas of the Australian shepherd dog. *J Am Vet Med Assoc.* 1971; 162.
3. Gelatt KN, Veith LA. Hereditary multiple ocular anomalies in Australian shepherd dogs. *Vet Med Small Anim Clin.* 1970; 65.
4. Cook CS, Burling K, Nelson EJ. Embryogenesis of posterior segment colobomas in the Australian shepherd dog. *Prog in Vet Comp Ophthalmol.* 1991; 1.

OCULAR DISORDERS REPORT

MINIATURE AMERICAN/AUSTRALIAN SHEPHERD - 6

5. Bertram T, Coignoul F, Cheville N. Ocular dysgenesis in Australian shepherd dogs. *J Am Anim Hosp Assoc.* 1984; 20: 177.
6. Gelatt KN, Powell NG. Inheritance of microphthalmia with coloboma. *Am J Vet Res.* 1981; 1.
7. ACVO Genetics Committee, 2008 and/or Data from CERF All-Breeds Report, 2003-2007.
8. ACVO Genetics Committee, 2005 and/or Data from CERF All-Breeds Report 2003-2004.
9. ACVO Genetics Committee, 2011 and/or Data from CERF All-Breeds Report, 2010.
10. Mellersh CS, Pettitt L, Forman OP, et al. Identification of mutations in HSF4 in dogs of three different breeds with hereditary cataracts. *Vet Ophthalmol.* 2006; 9: 369-378.
11. Mellersh CS, McLaughlin B, Ahonen S, et al. Mutation in HSF4 is associated with hereditary cataract in the Australian Shepherd. *Vet Ophthalmol.* 2009; 12: 372-378.
12. Rubin LF, Nelson EJ, Sharp CA. Collie eye anomaly in Australian shepherd dogs. *Prog in Vet Comp Ophthalmol.* 1991; 1.
13. Lowe JK, Kukekova AV, Kirkness EF, et al. Linkage mapping of the primary disease locus for collie eye anomaly. *Genomics.* 2003; 82: 86-95.
14. Parker HG, Kukekova AV, Akey DT, et al. Breed relationships facilitate fine-mapping studies: a 7.8-kb deletion cosegregates with Collie eye anomaly across multiple dog breeds. *Genome Res.* 2007; 17: 1562-1571.
15. Munyard KA, Sherry CR, Sherry L. A retrospective evaluation of congenital ocular defects in Australian Shepherd dogs in Australia. *Vet Ophthalmol.* 2007; 10: 19-22.
16. ACVO Genetics Committee, 2007 and/or Data from CERF All-Breeds Report 2002-2006.
17. Hoffman I, Guziewicz KE, Zangler B, et al. Canine multifocal retinopathy in the Australian Shepherd: a case report. *Vet Ophthalmol.* 2012; 15: 134-138.
18. ACVO Genetics Committee, 2014 and/or Data from OFA/CERF All-Breeds Report 2013.

OCULAR DISORDERS REPORT

MINIATURE AUSTRALIAN SHEPHERD

Diagnostic Name	TOTAL DOGS EXAMINED		1991-1999		2000-2009		2010-2013		2014	
	#	%	#	%	#	%	#	%	#	%
GLOBE										
0.110 microphthalmia	1	0.1%	15	0.2%	1	0.0%	0			
EYELIDS										
25.110 distichiasis	41	4.8%	384	5.1%	146	4.3%	32	3.7%		
NASOLACRIMAL										
40.910 keratoconjunctivitis sicca	0		0		1	0.0%	0			
NICTITANS										
51.100 third eyelid cartilage anomaly	0		0		1	0.0%	0			
CORNEA										
70.220 pigmentary keratitis	0		1	0.0%	1	0.0%	0			
70.700 corneal dystrophy	2	0.2%	44	0.6%	18	0.5%	12	1.4%		
70.730 corneal endothelial degeneration	0		5	0.1%	0		0			
UVEA										
93.110 iris hypoplasia	0		19	0.3%	19	0.6%	8	0.9%		
93.150 iris coloboma	9	1.1%	174	2.3%	36	1.1%	12	1.4%		
93.710 persistent pupillary membranes, iris to iris	24	2.8%	651	8.6%	333	9.8%	82	9.4%		
93.720 persistent pupillary membranes, iris to lens	2	0.2%	9	0.1%	5	0.1%	2	0.2%		
93.730 persistent pupillary membranes, iris to cornea	0		4	0.1%	3	0.1%	0			
93.740 persistent pupillary membranes, iris sheets	2	0.2%	7	0.1%	0		0			
93.750 persistent pupillary membranes, lens pigment foci/no strands	0		0		1	0.0%	0			
93.760 persistent pupillary membranes, endothelial opacity/no strands	0		0		2	0.1%	0			
97.150 chorioretinal coloboma, congenital	0		0		0		3	0.3%		
LENS										
100.210 cataract, significance unknown	11	1.3%	82	1.1%	37	1.1%	9	1.0%		
100.301 punctate cataract, anterior cortex	4	0.5%	7	0.1%	8	0.2%	0			
100.302 punctate cataract, posterior cortex	1	0.1%	2	0.0%	4	0.1%	0			
100.303 punctate cataract, equatorial cortex	1	0.1%	4	0.1%	1	0.0%	0			
100.304 punctate cataract, anterior sutures	0		3	0.0%	0		0			
100.305 punctate cataract, posterior sutures	3	0.4%	4	0.1%	0		1	0.1%		
100.306 punctate cataract, nucleus	0		4	0.1%	0		0			
100.307 punctate cataract, capsular	1	0.1%	4	0.1%	2	0.1%	0			
100.311 incipient cataract, anterior cortex	3	0.4%	13	0.2%	3	0.1%	1	0.1%		
100.312 incipient cataract, posterior cortex	0		19	0.3%	5	0.1%	0			
100.313 incipient cataract, equatorial cortex	0		6	0.1%	1	0.0%	0			
100.315 incipient cataract, posterior sutures	0		1	0.0%	0		0			
100.316 incipient cataract, nucleus	0		2	0.0%	2	0.1%	0			
100.317 incipient cataract, capsular	0		4	0.1%	1	0.0%	1	0.1%		
100.322 incomplete cataract, posterior cortex	0		0		1	0.0%	0			
100.327 incomplete cataract, capsular	0		0		1	0.0%	0			
100.330 generalized/complete cataract	0		4	0.1%	0		0			
100.375 subluxation/luxation, unspecified	0		1	0.0%	0		0			

OCULAR DISORDERS REPORT MINIATURE AUSTRALIAN SHEPHERD

	1991-1999	2000-2009	2010-2013	2014
VITREOUS				
110.120 persistant hyaloid artery/remnant	3 0.4%	19 0.3%	5 0.1%	3 0.3%
110.135 PHPV/PTVL	0	6 0.1%	7 0.2%	0
110.200 vitritis	0	0	1 0.0%	1 0.1%
110.320 vitreous degeneration syneresis	2 0.2%	35 0.5%	21 0.6%	2 0.2%
110.330 vitreous degeneration anterior chamber	0	5 0.1%	3 0.1%	0
FUNDUS				
97.110 choroidal hypoplasia	3 0.4%	12 0.2%	2 0.1%	4 0.5%
97.120 coloboma	2 0.2%	5 0.1%	2 0.1%	0
RETINA				
120.170 retinal dysplasia, folds	1 0.1%	26 0.3%	12 0.4%	4 0.5%
120.180 retinal dysplasia, geographic	0	1 0.0%	0	0
120.190 retinal dysplasia, detached	0	0	1 0.0%	0
120.200 retinitis	0	0	0	2 0.2%
120.310 generalized progressive retinal atrophy (PRA)	5 0.6%	16 0.2%	7 0.2%	0
120.910 retinal detachment without dialysis	0	1 0.0%	0	0
OPTIC NERVE				
130.110 micropapilla	0	28 0.4%	24 0.7%	4 0.5%
130.120 optic nerve hypoplasia	2 0.2%	12 0.2%	3 0.1%	0
130.150 optic disc coloboma	6 0.7%	7 0.1%	5 0.1%	0
OTHER				
900.000 other, unspecified	0	30 0.4%	99 2.9%	0
900.100 other, not inherited	3 0.4%	175 2.3%	26 0.8%	20 2.3%
900.110 other, suspected as inherited	3 0.4%	7 0.1%	4 0.1%	1 0.1%
NORMAL				
0.000 normal globe	753 88.0%	6533 86.7%	2988 87.9%	761 87.3%

OCULAR DISORDERS REPORT

MINIATURE BULL TERRIER - 1

MINIATURE BULL TERRIER

	DISORDER	INHERITANCE	REFERENCE	BREEDING ADVICE
A.	Corneal dystrophy - endothelial	Not defined	1	Breeder option
B.	Persistent pupillary membranes			
	- iris to iris	Not defined	2, 3	Breeder option
	- iris to lens	Not defined	4	NO
	- iris to cornea	Not defined	4	NO
	- endothelial opacity/ no strands	Not defined	4	NO
	- all other forms	Not defined	3	NO
C.	Cataract	Not defined	3	NO
D.	Lens luxation * a DNA test is available	Not defined	2, 5-7	NO
E.	Vitreous degeneration	Not defined	1, 3, 4	Breeder option
F.	Retinal atrophy - generalized	Not defined	4	NO

Description and Comments

A. Corneal dystrophy - endothelial

Corneal endothelial dystrophy is an abnormal loss of the inner lining of the cornea that causes progressive fluid retention (edema). With time the edema results in keratitis and decreased vision. This usually does not occur until the animal is older.

B. Persistent pupillary membranes (PPM)

Persistent blood vessel remnants in the anterior chamber of the eye which fail to regress normally by 3 months of age. These strands may bridge from iris to iris, iris to cornea, iris to lens, or form sheets of tissue in the anterior chamber. The last three forms pose the greatest threat to vision and when severe, vision impairment or blindness may occur.

Although the total number of Miniature Bull Terriers presented for OFA/CERF examination is not large, the incidence of PPM in this breed is approximately 10% in recent years. Some of

OCULAR DISORDERS REPORT

MINIATURE BULL TERRIER - 2

these PPM's have been iris to cornea and iris to lens. Considerable discretion should be used before breeding a dog with the latter more severe forms of PPM.

C. Cataract

A partial or complete opacity of the lens and/or its capsule. In cases where cataracts are complete and affect both eyes, blindness results. The prudent approach is to assume cataracts to be hereditary except in cases known to be associated with trauma, other causes of ocular inflammation, specific metabolic diseases, persistent pupillary membrane, persistent hyaloid or nutritional deficiencies. Cataracts may involve the lens completely (diffuse) or in a localized region.

D. Lens luxation

Partial (subluxation) or complete displacement of the lens from the normal anatomic site behind the pupil. Lens luxation not associated with trauma or inflammation is presumed to be inherited. Lens luxation may result in elevated intraocular pressure (glaucoma) causing vision impairment or blindness. A DNA test is available.

E. Vitreous degeneration

Liquefaction of the vitreous gel which may predispose to retinal detachment.

F. Retinal atrophy - generalized

A degenerative disease of the retinal visual cells which progresses to blindness. This abnormality, also known as progressive retinal atrophy or PRA, may be detected by electroretinogram (not part of a routine eye screening examination) before it is apparent clinically. Except for X-linked PRA in the Siberian Husky, in all breeds studied to date, PRA is inherited as an autosomal recessive trait.

References

1. ACVO Genetics Committee, 2002-2003 and/or Data from CERF All-Breeds Report, 2002-2003.
2. ACVO Genetics Committee, 1999 and/or Data from CERF All-Breeds Report, 1991-1998.
3. ACVO Genetics Committee, 2005 and/or Data from CERF All-Breeds Report 2003-2004.
4. ACVO Genetics Committee, 2009 and/or Data from CERF All-Breeds Report, 2008.
5. Curtis R, Barnett KC and Startup FG. Primary lens luxation in the miniature bull terrier. *Vet Rec.* 1983 Apr 2;112:328-330.
6. Sargan DR, Withers D, Pettitt L, et al. Mapping the mutation causing lens luxation in several

OCULAR DISORDERS REPORT

MINIATURE BULL TERRIER - 3

terrier breeds. *J Hered.* 2007;98:534-538.

7. Farias FH, Johnson GS, Taylor JF, et al. An ADAMTS17 splice donor site mutation in dogs with primary lens luxation. *Invest Ophthalmol Vis Sci.* 2010 Sep;51:4716-4721.

OCULAR DISORDERS REPORT MINIATURE BULL TERRIER

Diagnostic Name	TOTAL DOGS EXAMINED	1991-1999		2000-2009		2010-2013		2014	
		#	%	#	%	#	%	#	%
GLOBE									
0.110	microphthalmia	2	0.5%	1	0.1%	0		0	
10.000	glaucoma	1	0.2%	0		0		0	
EYELIDS									
22.000	ectropion, unspecified	0		1	0.1%	0		0	
NASOLACRIMAL									
40.910	keratoconjunctivitis sicca	0		4	0.6%	1	1.1%	0	
CORNEA									
70.700	corneal dystrophy	1	0.2%	1	0.1%	0		1	5.9%
70.730	corneal endothelial degeneration	7	1.6%	6	0.9%	0		0	
UVEA									
93.140	corneal endothelial pigment without PPM	0		4	0.6%	0		0	
93.710	persistent pupillary membranes, iris to iris	41	9.5%	34	5.0%	4	4.3%	1	5.9%
93.720	persistent pupillary membranes, iris to lens	22	5.1%	27	4.0%	3	3.3%	0	
93.730	persistent pupillary membranes, iris to cornea	36	8.3%	45	6.7%	0		0	
93.740	persistent pupillary membranes, iris sheets	6	1.4%	2	0.3%	0		0	
93.750	persistent pupillary membranes, lens pigment foci/no strands	0		3	0.4%	1	1.1%	1	5.9%
93.760	persistent pupillary membranes, endothelial opacity/no strands	0		7	1.0%	4	4.3%	1	5.9%
LENS									
100.200	cataract, unspecified	2	0.5%	0		0		0	
100.210	cataract, significance unknown	16	3.7%	28	4.1%	3	3.3%	3	17.6%
100.301	punctate cataract, anterior cortex	7	1.6%	3	0.4%	2	2.2%	0	
100.302	punctate cataract, posterior cortex	0		1	0.1%	0		0	
100.305	punctate cataract, posterior sutures	0		1	0.1%	0		0	
100.307	punctate cataract, capsular	0		4	0.6%	0		0	
100.311	incipient cataract, anterior cortex	7	1.6%	6	0.9%	1	1.1%	1	5.9%
100.312	incipient cataract, posterior cortex	1	0.2%	3	0.4%	1	1.1%	0	
100.313	incipient cataract, equatorial cortex	0		1	0.1%	0		0	
100.314	incipient cataract, anterior sutures	0		1	0.1%	0		0	
100.317	incipient cataract, capsular	0		10	1.5%	2	2.2%	0	
100.330	generalized/complete cataract	1	0.2%	3	0.4%	0		0	
100.375	subluxation/luxation, unspecified	24	5.6%	25	3.7%	1	1.1%	1	5.9%
VITREOUS									
110.120	persistant hyaloid artery/remnant	0		1	0.1%	0		0	
110.320	vitreous degeneration syneresis	3	0.7%	14	2.1%	1	1.1%	0	
110.330	vitreous degeneration anterior chamber	0		2	0.3%	2	2.2%	0	
RETINA									
120.170	retinal dysplasia, folds	0		3	0.4%	0		0	
120.180	retinal dysplasia, geographic	0		1	0.1%	0		0	
120.310	generalized progressive retinal atrophy (PRA)	3	0.7%	10	1.5%	0		0	

OCULAR DISORDERS REPORT MINIATURE BULL TERRIER

	1991-1999	2000-2009	2010-2013	2014
OPTIC NERVE				
130.110 micropapilla	2 0.5%	9 1.3%	1 1.1%	0
130.120 optic nerve hypoplasia	2 0.5%	1 0.1%	0	0
130.150 optic disc coloboma	0	1 0.1%	0	0
OTHER				
900.000 other, unspecified	0	7 1.0%	2 2.2%	0
900.100 other, not inherited	1 0.2%	31 4.6%	1 1.1%	1 5.9%
900.110 other, suspected as inherited	13 3.0%	5 0.7%	1 1.1%	0
NORMAL				
0.000 normal globe	302 69.9%	513 75.9%	79 85.9%	15 88.2%

OCULAR DISORDERS REPORT

MINIATURE PINSCHER - 1

MINIATURE PINSCHER

	DISORDER	INHERITANCE	REFERENCE	BREEDING ADVICE
A.	Corneal dystrophy - epithelial/stromal	Not defined	1	Breeder option
B.	Persistent pupillary membranes - iris to iris - all other forms	Not defined Not defined	2, 3 3	Breeder option NO
C.	Cataract	Not defined	1	NO
D.	Vitreous degeneration	Not defined	4	Breeder option
E.	Retinal atrophy - generalized	Presumed autosomal recessive	2	NO
F.	Optic nerve hypoplasia	Not defined	2	NO
G.	Micropapilla	Not defined	2	Breeder option

Description and Comments

A. Corneal dystrophy - epithelial/stromal

A non-inflammatory corneal opacity (white to gray) present in one or more of the corneal layers. Corneal dystrophy implies a probable inherited basis and is usually bilateral.

B. Persistent pupillary membranes (PPM)

Persistent blood vessel remnants in the anterior chamber of the eye which fail to regress normally by 3 months of age. These strands may bridge from iris to iris, iris to cornea, iris to lens, or form sheets of tissue in the anterior chamber. The last three forms pose the greatest threat to vision and when severe, vision impairment or blindness may occur.

C. Cataract

A partial or complete opacity of the lens and/or its capsule. In cases where cataracts are

OCULAR DISORDERS REPORT

MINIATURE PINSCHER - 2

complete and affect both eyes, blindness results. The prudent approach is to assume cataracts to be hereditary except in cases known to be associated with trauma, other causes of ocular inflammation, specific metabolic diseases, persistent pupillary membrane, persistent hyaloid or nutritional deficiencies. Cataracts may involve the lens completely (diffuse) or in a localized region.

D. Vitreous degeneration

A liquefaction of the vitreous gel which may predispose to retinal detachment.

E. Retinal atrophy - generalized

A degenerative disease of the retinal visual cells which progresses to blindness. This abnormality, also known as Progressive Retinal Atrophy or PRA, may be detected by electroretinogram (not part of a routine eye screening examination) before it is apparent clinically. Except for X-linked PRA in the Siberian Husky, in all breeds studied to date, PRA is inherited as an autosomal recessive trait.

F. Optic nerve hypoplasia

A congenital defect of the optic nerve which causes blindness and abnormal pupil response in the affected eye. May be unable to differentiate from micropapilla on a routine (dilated) screening ophthalmoscopic exam.

G. Micropapilla

Hypoplasia of the optic nerve is seen in the Miniature Pinscher. In this condition, the optic nerve fails to develop completely. The signs have a variety of expression and degrees of hypoplasia can be found. One or both eyes may be affected. Affected eyes may retain some function or be blind. The mode of inheritance is not clear.

References

There are no references providing detailed descriptions of hereditary ocular conditions of the Miniature Pinscher. The conditions listed above are generally recognized to exist in this breed, as evidenced by identification on breed eye screening examinations and/or clinical experience of veterinary ophthalmologists.

1. ACVO Genetics Committee, 1999 and/or Data from CERF All-Breeds Report, 1991-1998.
2. ACVO Genetics Committee, 2000-2002 and/or Data from CERF All-Breeds Report, 2000-2002.
3. ACVO Genetics Committee, 2005 and/or Data from CERF All-Breeds Report 2003-2004.
4. ACVO Genetics Committee, 2009 and/or Data from CERF All-Breeds Report, 2008.

OCULAR DISORDERS REPORT MINIATURE PINSCHER

Diagnostic Name	TOTAL DOGS EXAMINED		1991-1999		2000-2009		2010-2013		2014	
	#	%	#	%	#	%	#	%	#	%
GLOBE										
0.110 microphthalmia	2	0.8%	1	0.3%	0		0		0	
EYELIDS										
20.140 ectopic cilia	0		0		0		0		1	4.3%
21.000 entropion, unspecified	2	0.8%	0		0		0		0	
22.000 ectropion, unspecified	1	0.4%	0		0		0		0	
25.110 distichiasis	3	1.2%	2	0.6%	0		0		0	
NICTITANS										
52.110 prolapsed gland of the third eyelid	0		0		2	2.4%	0		0	
CORNEA										
70.210 corneal pannus	1	0.4%	1	0.3%	0		0		0	
70.220 pigmentary keratitis	0		2	0.6%	0		0		0	
70.700 corneal dystrophy	20	7.9%	19	5.4%	1	1.2%	0		0	
70.730 corneal endothelial degeneration	1	0.4%	0		0		0		0	
UVEA										
93.140 corneal endothelial pigment without PPM	0		1	0.3%	0		0		0	
93.710 persistent pupillary membranes, iris to iris	7	2.8%	17	4.8%	1	1.2%	0		0	
93.720 persistent pupillary membranes, iris to lens	0		0		1	1.2%	0		0	
93.740 persistent pupillary membranes, iris sheets	0		0		1	1.2%	0		0	
93.750 persistent pupillary membranes, lens pigment foci/no strands	0		0		2	2.4%	2	2.4%	2	8.7%
93.760 persistent pupillary membranes, endothelial opacity/no strands	0		1	0.3%	0		0		0	
LENS										
100.210 cataract, significance unknown	7	2.8%	19	5.4%	1	1.2%	0		0	
100.301 punctate cataract, anterior cortex	3	1.2%	2	0.6%	1	1.2%	0		0	
100.302 punctate cataract, posterior cortex	0		4	1.1%	2	2.4%	0		0	
100.304 punctate cataract, anterior sutures	1	0.4%	0		0		0		0	
100.305 punctate cataract, posterior sutures	2	0.8%	1	0.3%	0		0		0	
100.307 punctate cataract, capsular	0		1	0.3%	0		0		0	
100.311 incipient cataract, anterior cortex	5	2.0%	4	1.1%	6	7.2%	1	4.3%	0	
100.312 incipient cataract, posterior cortex	3	1.2%	4	1.1%	2	2.4%	0		0	
100.313 incipient cataract, equatorial cortex	3	1.2%	0		0		0		0	
100.315 incipient cataract, posterior sutures	1	0.4%	0		0		0		0	
100.317 incipient cataract, capsular	0		1	0.3%	0		0		0	
100.321 incomplete cataract, anterior cortex	0		0		1	1.2%	0		0	
100.322 incomplete cataract, posterior cortex	0		0		1	1.2%	0		0	
100.330 generalized/complete cataract	6	2.4%	1	0.3%	0		0		0	
100.375 subluxation/luxation, unspecified	2	0.8%	0		1	1.2%	0		0	
VITREOUS										
110.120 persistent hyaloid artery/remnant	2	0.8%	2	0.6%	0		0		0	
110.135 PHPV/PTVL	2	0.8%	0		0		0		0	
110.200 vitritis	0		0		1	1.2%	0		0	
110.320 vitreous degeneration syneresis	8	3.2%	21	6.0%	3	3.6%	1	4.3%	0	
110.330 vitreous degeneration anterior chamber	0		7	2.0%	0		0		0	

OCULAR DISORDERS REPORT MINIATURE PINSCHER

	1991-1999	2000-2009	2010-2013	2014
FUNDUS				
97.120 coloboma	1 0.4%	0	0	0
RETINA				
120.170 retinal dysplasia, folds	2 0.8%	0	0	0
120.310 generalized progressive retinal atrophy (PRA)	8 3.2%	4 1.1%	0	0
120.910 retinal detachment without dialysis	0	3 0.9%	0	0
OPTIC NERVE				
130.120 optic nerve hypoplasia	5 2.0%	4 1.1%	0	0
OTHER				
900.000 other, unspecified	0	4 1.1%	8 9.6%	0
900.100 other, not inherited	1 0.4%	25 7.1%	0	1 4.3%
900.110 other, suspected as inherited	5 2.0%	2 0.6%	0	0
NORMAL				
0.000 normal globe	183 72.3%	269 76.4%	69 83.1%	19 82.6%

OCULAR DISORDERS REPORT

MINIATURE SCHNAUZER - 1

MINIATURE SCHNAUZER

	DISORDER	INHERITANCE	REFERENCE	BREEDING ADVICE
A.	Microphthalmia with congenital cataract	Presumed autosomal recessive	1-4	NO
B.	Distichiasis	Not defined	5	Breeder option
C.	Corneal dystrophy - epithelial/stromal	Not defined	20	Breeder option
D.	Keratoconjunctivitis sicca (dry eye)	Not defined	1, 6	NO
E.	Persistent pupillary membranes - iris to iris	Not defined	5	Breeder option
F.	Cataract	Presumed autosomal recessive	1, 7-13	NO
G.	Vitreous degeneration	Not defined	20	Breeder option
H.	Retinal atrophy- Photoreceptor dysplasia (<i>pd</i>) * a DNA test is available	Presumed autosomal recessive	1, 14	NO
I.	Retinal atrophy - low amplitude electroretinogram	Not defined	15	NO
J.	Ceroid lipofuscinosis	Presumed autosomal recessive	16, 17	NO
K.	Retinal dysplasia all forms with or without persistent hyperplastic primary vitreous	Autosomal recessive	18, 19	NO

OCULAR DISORDERS REPORT

MINIATURE SCHNAUZER - 2

Description and Comments

A. Microphthalmia with congenital cataract

Congenital nuclear and posterior cortical lens opacities that progress slowly. In some cases, these cataracts appear similar to the congenital cataracts described in "E" below. An associated abnormality in this defect is microphthalmia that is often mild and is accompanied by a 1-3 mm reduction in the axial length of the globe as determined by ultrasonography. Congenital cataracts and microphthalmia are inherited as an autosomal recessive disorder.

B. Distichiasis

Eyelashes abnormally located on the eyelid margin which may cause ocular irritation. Distichiasis may occur at any time in the life of a dog. It is difficult to make a strong recommendation with regard to breeding dogs with this entity. The hereditary basis has not been established although it seems probable due to the high incidence in some breeds. Reducing the incidence is a logical goal. When diagnosed, distichiasis should be recorded; breeding discretion is advised.

C. Corneal dystrophy - epithelial/stromal

A non-inflammatory corneal opacity (white to gray) present in one or more of the corneal layers; usually inherited and bilateral.

D. Keratoconjunctivitis sicca (KCS)/dry eye

An abnormality of the tear film, most commonly a deficiency of the aqueous portion, although the mucin and/or lipid layers may be affected; results in ocular irritation and/or vision impairment.

E. Persistent pupillary membranes (PPM)

Persistent blood vessel remnants in the anterior chamber of the eye which fail to regress normally by 3 months of age. These strands may bridge from iris to iris, iris to cornea, iris to lens, or form sheets of tissue in the anterior chamber. The last three forms pose the greatest threat to vision and when severe, vision impairment or blindness may occur.

F. Cataract

A partial or complete opacity of the lens and/or its capsule. In cases where cataracts are complete and affect both eyes, blindness results. The prudent approach is to assume cataracts to be hereditary except in cases known to be associated with trauma, other causes of ocular inflammation, specific metabolic diseases, persistent pupillary membrane, persistent hyaloid or nutritional deficiencies. Cataracts may involve the lens completely (diffuse) or in a localized region.

Congenital cataracts in the Miniature Schnauzer are bilateral and appear prior to 6 weeks

OCULAR DISORDERS REPORT

MINIATURE SCHNAUZER - 3

of age. At this time they may already involve the entire lens. Others will first appear as posterior subcapsular opacities and usually progress to complete cataracts. These congenital cataracts are inherited as an autosomal recessive trait. Later-onset cataracts may represent a genetically distinct entity. There are other types of cataract in the breed which are also likely hereditary.

Note: It is not certain whether A and E are genetically distinct, or different manifestations of the same entity, as eyes affected with cataracts are often smaller than normal.

G. Vitreous degeneration

Liquefaction of the vitreous gel which may predispose to retinal detachment.

H. Retinal atrophy - photoreceptor dysplasia (*pd*)

A form of PRA in the Miniature Schnauzer characterized as an autosomal recessive genetic disorder. The name "photoreceptor dysplasia" refers specifically to this disease. The dysplasia results from the abnormal development of visual cells followed by their slow degeneration. The disorder appears to affect the generation of an electrical signal within the retinal photoreceptor cells. Although fundus abnormalities usually are not present until 3-5 years of age, abnormalities of the electroretinogram can be demonstrated by 8-10 weeks of age. Clinical signs include mildly impaired night vision and variable rate of progression. A DNA test is available.

I. Retinal atrophy - low amplitude electroretinogram ("low amplitude ERG")

This is a slowly progressive functional defect of the electroretinogram (ERG) that is characterized by a normal waveform but a lower than normal amplitude. "Low amplitude" has been detected as early as 16 weeks of age. When first detected, vision is normal and the retina is ophthalmoscopically normal. The significance of "low amplitude" is uncertain. Unpublished work (Parshall CJ and Aguirre G) suggests that animals having this functional deficit may develop PRA at a later age (10-13 years).

J. Ceroid lipofuscinosis

An inherited disease of man and animals characterized by the accumulation of lipopigment in various tissues of the body including the eye. It results in progressive neurologic disease including blindness. (Also called Batten's disease)

K. Retinal dysplasia all forms with or without persistent hyperplastic primary vitreous

Abnormal development of the retina present at birth usually recognized to have three forms, folds, geographic and retinal detachment as described below. In the Miniature Schnauzer Retinal dysplasia is also associated with persistent hyperplastic primary vitreous

- 1) Retinal dysplasia - folds: linear, triangular, curved or curvilinear foci of retinal folding that may be single or multiple.
- 2) Retinal dysplasia - geographic: any irregularly shaped area of abnormal retinal

©2014, American College of Veterinary Ophthalmologists

OCULAR DISORDERS REPORT

MINIATURE SCHNAUZER - 4

- development, representing changes not accountable by simple folding.
- 3) Retinal dysplasia - detachment: either of the above described forms of retinal dysplasia associated with separation (detachment) of the retina.
 - 4) Retinal dysplasia with persistent hyperplastic primary vitreous

The three latter forms are associated with vision impairment or blindness in the Miniature Schnauzer.

References

1. ACVO Genetics Committee, 1999 and/or Data from CERF All-Breeds Report, 1991-1998.
2. Gelatt KN, Samuelson DA, Barrie KP, et al. Biometry and clinical characteristics of congenital cataracts and microphthalmia in the Miniature Schnauzer. *J Am Vet Med Assoc.* 1983 Jul 1;183:99-102.
3. Gelatt KN, Samuelson DA, Bauer JE, et al. Inheritance of congenital cataracts and microphthalmia in the Miniature Schnauzer. *Am J Vet Res.* 1983 Jun;44:1130-1132.
4. Shastry BS and Reddy VN. Studies on congenital hereditary cataract and microphthalmia of the miniature schnauzer dog. *Biochemical and biophysical research communications.* 1994 Sep 30;203:1663-1667.
5. ACVO Genetics Committee, 2002-2003 and/or Data from CERF All-Breeds Report, 2002-2003.
6. Aguirre GD, Rubin LF and Harvey CE. Keratoconjunctivitis sicca in dogs. *J Am Vet Med Assoc.* 1971 May 1;158:1566-1579.
7. Barnett KC. Hereditary cataract in the dog. *J Small Anim Pract.* 1978 Feb;19:109-120.
8. Barnett KC. The diagnosis and differential diagnosis of cataract in the dog. *J Small Anim Pract.* 1985;26:305.
9. Rubin LF, Koch SA and Huber RJ. Hereditary cataracts in miniature schnauzers. *J Am Vet Med Assoc.* 1969 Jun 1;154:1456-1458.
10. Donovan R. Congenital cataracts in the miniature schnauzer. *Trans Am Coll Vet Ophthalmol.* 1971;2:36.
11. Samuelson DA. Prenatal morphogenesis of the congenital cataracts in the miniature schnauzer. *Lens Res.* 1987;4:231.
12. Barnett KC. Hereditary cataracts in the miniature schnauzer. *J Small Anim Pract.* 1985;26:635.
13. Monaco MA, Samuelson DA and Gelatt KN. Morphology and postnatal development of the normal lens in the dog and congenital cataract in the miniature schnauzer. *Lens Res.*

OCULAR DISORDERS REPORT

MINIATURE SCHNAUZER - 5

1985;2:393.

14. Aguirre G. Progressive retinal atrophy in the miniature schnauzer. *Trans Am Coll Vet Ophthalmol.* 1985;16:226.
15. Parshall C, Wyman M and Nitroy S. Photoreceptor dysplasia: An inherited progressive retinal atrophy of miniature schnauzer dogs. *Prog Vet Comp Ophthalmol.* 1991;1:187.
16. Jolly RD, Palmer DN and Studdert VP. Canine ceroid-lipofuscinoses: A review and classification. *J Small Anim Pract.* 1994;35:299.
17. Smith RIE, Sutton RH and Jolly RD. A retinal degeneration associated with ceroid-lipofuscinosis in adult miniature schauzer. *Vet Comp Ophthalmol.* 1996;6:187.
18. Grahn BH, Storey ES and McMillan C. Inherited retinal dysplasia and persistent hyperplastic primary vitreous in Miniature Schnauzer dogs. *Vet Ophthalmol.* 2004 May-Jun;7:151-158.
19. Grahn BH, Storey ES and McMillan C, editors. Inherited retinal dysplasia in miniature schnauzer dogs. *ACVO Proceedings*; 2003.
20. ACVO Genetics Committee, 2014 and/or Data from OFA All-Breeds Report, 2013-2014.

OCULAR DISORDERS REPORT

MINIATURE SCHNAUZER

Diagnostic Name	TOTAL DOGS EXAMINED	1991-1999		2000-2009		2010-2013		2014	
		#	%	#	%	#	%	#	%
GLOBE									
0.110 microphthalmia		9	0.1%	9	0.1%	2	0.0%	2	0.2%
EYELIDS									
21.000 entropion, unspecified		3	0.0%	0		1	0.0%	0	
25.110 distichiasis		154	1.9%	310	2.2%	92	2.1%	21	1.9%
NASOLACRIMAL									
40.910 keratoconjunctivitis sicca		0		2	0.0%	2	0.0%	2	0.2%
NICTITANS									
51.100 third eyelid cartilage anomaly		1	0.0%	0		0		0	
52.110 prolapsed gland of the third eyelid		1	0.0%	0		3	0.1%	0	
CORNEA									
70.210 corneal pannus		2	0.0%	0		0		0	
70.220 pigmentary keratitis		2	0.0%	5	0.0%	0		0	
70.700 corneal dystrophy		47	0.6%	66	0.5%	25	0.6%	8	0.7%
70.730 corneal endothelial degeneration		4	0.0%	10	0.1%	2	0.0%	1	0.1%
UVEA									
90.250 pigmentary uveitis		0		1	0.0%	1	0.0%	0	
93.120 iris cyst		0		1	0.0%	0		0	
93.140 corneal endothelial pigment without PPM		0		6	0.0%	4	0.1%	0	
93.710 persistent pupillary membranes, iris to iris		55	0.7%	306	2.2%	66	1.5%	19	1.8%
93.720 persistent pupillary membranes, iris to lens		11	0.1%	32	0.2%	4	0.1%	1	0.1%
93.730 persistent pupillary membranes, iris to cornea		19	0.2%	44	0.3%	14	0.3%	1	0.1%
93.740 persistent pupillary membranes, iris sheets		2	0.0%	10	0.1%	0		0	
93.750 persistent pupillary membranes, lens pigment foci/no strands		0		7	0.0%	42	1.0%	13	1.2%
93.760 persistent pupillary membranes, endothelial opacity/no strands		0		2	0.0%	10	0.2%	0	
LENS									
100.200 cataract, unspecified		61	0.8%	0		0		0	
100.210 cataract, significance unknown		129	1.6%	298	2.1%	103	2.4%	32	3.0%
100.301 punctate cataract, anterior cortex		39	0.5%	36	0.3%	13	0.3%	2	0.2%
100.302 punctate cataract, posterior cortex		16	0.2%	19	0.1%	6	0.1%	3	0.3%
100.303 punctate cataract, equatorial cortex		11	0.1%	10	0.1%	5	0.1%	1	0.1%
100.304 punctate cataract, anterior sutures		6	0.1%	8	0.1%	1	0.0%	0	
100.305 punctate cataract, posterior sutures		11	0.1%	25	0.2%	17	0.4%	1	0.1%
100.306 punctate cataract, nucleus		5	0.1%	4	0.0%	3	0.1%	1	0.1%
100.307 punctate cataract, capsular		0		12	0.1%	8	0.2%	5	0.5%
100.311 incipient cataract, anterior cortex		35	0.4%	38	0.3%	18	0.4%	3	0.3%
100.312 incipient cataract, posterior cortex		36	0.4%	70	0.5%	21	0.5%	6	0.6%
100.313 incipient cataract, equatorial cortex		16	0.2%	30	0.2%	4	0.1%	2	0.2%
100.314 incipient cataract, anterior sutures		2	0.0%	5	0.0%	1	0.0%	0	
100.315 incipient cataract, posterior sutures		10	0.1%	12	0.1%	11	0.3%	2	0.2%
100.316 incipient cataract, nucleus		8	0.1%	8	0.1%	2	0.0%	3	0.3%
100.317 incipient cataract, capsular		0		13	0.1%	6	0.1%	1	0.1%
100.321 incomplete cataract, anterior cortex		0		0		1	0.0%	4	0.4%
100.322 incomplete cataract, posterior cortex		0		0		1	0.0%	5	0.5%

OCULAR DISORDERS REPORT MINIATURE SCHNAUZER

LENS CONTINUED	1991-1999	2000-2009	2010-2013	2014
100.326 incomplete cataract, nucleus	0	0	5 0.1%	5 0.5%
100.330 generalized/complete cataract	52 0.6%	71 0.5%	22 0.5%	2 0.2%
100.375 subluxation/luxation, unspecified	3 0.0%	4 0.0%	0	0
VITREOUS				
110.120 persistent hyaloid artery/remnant	9 0.1%	21 0.1%	4 0.1%	1 0.1%
110.135 PHPV/PTVL	2 0.0%	16 0.1%	3 0.1%	1 0.1%
110.200 vitritis	0	0	4 0.1%	1 0.1%
110.320 vitreous degeneration syneresis	35 0.4%	76 0.5%	17 0.4%	2 0.2%
110.330 vitreous degeneration anterior chamber	0	25 0.2%	7 0.2%	0
FUNDUS				
97.110 choroidal hypoplasia	0	1 0.0%	0	3 0.3%
97.120 coloboma	0	1 0.0%	0	0
RETINA				
120.170 retinal dysplasia, folds	10 0.1%	48 0.3%	8 0.2%	2 0.2%
120.180 retinal dysplasia, geographic	3 0.0%	41 0.3%	5 0.1%	0
120.190 retinal dysplasia, detached	0	29 0.2%	1 0.0%	1 0.1%
120.200 retinitis	0	0	0	1 0.1%
120.310 generalized progressive retinal atrophy (PRA)	89 1.1%	50 0.4%	8 0.2%	1 0.1%
120.400 retinal hemorrhage	2 0.0%	3 0.0%	1 0.0%	0
120.910 retinal detachment without dialysis	6 0.1%	7 0.0%	1 0.0%	0
120.920 retinal detachment with dialysis	0	0	0	1 0.1%
120.960 retinopathy	0	0	1 0.0%	0
OPTIC NERVE				
130.110 micropapilla	0	38 0.3%	4 0.1%	1 0.1%
130.120 optic nerve hypoplasia	8 0.1%	5 0.0%	1 0.0%	0
130.150 optic disc coloboma	0	1 0.0%	0	0
OTHER				
900.000 other, unspecified	0	38 0.3%	120 2.7%	0
900.100 other, not inherited	14 0.2%	326 2.3%	32 0.7%	32 3.0%
900.110 other, suspected as inherited	31 0.4%	31 0.2%	4 0.1%	0
NORMAL				
0.000 normal globe	7333 90.7%	13014 92.2%	4072 93.1%	990 91.9%

OCULAR DISORDERS REPORT

NEAPOLITAN MASTIFF - 1

NEAPOLITAN MASTIFF

	DISORDER	INHERITANCE	REFERENCE	BREEDING ADVICE
A.	Entropion	Not defined	1	Breeder option
B.	Ectropion	Not defined	1	Breeder option
C.	Macroblepharon	Not defined	1	Breeder option
D.	Distichiasis	Not defined	1	Breeder option
E.	Prolapsed gland of the third eyelid	Not defined	2	Breeder option
F.	Persistent pupillary membranes - iris to iris	Not defined	1	Breeder option
G.	Cataract	Not defined	1	NO

Description and Comments

There are no references providing detailed descriptions of hereditary ocular conditions of the Neapolitan Mastiff. The conditions listed above are generally recognized to exist in this breed, as evidenced by identification on breed eye screening examinations and/or clinical experience of veterinary ophthalmologists.

A. Entropion

A conformational defect resulting in an "in-rolling" of one or both of the eyelids which may cause ocular irritation. It is likely that entropion is influenced by several genes (polygenic), defining the skin and other structures which make up the eyelids, the amount and weight of the skin covering the head and face, the orbital contents, and the conformation of the skull.

OCULAR DISORDERS REPORT

NEAPOLITAN MASTIFF - 2

B. Ectropion

A conformational defect resulting in eversion of the eyelid(s), which may cause ocular irritation due to exposure. It is likely that ectropion is influenced by several genes (polygenic) defining the skin and other structures which make up the eyelids, the amount and weight of the skin covering the head and face, the orbital contents and the conformation of the skull.

C. Macropblepharon

Defined as an exceptionally large palpebral fissure, macropblepharon in conjunction with laxity of the lateral canthal structures may lead to lower lid ectropion and upper lid entropion. Either of these conditions may lead to severe ocular irritation.

D. Distichiasis

Eyelashes abnormally located on the eyelid margin which may cause ocular irritation. Distichiasis may occur at any time in the life of a dog. It is difficult to make a strong recommendation with regard to breeding dogs with this entity. The hereditary basis has not been established although it seems probable due to the high incidence in some breeds. Reducing the incidence is a logical goal. When diagnosed, distichiasis should be recorded; breeding discretion is advised.

E. Prolapsed gland of the third eyelid

Protrusion of the tear gland associated with the third eyelid. The mode of inheritance of this disorder is unknown. The exposed gland may become irritated and cause tear film anomalies. Commonly referred to as "**cherry eye**".

F. Persistent pupillary membranes (PPM)

Persistent blood vessel remnants in the anterior chamber of the eye which fail to regress normally by 3 months of age. These strands may bridge from iris to iris, iris to cornea, iris to lens, or form sheets of tissue in the anterior chamber. The last three forms pose the greatest threat to vision and when severe, vision impairment or blindness

G. Cataract

A partial or complete opacity of the lens and/or its capsule. In cases where cataracts are complete and affect both eyes, blindness results. The prudent approach is to assume cataracts to be hereditary except in cases known to be associated with trauma, other causes of ocular inflammation, specific metabolic diseases, persistent pupillary membrane, persistent hyaloid or nutritional deficiencies. Cataracts may involve the lens completely (diffuse) or in a localized region.

OCULAR DISORDERS REPORT

NEAPOLITAN MASTIFF - 3

References

There are no references providing detailed descriptions of hereditary ocular conditions of the Neapolitan Mastiff breed. The conditions listed above are generally recognized to exist in this breed, as evidenced by identification on breed eye screening examinations and/or clinical experience of veterinary ophthalmologists.

1. ACVO Genetics Committee, 2000-2002 and/or Data from CERF All-Breeds Report, 2000-2002.
2. ACVO Genetics Committee, consensus agreed/supportive vote.

OCULAR DISORDERS REPORT NEAPOLITAN MASTIFF

Diagnostic Name	TOTAL DOGS EXAMINED	1991-1999		2000-2009		2010-2013		2014	
		#	%	#	%	#	%	#	%
EYELIDS									
20.160	macropalpebral fissure	4	30.8%	1	11.1%	9	28.1%	0	
21.000	entropion, unspecified	4	30.8%	0		5	15.6%	1	50.0%
22.000	ectropion, unspecified	4	30.8%	4	44.4%	7	21.9%	2	100.0%
25.110	distichiasis	0		1	11.1%	9	28.1%	0	
NASOLACRIMAL									
40.910	keratoconjunctivitis sicca	0		0		0		1	50.0%
NICTITANS									
51.100	third eyelid cartilage anomaly	0		1	11.1%	0		0	
52.110	prolapsed gland of the third eyelid	1	7.7%	0		1	3.1%	0	
CORNEA									
70.220	pigmentary keratitis	0		0		1	3.1%	1	50.0%
70.700	corneal dystrophy	0		0		1	3.1%	0	
UVEA									
93.730	persistent pupillary membranes, iris to cornea	1	7.7%	0		0		0	
LENS									
100.210	cataract, significance unknown	0		0		1	3.1%	0	
100.313	incipient cataract, equatorial cortex	1	7.7%	0		0		0	
100.316	incipient cataract, nucleus	1	7.7%	0		0		0	
100.330	generalized/complete cataract	3	23.1%	0		0		0	
RETINA									
120.170	retinal dysplasia, folds	0		1	11.1%	1	3.1%	0	
120.960	retinopathy	0		0		1	3.1%	0	
OTHER									
900.000	other, unspecified	0		0		1	3.1%	0	
900.110	other, suspected as inherited	1	7.7%	0		0		0	
NORMAL									
0.000	normal globe	4	30.8%	4	44.4%	10	31.2%	0	

OCULAR DISORDERS REPORT

NEWFOUNDLAND - 1

NEWFOUNDLAND

	DISORDER	INHERITANCE	REFERENCE	BREEDING ADVICE
A.	Glaucoma	Not defined	2, 3	NO
B.	Entropion	Not defined	1	Breeder option
C.	Ectropion	Not defined	1	Breeder option
D.	Macroblepharon	Not defined	1	Breeder option
E.	Distichiasis	Not defined	6	Breeder option
F.	Prolapsed gland of the third eyelid	Not defined	1	Breeder option
G.	Persistent pupillary membrane - iris to iris	Not defined	2	Breeder option
H.	Uveal cysts	Not defined	1	Breeder option
I.	Cataract	Not defined	1	NO
J.	Retinal dysplasia - folds	Not defined	1, 2, 4	Breeder option
K.	Retinal atrophy - generalized	Not defined	5	NO

Description and Comments

A. Glaucoma

Glaucoma is characterized by an elevation of intraocular pressure which, when sustained even for a brief period of time, causes intraocular damage resulting in blindness. The elevated intraocular pressure occurs because the fluid cannot leave through the iridocorneal angle. Diagnosis and classification of glaucoma requires measurement of IOP (tonometry) and examination of the iridocorneal angle (gonioscopy). Neither of these tests is part of a routine breed eye screening examination.

Some Newfoundlands have an abnormality of the iridocorneal angle termed goniodysgenesis. This abnormality is not visible during routine ophthalmic examination using a slitlamp biomicroscope and an indirect ophthalmoscope. There appears to be an

OCULAR DISORDERS REPORT

NEWFOUNDLAND-2

association between goniodysgenesis and glaucoma, but the mechanism by which the angle defect results in glaucoma has not been determined. The inheritance of goniodysgenesis in the Newfoundland is not known. Until the inheritance is determined, control should be directed towards removing dogs from breeding that have glaucoma and have goniodysgenesis, as well as those dogs that produce progeny afflicted with glaucoma.

B. Entropion

A conformational defect resulting in an "in-rolling" of one or both of the eyelids which may cause ocular irritation. It is likely that entropion is influenced by several genes (polygenic), defining the skin and other structures which make up the eyelids, the amount and weight of the skin covering the head and face, the orbital contents, and the conformation of the skull.

C. Ectropion

A conformational defect resulting in eversion of the eyelids, which may cause ocular irritation due to exposure. It is likely that ectropion is influenced by several genes (polygenic), defining the skin and other structures which make up the eyelids, the amount and weight of the skin covering the head and face, the orbital contents and the conformation of the skull.

D. Macoblepharon

Abnormally large eyelid opening; may lead to secondary conditions associated with corneal exposure. In the Newfoundland, ectropion is associated with an exceptionally large palpebral fissure and laxity of the canthal structures. Central lower lid ectropion is often associated with entropion of the adjacent lid. This causes severe ocular irritation.

E. Distichiasis

Eyelashes abnormally located on the eyelid margin which may cause ocular irritation. Distichiasis may occur at any time in the life of a dog. It is difficult to make a strong recommendation with regard to breeding dogs with this entity. The hereditary basis has not been established, although it seems probable due to the high incidence in some breeds. Reducing the incidence is a logical goal. When diagnosed, distichiasis should be recorded; breeding discretion is advised.

F. Prolapsed gland of the third eyelid

Protrusion of the tear gland associated with the third eyelid. The mode of inheritance of this disorder is unknown. The exposed gland may become irritated. Commonly referred to as "cherry eye".

G. Persistent pupillary membranes (PPM)

Persistent blood vessel remnants in the anterior chamber of the eye which fail to regress normally by 3 months of age. These strands may bridge from iris to iris, iris to cornea, iris to lens, or form sheets of tissue in the anterior chamber. The last three forms pose the greatest threat to vision and when severe, vision impairment or blindness may occur.

OCULAR DISORDERS REPORT

NEWFOUNDLAND - 3

H. Uveal cysts

A pigmented, fluid-filled epithelial-lined structure arising from the posterior iris or ciliary body epithelium. Cysts may remain attached to the pupil margin, iris, or ciliary body, or may detach and be free-floating within the anterior chamber. They may rupture and adhere to the cornea or anterior lens capsule. Uveal cysts may occur in any breed. Uveal cysts are commonly benign, although they may be associated with other pathologic conditions in various breeds.

I. Cataract

A partial or complete opacity of the lens and/or its capsule. In cases where cataracts are complete and affect both eyes, blindness results. The prudent approach is to assume cataracts to be hereditary except in cases known to be associated with trauma, other causes of ocular inflammation, specific metabolic diseases, persistent pupillary membrane, persistent hyaloid or nutritional deficiencies. Cataracts may involve the lens completely (diffuse) or in a localized region.

J. Retinal dysplasia - folds

Linear, triangular, curved or curvilinear foci of retinal folding that may be single or multiple. When seen in puppies, this condition may partially or completely resolve with maturity. Its significance to vision is unknown. There are two other forms of retinal dysplasia (geographic, detached) which are known to be inherited in other breeds and, in their most severe form, cause blindness. The genetic relationship between folds and more severe forms of retinal dysplasia is undetermined.

K. Retinal atrophy - generalized

A degenerative disease of the retinal visual cells which progresses to blindness. This abnormality, also known as Progressive Retinal Atrophy or PRA, may be detected by electroretinogram (not part of a routine eye screening examination) before it is apparent clinically. Except for X-linked PRA in the Siberian Husky, in all breeds studied to date, PRA is inherited as an autosomal recessive trait.

References

There are few references providing detailed descriptions of hereditary ocular conditions of the Newfoundland breed. The conditions listed above are generally recognized to exist in this breed, as evidenced by identification on breed eye screening examinations and/or clinical experience of veterinary ophthalmologists.

1. ACVO Genetics Committee, 1999 and/or Data from CERF All-Breeds Report, 1991-1998.
2. ACVO Genetics Committee, 2005 and/or Data from CERF All-Breeds Report 2003-2004.
3. Strom AR, Hassig M, Iburg TM, et al. Epidemiology of canine glaucoma presented to

©2014, American College of Veterinary Ophthalmologists

OCULAR DISORDERS REPORT

NEWFOUNDLAND-4

University of Zurich from 1995 to 2009. Part 1: Congenital and primary glaucoma (4 and 123 cases). *Vet Ophthalmol.* 2011 Mar;14:121-126.

4. ACVO Genetics Committee, 2000-2002 and/or Data from CERF All-Breeds Report, 2000-2002.
5. Dekomien G and Epplen JT. Evaluation of the canine RPE65 gene in affected dogs with generalized progressive retinal atrophy. *Mol Vis.* 2003 Nov 11;9:601-605.
6. ACVO Genetics Committee, 2014 and/or Data from OFA All-Breeds Report, 2013-2014.

OCULAR DISORDERS REPORT NEWFOUNDLAND

Diagnostic Name	TOTAL DOGS EXAMINED		1991-1999		2000-2009		2010-2013		2014	
	#	%	#	%	#	%	#	%	#	%
GLOBE										
0.110 microphthalmia	4	0.5%	1	0.1%	0		0		0	
10.000 glaucoma	0		0		0		0		1	0.8%
EYELIDS										
20.160 macropalpebral fissure	17	2.0%	90	6.2%	21	3.8%	0		0	
21.000 entropion, unspecified	59	6.8%	106	7.3%	27	4.8%	10	8.2%	10	8.2%
22.000 ectropion, unspecified	44	5.1%	132	9.1%	27	4.8%	10	8.2%	10	8.2%
25.110 distichiasis	7	0.8%	5	0.3%	9	1.6%	1	0.8%	1	0.8%
NASOLACRIMAL										
40.910 keratoconjunctivitis sicca	0		1	0.1%	0		0		0	
NICTITANS										
51.100 third eyelid cartilage anomaly	0		11	0.8%	2	0.4%	0		0	
52.110 prolapsed gland of the third eyelid	5	0.6%	3	0.2%	0		1	0.8%	1	0.8%
CORNEA										
70.210 corneal pannus	1	0.1%	0		0		0		0	
70.220 pigmentary keratitis	0		2	0.1%	0		0		0	
70.700 corneal dystrophy	0		1	0.1%	0		0		0	
UVEA										
93.120 iris cyst	14	1.6%	19	1.3%	11	2.0%	2	1.6%	2	1.6%
93.140 corneal endothelial pigment without PPM	0		0		1	0.2%	0		0	
93.170 anterior chamber cyst	0		0		2	0.4%	1	0.8%	1	0.8%
93.710 persistent pupillary membranes, iris to iris	3	0.3%	10	0.7%	5	0.9%	3	2.5%	3	2.5%
93.720 persistent pupillary membranes, iris to lens	2	0.2%	3	0.2%	0		0		0	
93.730 persistent pupillary membranes, iris to cornea	2	0.2%	3	0.2%	0		0		0	
93.740 persistent pupillary membranes, iris sheets	0		1	0.1%	0		0		0	
93.750 persistent pupillary membranes, lens pigment foci/no strands	0		0		3	0.5%	0		0	
93.810 uveal melanoma	0		0		1	0.2%	0		0	
95.120 ciliary body cyst	0		0		1	0.2%	3	2.5%	3	2.5%
LENS										
100.200 cataract, unspecified	11	1.3%	0		0		0		0	
100.210 cataract, significance unknown	19	2.2%	63	4.4%	11	2.0%	3	2.5%	3	2.5%
100.301 punctate cataract, anterior cortex	1	0.1%	4	0.3%	2	0.4%	0		0	
100.302 punctate cataract, posterior cortex	6	0.7%	4	0.3%	1	0.2%	0		0	
100.303 punctate cataract, equatorial cortex	0		3	0.2%	1	0.2%	0		0	
100.305 punctate cataract, posterior sutures	1	0.1%	2	0.1%	3	0.5%	0		0	
100.306 punctate cataract, nucleus	2	0.2%	1	0.1%	0		0		0	
100.307 punctate cataract, capsular	0		2	0.1%	1	0.2%	0		0	
100.311 incipient cataract, anterior cortex	6	0.7%	7	0.5%	3	0.5%	0		0	
100.312 incipient cataract, posterior cortex	40	4.6%	33	2.3%	11	2.0%	1	0.8%	1	0.8%
100.313 incipient cataract, equatorial cortex	5	0.6%	9	0.6%	1	0.2%	1	0.8%	1	0.8%
100.314 incipient cataract, anterior sutures	2	0.2%	1	0.1%	0		0		0	
100.315 incipient cataract, posterior sutures	6	0.7%	5	0.3%	1	0.2%	0		0	
100.316 incipient cataract, nucleus	4	0.5%	4	0.3%	1	0.2%	2	1.6%	2	1.6%
100.317 incipient cataract, capsular	0		6	0.4%	0		1	0.8%	1	0.8%
100.322 incomplete cataract, posterior cortex	0		0		2	0.4%	1	0.8%	1	0.8%

OCULAR DISORDERS REPORT NEWFOUNDLAND

LENS CONTINUED	1991-1999	2000-2009	2010-2013	2014
100.323 incomplete cataract, equatorial cortex	0	0	0	1 0.8%
100.330 generalized/complete cataract	19 2.2%	18 1.2%	0	0
100.375 subluxation/luxation, unspecified	1 0.1%	0	0	0
VITREOUS				
110.120 persistent hyaloid artery/remnant	0	1 0.1%	2 0.4%	1 0.8%
110.130 PHPV/PTVL	0	0	1 0.2%	0
110.135 PHPV/PTVL	0	3 0.2%	1 0.2%	0
110.320 vitreous degeneration syneresis	2 0.2%	0	2 0.4%	0
110.330 vitreous degeneration anterior chamber	0	1 0.1%	0	0
RETINA				
120.170 retinal dysplasia, folds	10 1.2%	15 1.0%	1 0.2%	0
120.180 retinal dysplasia, geographic	0	2 0.1%	0	0
120.190 retinal dysplasia, detached	0	1 0.1%	0	0
120.200 retinitis	0	0	0	1 0.8%
120.310 generalized progressive retinal atrophy (PRA)	1 0.1%	0	0	0
120.910 retinal detachment without dialysis	0	1 0.1%	0	0
OPTIC NERVE				
130.120 optic nerve hypoplasia	7 0.8%	0	0	0
130.150 optic disc coloboma	0	1 0.1%	0	0
OTHER				
900.000 other, unspecified	0	7 0.5%	22 3.9%	0
900.100 other, not inherited	8 0.9%	61 4.2%	7 1.3%	6 4.9%
900.110 other, suspected as inherited	14 1.6%	12 0.8%	3 0.5%	1 0.8%
NORMAL				
0.000 normal globe	639 73.7%	1096 75.7%	468 84.0%	99 81.1%

OCULAR DISORDERS REPORT

NORBOTTENSPETS - 1

NORBOTTENSPETS

	DISORDER	INHERITANCE	REFERENCE	BREEDING ADVICE
A.	Cataract	Not defined	1	NO

Description and Comments

A. Cataract

A partial or complete opacity of the lens and/or its capsule. In cases where cataracts are complete and affect both eyes, blindness results. The prudent approach is to assume cataracts to be hereditary except in cases known to be associated with trauma, other causes of ocular inflammation, specific metabolic diseases, persistent pupillary membrane, persistent hyaloid or nutritional deficiencies. Cataracts may involve the lens completely (diffuse) or in a localized region.

References

There are no references providing detailed descriptions of hereditary ocular conditions of the Norbottenspets. The conditions listed above are generally recognized to exist in this breed, as evidenced by identification on breed eye screening examinations and/or clinical experience of veterinary ophthalmologists.

1. ACVO Genetics Committee, 1999 and/or Data from CERF All-Breeds Report, 1991-1998.

OCULAR DISORDERS REPORT NORBOTTENSPETS

Diagnostic Name	TOTAL DOGS EXAMINED	1991-1999		2000-2009		2010-2013		2014	
		#	%	#	%	#	%	#	%
EYELIDS									
25.110	distichiasis	0		1	2.3%	0		0	
CORNEA									
70.700	corneal dystrophy	1	2.4%	0		0		0	
UVEA									
93.710	persistent pupillary membranes, iris to iris	2	4.8%	3	7.0%	0		0	
93.720	persistent pupillary membranes, iris to lens	1	2.4%	0		0		0	
LENS									
100.210	cataract, significance unknown	2	4.8%	2	4.7%	1	8.3%	0	
100.302	punctate cataract, posterior cortex	2	4.8%	0		0		0	
100.305	punctate cataract, posterior sutures	1	2.4%	0		0		0	
100.306	punctate cataract, nucleus	1	2.4%	0		0		0	
100.311	incipient cataract, anterior cortex	7	16.7%	0		0		0	
100.312	incipient cataract, posterior cortex	9	21.4%	0		0		0	
100.315	incipient cataract, posterior sutures	1	2.4%	0		0		0	
100.316	incipient cataract, nucleus	2	4.8%	1	2.3%	0		0	
100.330	generalized/complete cataract	1	2.4%	0		0		0	
RETINA									
120.170	retinal dysplasia, folds	1	2.4%	0		0		0	
120.310	generalized progressive retinal atrophy (PRA)	2	4.8%	0		0		0	
OTHER									
900.100	other, not inherited	0		3	7.0%	0		0	
NORMAL									
0.000	normal globe	26	61.9%	36	83.7%	12	100.0%	0	

OCULAR DISORDERS REPORT

NORFOLK TERRIER - 1

NORFOLK TERRIER

	DISORDER	INHERITANCE	REFERENCE	BREEDING ADVICE
A.	Corneal dystrophy - epithelial/stromal	Not defined	1	Breeder option
B.	Persistent pupillary membranes - iris to iris - all other forms	Not defined Not defined	2, 3	Breeder option NO
C.	Cataract	Not defined	2, 3	NO
D.	Vitreous degeneration	Not defined	4	Breeder option
E.	Retinal atrophy - generalized	Presumed autosomal recessive	2	NO
F.	Optic nerve coloboma	Not defined	3	NO
G.	Optic nerve hypoplasia	Not defined	3	NO
H.	Micropapilla	Not defined	3	Breeder option

Description and Comments

A. Corneal Dystrophy - epithelial/stromal

A non-inflammatory corneal opacity (white to gray) present in one or more of the corneal layers. Corneal dystrophy implies a probable inherited basis and is usually bilateral.

B. Persistent pupillary membranes (PPM)

Persistent blood vessel remnants in the anterior chamber of the eye which fail to regress normally by 3 months of age. These strands may bridge from iris to iris, iris to cornea, iris to lens, or form sheets of tissue in the anterior chamber. The last three forms pose the greatest threat to vision and when severe, vision impairment or blindness may occur.

OCULAR DISORDERS REPORT

NORFOLK TERRIER - 2

C. Cataract

A partial or complete opacity of the lens and/or its capsule. In cases where cataracts are complete and affect both eyes, blindness results. The prudent approach is to assume cataracts to be hereditary except in cases known to be associated with trauma, other causes of ocular inflammation, specific metabolic diseases, persistent pupillary membrane, persistent hyaloid or nutritional deficiencies. Cataracts may involve the lens completely (diffuse) or in a localized region.

D. Vitreous degeneration

Liquefaction of the vitreous gel which may predispose to retinal detachment resulting in blindness.

E. Retinal atrophy - generalized

A degenerative disease of the retinal visual cells which progresses to blindness. This abnormality, also known as Progressive Retinal Atrophy or PRA, may be detected by electroretinogram (not part of a routine eye screening examination) before it is apparent clinically. Except for X-linked PRA in the Siberian Husky, in all breeds studied to date, PRA is inherited as an autosomal recessive trait.

The age of onset has been reported to be between 2 and 3 years of age with initial loss of night vision progressing to complete blindness.

F. Optic nerve coloboma

A congenital cavity in the optic nerve which, if large, may cause blindness or vision impairment.

G. Optic nerve hypoplasia

A congenital defect of the optic nerve which causes blindness and abnormal pupil response in the affected eye. May be unable to differentiate from micropapilla on a routine (dilated) screening ophthalmoscopic exam.

H. Micropapilla

Micropapilla refers to a small optic disc which is not associated with vision impairment. Optic nerve hypoplasia refers to a congenital defect of the optic nerve which causes blindness and abnormal pupil response in the affected eye. It may be difficult to differentiate between micropapilla and optic nerve hypoplasia on a routine (dilated) screening ophthalmoscopic exam.

OCULAR DISORDERS REPORT

NORFOLK TERRIER - 3

References

There are no references providing detailed descriptions of hereditary ocular conditions of the Norfolk Terrier. The conditions listed above are generally recognized to exist in this breed, as evidenced by identification on breed eye screening examinations and/or clinical experience of veterinary ophthalmologists.

1. ACVO Genetics Committee, 2008 and/or Data from CERF All-Breeds Report, 2003-2007.
2. ACVO Genetics Committee, 2000-2002 and/or Data from CERF All-Breeds Report, 2000-2002.
3. ACVO Genetics Committee, 2005 and/or Data from CERF All-Breeds Report 2003-2004.
4. ACVO Genetics Committee, 2007 and/or Data from CERF All-Breeds Report 2002-2006.

OCULAR DISORDERS REPORT NORFOLK TERRIER

Diagnostic Name	TOTAL DOGS EXAMINED		1991-1999		2000-2009		2010-2013		2014	
	#	%	#	%	#	%	#	%	#	%
EYELIDS										
20.160	macropalpebral fissure	0		1	0.1%	0		0		0
25.110	distichiasis	0		4	0.5%	3	0.9%	0		0
NICTITANS										
52.110	prolapsed gland of the third eyelid	0		0		1	0.3%	1	1.8%	
CORNEA										
70.700	corneal dystrophy	1	0.8%	7	0.9%	1	0.3%	2	3.6%	
70.730	corneal endothelial degeneration	0		0		1	0.3%	0		
UVEA										
93.140	corneal endothelial pigment without PPM	0		0		1	0.3%	0		0
93.710	persistent pupillary membranes, iris to iris	9	7.3%	163	21.1%	69	21.0%	19	33.9%	
93.720	persistent pupillary membranes, iris to lens	0		1	0.1%	0		0		0
93.730	persistent pupillary membranes, iris to cornea	3	2.4%	0		0		0		0
93.750	persistent pupillary membranes, lens pigment foci/no strands	0		2	0.3%	3	0.9%	1	1.8%	
LENS										
100.200	cataract, unspecified	1	0.8%	0		0		0		0
100.210	cataract, significance unknown	4	3.2%	34	4.4%	5	1.5%	2	3.6%	
100.301	punctate cataract, anterior cortex	0		3	0.4%	2	0.6%	1	1.8%	
100.302	punctate cataract, posterior cortex	0		3	0.4%	2	0.6%	1	1.8%	
100.303	punctate cataract, equatorial cortex	0		0		1	0.3%	0		0
100.305	punctate cataract, posterior sutures	0		8	1.0%	0		1	1.8%	
100.306	punctate cataract, nucleus	0		1	0.1%	0		0		0
100.307	punctate cataract, capsular	0		2	0.3%	1	0.3%	0		0
100.311	incipient cataract, anterior cortex	1	0.8%	5	0.6%	0		1	1.8%	
100.312	incipient cataract, posterior cortex	1	0.8%	13	1.7%	0		2	3.6%	
100.313	incipient cataract, equatorial cortex	1	0.8%	2	0.3%	1	0.3%	0		0
100.315	incipient cataract, posterior sutures	0		2	0.3%	0		0		0
100.317	incipient cataract, capsular	0		4	0.5%	0		0		0
100.330	generalized/complete cataract	1	0.8%	3	0.4%	0		0		0
VITREOUS										
110.120	persistant hyaloid artery/remnant	1	0.8%	3	0.4%	2	0.6%	0		0
110.135	PHPV/PTVL	0		0		1	0.3%	0		0
110.320	vitreous degeneration syneresis	2	1.6%	4	0.5%	2	0.6%	0		0
FUNDUS										
97.120	coloboma	0		1	0.1%	0		0		0
RETINA										
120.170	retinal dysplasia, folds	0		5	0.6%	0		1	1.8%	
120.180	retinal dysplasia, geographic	0		1	0.1%	1	0.3%	0		0
120.310	generalized progressive retinal atrophy (PRA)	3	2.4%	7	0.9%	0		0		0
120.910	retinal detachment without dialysis	0		1	0.1%	0		0		0
OPTIC NERVE										
130.110	micropapilla	0		8	1.0%	0		2	3.6%	
130.120	optic nerve hypoplasia	1	0.8%	14	1.8%	1	0.3%	1	1.8%	

OCULAR DISORDERS REPORT NORFOLK TERRIER

OPTIC NERVE CONTINUED	1991-1999	2000-2009	2010-2013	2014
130.150 optic disc coloboma	1 0.8%	14 1.8%	3 0.9%	0
OTHER				
900.000 other, unspecified	0	2 0.3%	12 3.6%	0
900.100 other, not inherited	0	38 4.9%	5 1.5%	5 8.9%
900.110 other, suspected as inherited	1 0.8%	5 0.6%	1 0.3%	0
NORMAL				
0.000 normal globe	101 81.5%	569 73.6%	254 77.2%	34 60.7%

OCULAR DISORDERS REPORT

NORWEGIAN BUHUND - 1

NORWEGIAN BUHUND

	DISORDER	INHERITANCE	REFERENCE	BREEDING ADVICE
A.	Cataract	Not defined	1	NO
B.	Cataract - pulverulent	Presumed autosomal dominant	2	Breeder Option
C.	Retinal dysplasia - folds	Not defined	3	Breeder option

Description and Comments

A. Cataract

A partial or complete opacity of the lens and/or its capsule. In cases where cataracts are complete and affect both eyes, blindness results. The prudent approach is to assume cataracts to be hereditary except in cases known to be associated with trauma, other causes of ocular inflammation, specific metabolic diseases, persistent pupillary membrane, persistent hyaloid or nutritional deficiencies. Cataracts may involve the lens completely (diffuse) or in a localized region.

B. Cataract - pulverulent

With the pulverulent cataract in the Norwegian Buhund initial lens changes may be visible as early as 6.5 weeks of age as small dots parallel to the suture lines behind the nucleus. By the age of 4 to 5.5 years, the opacities progress to involve the fetal nucleus which then resembles a ball of candy floss. The adult nucleus and the cortex remain clear. An autosomal dominant mode of inheritance with a high degree of penetrance has been suggested.

Cortical cataract with or without the presence of pulverulent cataract have been diagnosed in a few dogs.

C. Retinal dysplasia - folds

Linear, triangular, curved or curvilinear foci of retinal folding that may be single or multiple. When seen in puppies, this condition may partially or completely resolve with maturity. Its significance to vision is unknown. There are two other forms of retinal dysplasia (geographic, detached) which are known to be inherited in other breeds and, in their most severe form, cause blindness. The genetic relationship between folds and more severe

OCULAR DISORDERS REPORT

NORWEGIAN BUHUND - 2

forms of retinal dysplasia is undetermined.

References

1. ACVO Genetics Committee, 1999 and/or Data from CERF All-Breeds Report, 1991-1998.
2. Bjerkas E and Haaland MB. Pulverulent nuclear cataract in the Norwegian buhund. *J Small Anim Pract.* 1995;36:471-474.
3. ACVO Genetics Committee, 2014 and/or Data from OFA AllBreeds Report, 2013-2014.

OCULAR DISORDERS REPORT NORWEGIAN BUHUND

Diagnostic Name	TOTAL DOGS EXAMINED	1991-1999		2000-2009		2010-2013		2014	
		#	%	#	%	#	%	#	%
EYELIDS									
25.110	distichiasis	0		1	0.4%	0		0	
CORNEA									
70.700	corneal dystrophy	0		3	1.1%	1	0.7%	0	
UVEA									
93.710	persistent pupillary membranes, iris to iris	0		1	0.4%	1	0.7%	0	
93.740	persistent pupillary membranes, iris sheets	0		1	0.4%	0		0	
LENS									
100.210	cataract, significance unknown	4	2.9%	45	16.2%	13	8.6%	5	12.5%
100.301	punctate cataract, anterior cortex	2	1.4%	2	0.7%	1	0.7%	0	
100.302	punctate cataract, posterior cortex	3	2.2%	2	0.7%	2	1.3%	0	
100.303	punctate cataract, equatorial cortex	0		0		1	0.7%	0	
100.305	punctate cataract, posterior sutures	2	1.4%	2	0.7%	1	0.7%	0	
100.306	punctate cataract, nucleus	2	1.4%	5	1.8%	2	1.3%	0	
100.307	punctate cataract, capsular	0		1	0.4%	0		0	
100.311	incipient cataract, anterior cortex	0		3	1.1%	0		0	
100.312	incipient cataract, posterior cortex	4	2.9%	9	3.2%	4	2.6%	0	
100.315	incipient cataract, posterior sutures	2	1.4%	6	2.2%	2	1.3%	0	
100.316	incipient cataract, nucleus	0		8	2.9%	5	3.3%	1	2.5%
100.322	incomplete cataract, posterior cortex	0		0		2	1.3%	0	
100.325	incomplete cataract, posterior sutures	0		0		2	1.3%	0	
100.330	generalized/complete cataract	3	2.2%	2	0.7%	1	0.7%	0	
RETINA									
120.170	retinal dysplasia, folds	2	1.4%	1	0.4%	5	3.3%	0	
120.200	retinitis	0		0		0		3	7.5%
120.310	generalized progressive retinal atrophy (PRA)	1	0.7%	0		2	1.3%	0	
OTHER									
900.000	other, unspecified	0		3	1.1%	11	7.3%	0	
900.100	other, not inherited	3	2.2%	14	5.1%	1	0.7%	2	5.0%
900.110	other, suspected as inherited	1	0.7%	6	2.2%	1	0.7%	0	
NORMAL									
0.000	normal globe	116	83.5%	203	73.3%	114	75.5%	33	82.5%

OCULAR DISORDERS REPORT

NORWEGIAN ELKHOUND - 1

NORWEGIAN ELKHOUND

	DISORDER	INHERITANCE	REFERENCE	BREEDING ADVICE
A.	Glaucoma	Not defined	1-6	NO
B.	Ectropion	Not defined	7	Breeder option
C.	Distichiasis	Not defined	1	Breeder option
D.	Uveal cysts	Not defined	8	Breeder option
E.	Persistent pupillary membranes			
	- iris to iris	Not defined	1, 9	Breeder option
	- all other forms	Not defined	9	NO
F.	Cataract	Not defined	1	NO
G.	Retinal atrophy - generalized (<i>prcd</i>) *a DNA test is available	Autosomal recessive	8, 10	NO
H.	Retinal atrophy - generalized			
	1. Rod dysplasia (<i>rd</i>)	Presumed autosomal recessive	1, 11-14	NO
	2. Early retinal degeneration (<i>erd</i>)	Autosomal recessive	1, 15-21	NO
I.	Retinal dysplasia - folds	Not defined	1	Breeder option

Description and Comments

A. Glaucoma

Glaucoma is characterized by an elevation of intraocular pressure (IOP) which, when sustained, causes intraocular damage resulting in blindness. The elevated intraocular pressure occurs because the fluid cannot leave through the iridocorneal angle. Diagnosis and classification of glaucoma requires measurement of the IOP (tonometry) and

©2014, American College of Veterinary Ophthalmologists

OCULAR DISORDERS REPORT

NORWEGIAN ELKHOUND - 2

examination of the iridocorneal angle (gonioscopy). Neither of these tests is part of a routine screening exam for certification.

In the Norwegian Elkhound, glaucoma appears to be familial. In most cases the drainage angle is reported to be open.

B. Ectropion

A conformational defect resulting in eversion of the eyelid(s), which may cause ocular irritation due to exposure. It is likely that ectropion is influenced by several genes (polygenic) defining the skin and other structures which make up the eyelids, the amount and weight of the skin covering the head and face, the orbital contents and the conformation of the skull.

C. Distichiasis

Eyelashes abnormally located on the eyelid margin which may cause ocular irritation. Distichiasis may occur at any time in the life of a dog. It is difficult to make a strong recommendation with regard to breeding dogs with this entity. The hereditary basis has not been established, although it seems probable due to the high incidence in some breeds. Reducing the incidence is a logical goal. When diagnosed, distichiasis should be recorded; breeding discretion is advised.

D. Uveal cysts

A pigmented, fluid-filled epithelial-lined structure arising from the posterior iris or ciliary body epithelium. Cysts may remain attached to the pupil margin, iris, or ciliary body, or may detach and be free-floating within the anterior chamber. They may rupture and adhere to the cornea or anterior lens capsule. Uveal cysts may occur in any breed. Uveal cysts are commonly benign, although they may be associated with other pathologic conditions in various breeds.

E. Persistent pupillary membranes (PPM)

Persistent blood vessel remnants in the anterior chamber of the eye which fail to regress normally by 3 months of age. These strands may bridge from iris to iris, iris to cornea, iris to lens, or form sheets of tissue in the anterior chamber. The last three forms pose the greatest threat to vision and when severe, vision impairment or blindness may occur.

F. Cataract

A partial or complete opacity of the lens and/or its capsule. In cases where cataracts are complete and affect both eyes, blindness results. The prudent approach is to assume cataracts to be hereditary except in cases known to be associated with trauma, other causes of ocular inflammation, specific metabolic diseases, persistent pupillary membrane, persistent hyaloid or nutritional deficiencies. Cataracts may involve the lens completely (diffuse) or in a localized region.

G. Retinal atrophy - generalized (*prcd*)

©2014, American College of Veterinary Ophthalmologists

OCULAR DISORDERS REPORT

NORWEGIAN ELKHOUND - 3

A degenerative disease of the retinal visual cells which progresses to blindness. This abnormality, also known as progressive retinal atrophy or PRA, may be detected by electroretinogram (not part of a routine eye screening examination) before it is apparent clinically. Except for X-linked PRA in the Siberian Husky, in all breeds studied to date, PRA is inherited as an autosomal recessive trait. A DNA test is available.

H. Retinal atrophy - generalized

A degenerative disease of the retinal visual cells which progresses to blindness. This abnormality, also known as progressive retinal atrophy or PRA, may be detected by electroretinogram (not part of a routine eye screening examination) before it is apparent clinically. Except for X-linked PRA in the Siberian Husky, in all breeds studied to date, PRA is inherited as an autosomal recessive trait.

1. **Rod dysplasia (*rd*)**: Inappropriate development of the visual cells resulting in vision impairment in dim light by 6 months and total blindness at 3-5 years. Ophthalmoscopic signs may be evident after 5 months of age, with signs of retinal vascular thinning after 2 years. An ERG can provide a diagnosis as early as 6 weeks of age. In the Norwegian Elkhound, this is an autosomal recessive trait.

2. **Early retinal degeneration (*erd*)**: Another form of PRA reported in the Norwegian Elkhound, animals are night blind at 6 weeks and blind by 1 year of age. Clinical signs are evident by 6 months. On histopath there is an abnormal structural development of the photoreceptors followed by rapid rod/cone degeneration. As with other forms of PRA, it is suspected to be an autosomal recessive disorder.

I. Retinal dysplasia - folds

Linear, triangular, curved or curvilinear foci of retinal folding that may be single or multiple. When seen in puppies, this condition may partially or completely resolve with maturity. Its significance to vision is unknown. There are two other forms of retinal dysplasia (geographic, detached) which are known to be inherited in other breeds and, in their most severe form, cause blindness. The genetic relationship between folds and more severe forms of retinal dysplasia is undetermined.

References

1. ACVO Genetics Committee, 1999 and/or Data from CERF All-Breeds Report, 1991-1998.
2. Martin CL and Wyman M. Primary glaucoma in the dog. *Vet Clin North Am.* 1978 May;8:257-286.
3. Slater MR and Erb HN. Effects of risk factors and prophylactic treatment on primary glaucoma in the dog. *J Am Vet Med Assoc.* 1986 May 1;188:1028-1030.
4. Bjerkas E, Peiffer RL, Jr. and Ekestén B. Primary glaucoma in the Norwegian elkhound. *Proc Am Coll Vet Ophthalmol.* 1994;25:74.

©2014, American College of Veterinary Ophthalmologists

OCULAR DISORDERS REPORT

NORWEGIAN ELKHOUND - 4

5. Gelatt KN and MacKay EO. Prevalence of the breed-related glaucomas in pure-bred dogs in North America. *Vet Ophthalmol.* 2004 Mar-Apr;7:97-111.
6. Ekesten B, Bjerkas E and Kongsengen K. Primary glaucoma in the Norwegian elkhound. *Vet Comp Ophthalmol.* 1997;7:14-18.
7. ACVO Genetics Committee, 2011 and/or Data from CERF All-Breeds Report, 2010.
8. ACVO Genetics Committee, 2013-2014 and Data from OFA All-Breeds Report, 2013-2014.
9. ACVO Genetics Committee, 2005 and/or Data from CERF All-Breeds Report 2003-2004.
10. Zangerl B, Goldstein O, Philp AR, et al. Identical mutation in a novel retinal gene causes progressive rod-cone degeneration in dogs and retinitis pigmentosa in humans. *Genomics.* 2006 Nov;88:551-563.
11. Cogan DG and Kuwabara T. Photoreceptor abiotrophy of the retina in the elkhound. *Path Vet.* 1965;2:101.
12. Aguirre GD and Rubin LF. Progressive retinal atrophy (rod dysplasia) in the Norwegian Elkhound. *J Am Vet Med Assoc.* 1971 Jan 15;158:208-218.
13. Aguirre GD and Rubin LF. An electrophysiologic approach for early diagnosis of progressive retinal atrophy in Norwegian elkhound. *J Am Anim Hosp Assoc.* 1971;7.
14. Aguirre GD and Rubin LF. The early diagnosis of rod dysplasia in the Norwegian Elkhound. *J Am Vet Med Assoc.* 1971 Aug 15;159:429-433.
15. Acland GM and Aguirre GD. Retinal degenerations in the dog: IV. Early retinal degeneration (erd) in Norwegian elkhound. *Exp Eye Res.* 1987;44:491.
16. Acland GM, Aguirre GD, Parkes J, et al. A new early onset inherited retinal degeneration in the Norwegian elkhound. *Trans Am Coll Vet Ophthalmol.* 1983:98.
17. Moghrabi WN, Kedzierski W and Travis GH. Canine homolog and exclusion of retinal degeneration slow (rds) as the gene for early retinal degeneration (erd) in the dog. *Exp Eye Res.* 1995 Nov;61:641-643.
18. Ray K, Acland GM and Aguirre GD. Nonallelism of erd and prcd and exclusion of the canine RDS/peripherin gene as a candidate for both retinal degeneration loci. *Invest Ophthalmol Vis Sci.* 1996 Apr;37:783-794.
19. Kukekova AV, Aguirre GD and Acland GM. Cloning and characterization of canine SHARP1 and its evaluation as a positional candidate for canine early retinal degeneration (erd). *Gene.* 2003 Jul 17;312:335-343.
20. Goldstein O, kukekova AV, Aguirre GD, et al. The mutant gene causing canine early retinal degeneration identifies a novel pathway critical for photoreceptor development. *ARVO abstract.* 2008:1704-A1314.

©2014, American College of Veterinary Ophthalmologists

OCULAR DISORDERS REPORT

NORWEGIAN ELKHOUND - 5

21. Goldstein O, Kukekova AV, Aguirre GD, et al. Exonic SINE insertion in STK38L causes canine early retinal degeneration (erd). *Genomics*. 2010 Dec;96:362-368.

OCULAR DISORDERS REPORT NORWEGIAN ELKHOUND

Diagnostic Name	TOTAL DOGS EXAMINED	1991-1999		2000-2009		2010-2013		2014	
		#	%	#	%	#	%	#	%
GLOBE									
0.110	microphthalmia	2	0.2%	2	0.2%	0		0	
10.000	glaucoma	2	0.2%	0		0		0	
EYELIDS									
20.160	macropalpebral fissure	1	0.1%	13	1.3%	2	0.8%	0	
21.000	entropion, unspecified	0		2	0.2%	3	1.1%	0	
22.000	ectropion, unspecified	0		9	0.9%	5	1.9%	0	
25.110	distichiasis	29	2.4%	11	1.1%	4	1.5%	0	
NASOLACRIMAL									
32.110	imperforate lower nasolacrimal punctum	0		0		2	0.8%	0	
NICTITANS									
51.100	third eyelid cartilage anomaly	0		0		1	0.4%	0	
52.110	prolapsed gland of the third eyelid	0		0		1	0.4%	0	
CORNEA									
70.210	corneal pannus	2	0.2%	0		0		0	
70.700	corneal dystrophy	1	0.1%	3	0.3%	3	1.1%	0	
UVEA									
93.120	iris cyst	0		2	0.2%	5	1.9%	0	
93.170	anterior chamber cyst	0		0		1	0.4%	0	
93.710	persistent pupillary membranes, iris to iris	21	1.8%	6	0.6%	4	1.5%	2	5.6%
93.720	persistent pupillary membranes, iris to lens	3	0.3%	6	0.6%	1	0.4%	0	
93.730	persistent pupillary membranes, iris to cornea	3	0.3%	2	0.2%	0		0	
93.750	persistent pupillary membranes, lens pigment foci/no strands	0		0		2	0.8%	0	
LENS									
100.200	cataract, unspecified	23	1.9%	0		0		0	
100.210	cataract, significance unknown	37	3.1%	50	5.0%	16	6.1%	4	11.1%
100.301	punctate cataract, anterior cortex	6	0.5%	2	0.2%	0		0	
100.302	punctate cataract, posterior cortex	4	0.3%	2	0.2%	1	0.4%	0	
100.303	punctate cataract, equatorial cortex	3	0.3%	1	0.1%	0		0	
100.304	punctate cataract, anterior sutures	0		1	0.1%	0		0	
100.305	punctate cataract, posterior sutures	6	0.5%	2	0.2%	1	0.4%	0	
100.306	punctate cataract, nucleus	1	0.1%	2	0.2%	1	0.4%	0	
100.307	punctate cataract, capsular	0		2	0.2%	0		0	
100.311	incipient cataract, anterior cortex	4	0.3%	7	0.7%	0		0	
100.312	incipient cataract, posterior cortex	25	2.1%	9	0.9%	3	1.1%	0	
100.313	incipient cataract, equatorial cortex	12	1.0%	6	0.6%	3	1.1%	0	
100.314	incipient cataract, anterior sutures	1	0.1%	2	0.2%	0		0	
100.315	incipient cataract, posterior sutures	6	0.5%	1	0.1%	0		0	
100.316	incipient cataract, nucleus	6	0.5%	2	0.2%	0		0	
100.317	incipient cataract, capsular	0		9	0.9%	0		0	
100.321	incomplete cataract, anterior cortex	0		0		1	0.4%	0	
100.330	generalized/complete cataract	4	0.3%	3	0.3%	0		0	
100.375	subluxation/luxation, unspecified	3	0.3%	1	0.1%	0		0	

OCULAR DISORDERS REPORT NORWEGIAN ELKHOUND

	1991-1999	2000-2009	2010-2013	2014
VITREOUS				
110.120 persistant hyaloid artery/remnant	3 0.3%	3 0.3%	0	0
110.135 PHPV/PTVL	0	2 0.2%	0	0
110.320 vitreous degeneration syneresis	3 0.3%	3 0.3%	0	1 2.8%
RETINA				
120.170 retinal dysplasia, folds	28 2.3%	7 0.7%	5 1.9%	2 5.6%
120.180 retinal dysplasia, geographic	2 0.2%	0	0	0
120.310 generalized progressive retinal atrophy (PRA)	8 0.7%	0	2 0.8%	0
120.400 retinal hemorrhage	2 0.2%	1 0.1%	0	0
120.910 retinal detachment without dialysis	1 0.1%	0	0	0
OPTIC NERVE				
130.120 optic nerve hypoplasia	2 0.2%	0	0	0
OTHER				
900.000 other, unspecified	0	10 1.0%	12 4.5%	0
900.100 other, not inherited	2 0.2%	30 3.0%	3 1.1%	1 2.8%
900.110 other, suspected as inherited	9 0.8%	1 0.1%	1 0.4%	0
NORMAL				
0.000 normal globe	985 82.6%	904 89.8%	244 92.4%	34 94.4%

OCULAR DISORDERS REPORT

NORWEGIAN LUNDEHUND - 1

NORWEGIAN LUNDEHUND

	DISORDER	INHERITANCE	REFERENCE	BREEDING ADVICE
A.	Persistent pupillary membranes - iris to iris	Not defined	1	Breeder option

Description and Comments

A. Persistent pupillary membranes (PPM)

Persistent blood vessel remnants in the anterior chamber of the eye which fail to regress normally by 3 months of age. These strands may bridge from iris to iris, iris to cornea, iris to lens, or form sheets of tissue in the anterior chamber. The last three forms pose the greatest threat to vision and when severe, vision impairment or blindness may occur.

References

There are no references providing detailed descriptions of hereditary conditions of the Norwegian Lundehund breed. The conditions listed above are generally recognized to exist in this breed, as evidenced by identification on breed eye screening examinations and/or clinical experience of veterinary ophthalmologists.

1. ACVO Genetics Committee, 2008 and/or Data from CERF All-Breeds Report, 2003-2007.

OCULAR DISORDERS REPORT NORWEGIAN LUNDEHUND

Diagnostic Name	TOTAL DOGS EXAMINED	1991-1999		2000-2009		2010-2013		2014		
		14		17		17		0		
		#	%	#	%	#	%	#	%	
UVEA										
93.710	persistent pupillary membranes, iris to iris	0		9	52.9%	4	23.5%	0		
93.720	persistent pupillary membranes, iris to lens	0		1	5.9%	0		0		
LENS										
100.210	cataract, significance unknown	1	7.1%	1	5.9%	6	35.3%	0		
100.301	punctate cataract, anterior cortex	0		0		1	5.9%	0		
100.302	punctate cataract, posterior cortex	0		0		2	11.8%	0		
100.311	incipient cataract, anterior cortex	0		1	5.9%	1	5.9%	0		
100.313	incipient cataract, equatorial cortex	1	7.1%	0		0		0		
100.315	incipient cataract, posterior sutures	0		1	5.9%	1	5.9%	0		
100.330	generalized/complete cataract	3	21.4%	0		0		0		
VITREOUS										
110.320	vitreous degeneration syneresis	0		0		2	11.8%	0		
OTHER										
900.000	other, unspecified	0		1	5.9%	0		0		
NORMAL										
0.000	normal globe	9	64.3%	11	64.7%	10	58.8%	0		

OCULAR DISORDERS REPORT

NORWICH TERRIER - 1

NORWICH TERRIER

	DISORDER	INHERITANCE	REFERENCE	BREEDING ADVICE
A.	Distichiasis	Not defined	1	Breeder option
B.	Corneal dystrophy - epithelial/stromal	Not defined	1	Breeder option
C.	Persistent pupillary membranes- - iris to iris	Not defined	1	Breeder option
D.	Cataract	Not defined	1	NO
E.	Lens luxation * a DNA is available	Not defined	2, 3	NO
F.	Vitreous degeneration	Not defined	1	Breeder option

Description and Comments

A. Distichiasis

Eyelashes abnormally located on the eyelid margin which may cause ocular irritation. Distichiasis may occur at any time in the life of a dog. It is difficult to make strong recommendations with regard to breeding dogs with this entity. The hereditary basis has not been established, although it seems probable due to the high incidence in some breeds. Reducing the incidence is a logical goal. When diagnosed, distichiasis should be recorded; breeding discretion is advised.

B. Corneal dystrophy - epithelial/stromal

A non-inflammatory corneal opacity (white to gray) present in one or more of the corneal layers; usually inherited and bilateral.

C. Persistent pupillary membranes (PPM)

Persistent blood vessel remnants in the anterior chamber of the eye which fail to regress normally by 3 months of age. These strands may bridge from iris to iris, iris to cornea, iris to lens, or form sheets of tissue in the anterior chamber. The last three forms pose the

OCULAR DISORDERS REPORT

NORWICH TERRIER - 2

greatest threat to vision and when severe, vision impairment or blindness may occur.

D. Cataract

A partial or complete opacity of the lens and/or its capsule. In cases where cataracts are complete and affect both eyes, blindness results. The prudent approach is to assume cataracts to be hereditary except in cases known to be associated with trauma, other causes of ocular inflammation, specific metabolic diseases, persistent pupillary membrane, persistent hyaloid or nutritional deficiencies. Cataracts may involve the lens completely (diffuse) or in a localized region.

E. Lens luxation

Partial (subluxation) or complete displacement of the lens from the normal anatomic site behind the pupil. Lens luxation may result in blinding retinal detachment and/or elevated intraocular pressure (glaucoma) causing vision impairment, pain, and blindness.

F. Vitreous degeneration

Liquefaction of the vitreous gel which may predispose to retinal detachment.

References

There are no references providing detailed descriptions of hereditary ocular conditions of the Norwich Terrier breed. The conditions listed above are generally recognized to exist in this breed, as evidenced by identification on breed eye screening examinations and/or clinical experience of veterinary ophthalmologists.

1. ACVO Genetics Committee, 2005 and/or Data from CERF All-Breeds Report 2003-2004.
2. Farias FH, Johnson GS, Taylor JF, et al. An ADAMTS17 splice donor site mutation in dogs with primary lens luxation. *Invest Ophthalmol Vis Sci*. 2010; 51: 4716-4721.
3. Gould D et al. ADAMTS17 mutation associated with primary lens luxation is widespread among breeds. *Vet Ophthalmol* 14 (6): 378-384.

OCULAR DISORDERS REPORT NORWICH TERRIER

Diagnostic Name	TOTAL DOGS EXAMINED		1991-1999		2000-2009		2010-2013		2014	
	#	%	#	%	#	%	#	%	#	%
EYELIDS										
20.160	macropalpebral fissure	0		1	0.1%	0		0		0
22.000	ectropion, unspecified	0		1	0.1%	0		0		0
25.110	distichiasis	1	0.3%	7	0.4%	5	0.5%	3	1.9%	
NICTITANS										
52.110	prolapsed gland of the third eyelid	1	0.3%	3	0.2%	0		0		
CORNEA										
70.700	corneal dystrophy	4	1.2%	8	0.5%	2	0.2%	2	1.3%	
70.730	corneal endothelial degeneration	1	0.3%	2	0.1%	1	0.1%	0		
UVEA										
93.120	iris cyst	0		1	0.1%	0		0		0
93.150	iris coloboma	0		1	0.1%	0		0		0
93.710	persistent pupillary membranes, iris to iris	5	1.5%	107	6.6%	59	6.4%	1	0.6%	
93.720	persistent pupillary membranes, iris to lens	0		4	0.2%	0		0		0
93.730	persistent pupillary membranes, iris to cornea	1	0.3%	4	0.2%	3	0.3%	0		0
93.740	persistent pupillary membranes, iris sheets	0		1	0.1%	0		0		0
93.750	persistent pupillary membranes, lens pigment foci/no strands	0		1	0.1%	2	0.2%	1	0.6%	
93.760	persistent pupillary membranes, endothelial opacity/no strands	0		2	0.1%	3	0.3%	0		0
LENS										
100.200	cataract, unspecified	5	1.5%	0		0		0		0
100.210	cataract, significance unknown	10	3.0%	38	2.4%	20	2.2%	3	1.9%	
100.301	punctate cataract, anterior cortex	0		5	0.3%	4	0.4%	0		0
100.302	punctate cataract, posterior cortex	0		7	0.4%	1	0.1%	0		0
100.303	punctate cataract, equatorial cortex	0		2	0.1%	1	0.1%	0		0
100.305	punctate cataract, posterior sutures	0		5	0.3%	1	0.1%	0		0
100.306	punctate cataract, nucleus	0		3	0.2%	0		0		0
100.307	punctate cataract, capsular	0		1	0.1%	0		0		0
100.311	incipient cataract, anterior cortex	1	0.3%	8	0.5%	6	0.7%	0		0
100.312	incipient cataract, posterior cortex	2	0.6%	9	0.6%	5	0.5%	0		0
100.313	incipient cataract, equatorial cortex	0		8	0.5%	5	0.5%	0		0
100.314	incipient cataract, anterior sutures	0		1	0.1%	0		0		0
100.315	incipient cataract, posterior sutures	1	0.3%	5	0.3%	0		0		0
100.316	incipient cataract, nucleus	3	0.9%	6	0.4%	2	0.2%	0		0
100.317	incipient cataract, capsular	0		1	0.1%	0		0		0
100.322	incomplete cataract, posterior cortex	0		0		2	0.2%	0		0
100.330	generalized/complete cataract	3	0.9%	5	0.3%	5	0.5%	0		0
100.375	subluxation/luxation, unspecified	0		1	0.1%	0		0		0
VITREOUS										
110.120	persistant hyaloid artery/remnant	1	0.3%	2	0.1%	0		0		0
110.135	PHPV/PTVL	0		1	0.1%	0		0		0
110.320	vitreous degeneration syneresis	0		7	0.4%	4	0.4%	0		0
FUNDUS										
97.120	coloboma	1	0.3%	1	0.1%	0		0		0

OCULAR DISORDERS REPORT NORWICH TERRIER

	1991-1999	2000-2009	2010-2013	2014
RETINA				
120.170 retinal dysplasia, folds	1 0.3%	3 0.2%	3 0.3%	0
120.180 retinal dysplasia, geographic	0	4 0.2%	0	0
120.310 generalized progressive retinal atrophy (PRA)	5 1.5%	5 0.3%	4 0.4%	0
120.960 retinopathy	0	0	4 0.4%	0
OPTIC NERVE				
130.110 micropapilla	0	1 0.1%	0	0
130.120 optic nerve hypoplasia	0	6 0.4%	2 0.2%	0
130.150 optic disc coloboma	1 0.3%	2 0.1%	0	0
OTHER				
900.000 other, unspecified	0	9 0.6%	19 2.1%	0
900.100 other, not inherited	0	48 3.0%	11 1.2%	6 3.8%
900.110 other, suspected as inherited	3 0.9%	3 0.2%	5 0.5%	0
NORMAL				
0.000 normal globe	298 89.0%	1442 89.3%	828 90.5%	158 99.4%

OCULAR DISORDERS REPORT

NOVA SCOTIA DUCK TOLLING RETRIEVER - 1

NOVA SCOTIA DUCK TOLLING RETRIEVER

	DISORDER	INHERITANCE	REFERENCE	BREEDING ADVICE
A.	Distichiasis	Not defined	1	Breeder option
B.	Corneal dystrophy - epithelial/stromal	Not defined	1	Breeder option
C.	Corneal dystrophy - endothelial	Not defined	2	NO
D.	Uveal cysts	Not defined	2	Breeder option
E.	Persistent pupillary membranes			
	- iris to iris	Not defined	1, 3	Breeder option
	- iris to lens	Not defined	3	NO
	- all other forms	Not defined	3	NO
F.	Cataract	Not defined	1, 4	NO
G.	Retinal atrophy - generalized (<i>prcd</i>) *a DNA test is available	Autosomal recessive	1, 4, 5	NO
H.	Retinal dysplasia - folds	Not defined	2	Breeder option
I.	Choroidal hypoplasia (Collie Eye Anomaly) - Staphyloma/coloboma - Retinal detachment - Retinal hemorrhage - Optic nerve coloboma * a DNA test is available	Autosomal recessive	6-8	NO
J.	Micropapilla	Not defined	2, 9	Breeder option

OCULAR DISORDERS REPORT

NOVA SCOTIA DUCK TOLLING RETRIEVER - 2

Description and Comments

A. Distichiasis

Eyelashes abnormally located on the eyelid margin which may cause ocular irritation. Distichiasis may occur at any time in the life of a dog. It is difficult to make a strong recommendation with regard to breeding dogs with this entity. The hereditary basis has not been established, although it seems probable due to the high incidence in some breeds. Reducing the incidence is a logical goal. When diagnosed, distichiasis should be recorded; breeding discretion is advised.

B. Corneal dystrophy - epithelial/stromal

A non-inflammatory corneal opacity (white to gray) present in one or more of the corneal layers. Corneal dystrophy implies a probable inherited basis and is usually bilateral.

C. Corneal dystrophy - endothelial

Corneal endothelial dystrophy is an abnormal loss of the inner lining of the cornea that causes progressive fluid retention (edema). With time the edema results in keratitis and decreased vision. This usually does not occur until the animal is older. In the Basenji, this condition is less common than corneal endothelial disease caused by attachment of persistent pupillary membranes.

D. Uveal cysts

A pigmented, fluid-filled epithelial-lined structure arising from the posterior iris or ciliary body epithelium. Cysts may remain attached to the pupil margin, iris, or ciliary body, or may detach and be free-floating within the anterior chamber. They may rupture and adhere to the cornea or anterior lens capsule. Uveal cysts may occur in any breed. Uveal cysts are commonly benign, although they may be associated with other pathologic conditions in various breeds.

E. Persistent pupillary membranes (PPM)

Persistent blood vessel remnants in the anterior chamber of the eye which fail to regress normally by 3 months of age. These strands may bridge from iris to iris, iris to cornea, iris to lens, or form sheets of tissue in the anterior chamber. The last three forms pose the greatest threat to vision and when severe, vision impairment or blindness may occur.

In the Nova Scotia Duck Tolling Retriever, many of the ppm's identified on routine screening examinations bridge from the iris to the lens where they are associated with focal cataract. This may result in vision impairment.

F. Cataract

A partial or complete opacity of the lens and/or its capsule. In cases where cataracts are complete and affect both eyes, blindness results. The prudent approach is to assume

OCULAR DISORDERS REPORT

NOVA SCOTIA DUCK TOLLING RETRIEVER - 3

cataracts to be hereditary except in cases known to be associated with trauma, other causes of ocular inflammation, specific metabolic diseases, persistent pupillary membrane, persistent hyaloid or nutritional deficiencies. Cataracts may involve the lens completely (diffuse) or in a localized region.

G. Retinal atrophy - generalized (*prcd*)

A degenerative disease of the retinal visual cells which progresses to blindness. This abnormality, also known as progressive retinal atrophy or PRA, may be detected by electroretinogram (not part of a routine eye screening examination) before it is apparent clinically. Except for X-linked PRA in the Siberian Husky, in all breeds studied to date, PRA is inherited as an autosomal recessive trait. A DNA test is available

H. Retinal dysplasia - folds

Linear, triangular, curved or curvilinear foci of retinal folding that may be single or multiple. When seen in puppies, this condition may partially or completely resolve with maturity. Its significance to vision is unknown. There are two other forms of retinal dysplasia (geographic, detached) which are known to be inherited in other breeds and, in their most severe form, cause blindness. The genetic relationship between folds and more severe forms of retinal dysplasia is undetermined.

I. Choroidal hypoplasia
(Collie eye anomaly)
- Staphyloma/coloboma
- Retinal detachment
- Retinal hemorrhage
- Optic nerve coloboma

A spectrum of malformations present at birth and ranging from inadequate development of the choroid (choroidal hypoplasia) to defects of the choroid, retina, or optic nerve (coloboma/staphyloma) to complete retinal detachment (with or without hemorrhage). Mildly affected animals will have no detectable vision deficit. This disorder is collectively referred to as "Collie Eye Anomaly". A DNA test is available.

J. Micropapilla

Micropapilla refers to a small optic disc which is not associated with vision impairment. May be difficult to differentiate between micropapilla and optic nerve hypoplasia on a routine (dilated) screening ophthalmoscopic exam.

Hypoplasia of the optic nerve is seen in the Nova Scotia Duck Tolling Retriever. In this condition, the optic nerve fails to develop completely. The signs have a variety of expression and degrees of hypoplasia can be found. One or both eyes may be affected. Affected eyes may retain some function or be blind. The mode of inheritance is not clear.

OCULAR DISORDERS REPORT

NOVA SCOTIA DUCK TOLLING RETRIEVER - 4

References

There are few references providing detailed descriptions of hereditary ocular conditions of the Nova Scotia Duck Tolling Retriever breed. The conditions listed above are generally recognized to exist in this breed, as evidenced by identification on breed eye screening examinations and/or clinical experience of veterinary ophthalmologists.

1. ACVO Genetics Committee, 1999 and/or Data from CERF All-Breeds Report, 1991-1998.
2. ACVO Genetics Committee, 2000-2002 and/or Data from CERF All-Breeds Report, 2000-2002.
3. ACVO Genetics Committee, 2005 and/or Data from CERF All-Breeds Report 2003-2004.
4. Nova Scotia Duck Tolling Retriever Club of Canada. December 1990.
5. Zangerl B, Goldstein O, Philp AR, et al. Identical mutation in a novel retinal gene causes progressive rod-cone degeneration in dogs and retinitis pigmentosa in humans. *Genomics*. 2006 Nov;88:551-563.
6. ACVO Genetics Committee, 2007 and/or Data from CERF All-Breeds Report 2002-2006.
7. Parker HG, Kukekova AV, Akey DT, et al. Breed relationships facilitate fine-mapping studies: a 7.8-kb deletion cosegregates with Collie eye anomaly across multiple dog breeds. *Genome Res*. 2007 Nov;17:1562-1571.
8. Lowe JK, Kukekova AV, Kirkness EF, et al. Linkage mapping of the primary disease locus for collie eye anomaly. *Genomics*. 2003;82:86-95.
9. ACVO Genetics Committee, 2003-2004 and/or Data from CERF All-Breeds Report, 2005.

OCULAR DISORDERS REPORT NOVA SCOTIA DUCK TOLLING RETRIEVER

Diagnostic Name	TOTAL DOGS EXAMINED	1991-1999 1279		2000-2009 2424		2010-2013 1219		2014 339		
		#	%	#	%	#	%	#	%	
GLOBE										
0.110	microphthalmia	0		0		1	0.1%	0		
10.000	glaucoma	1	0.1%	0		0		0		
EYELIDS										
25.110	distichiasis	134	10.5%	335	13.8%	122	10.0%	39	11.5%	
NASOLACRIMAL										
32.110	imperforate lower nasolacrimal punctum	2	0.2%	0		0		1	0.3%	
40.910	keratoconjunctivitis sicca	0		0		1	0.1%	0		
NICTITANS										
51.100	third eyelid cartilage anomaly	0		0		2	0.2%	0		
52.110	prolapsed gland of the third eyelid	0		0		5	0.4%	0		
CORNEA										
70.700	corneal dystrophy	36	2.8%	71	2.9%	22	1.8%	6	1.8%	
70.730	corneal endothelial degeneration	2	0.2%	0		0		1	0.3%	
UVEA										
93.120	iris cyst	0		14	0.6%	6	0.5%	1	0.3%	
93.140	corneal endothelial pigment without PPM	0		0		1	0.1%	0		
93.710	persistent pupillary membranes, iris to iris	19	1.5%	60	2.5%	19	1.6%	13	3.8%	
93.720	persistent pupillary membranes, iris to lens	19	1.5%	33	1.4%	1	0.1%	0		
93.730	persistent pupillary membranes, iris to cornea	0		2	0.1%	0		0		
93.740	persistent pupillary membranes, iris sheets	2	0.2%	6	0.2%	0		0		
93.750	persistent pupillary membranes, lens pigment foci/no strands	0		9	0.4%	84	6.9%	14	4.1%	
93.760	persistent pupillary membranes, endothelial opacity/no strands	0		0		2	0.2%	0		
95.120	ciliary body cyst	0		0		1	0.1%	0		
LENS										
100.200	cataract, unspecified	18	1.4%	0		0		0		
100.210	cataract, significance unknown	62	4.8%	143	5.9%	67	5.5%	17	5.0%	
100.301	punctate cataract, anterior cortex	9	0.7%	6	0.2%	8	0.7%	0		
100.302	punctate cataract, posterior cortex	10	0.8%	12	0.5%	5	0.4%	2	0.6%	
100.303	punctate cataract, equatorial cortex	6	0.5%	2	0.1%	1	0.1%	0		
100.305	punctate cataract, posterior sutures	3	0.2%	1	0.0%	0		1	0.3%	
100.306	punctate cataract, nucleus	2	0.2%	3	0.1%	3	0.2%	1	0.3%	
100.307	punctate cataract, capsular	2	0.2%	4	0.2%	8	0.7%	0		
100.311	incipient cataract, anterior cortex	3	0.2%	10	0.4%	3	0.2%	0		
100.312	incipient cataract, posterior cortex	10	0.8%	14	0.6%	7	0.6%	1	0.3%	
100.313	incipient cataract, equatorial cortex	3	0.2%	11	0.5%	2	0.2%	0		
100.314	incipient cataract, anterior sutures	0		0		0		1	0.3%	
100.315	incipient cataract, posterior sutures	3	0.2%	0		0		0		
100.316	incipient cataract, nucleus	2	0.2%	3	0.1%	4	0.3%	1	0.3%	
100.317	incipient cataract, capsular	0		6	0.2%	2	0.2%	0		
100.321	incomplete cataract, anterior cortex	0		0		1	0.1%	2	0.6%	
100.322	incomplete cataract, posterior cortex	0		0		0		1	0.3%	
100.330	generalized/complete cataract	1	0.1%	5	0.2%	0		1	0.3%	

OCULAR DISORDERS REPORT NOVA SCOTIA DUCK TOLLING RETRIEVER

	1991-1999	2000-2009	2010-2013	2014
VITREOUS				
110.120 persistant hyaloid artery/remnant	2 0.2%	6 0.2%	2 0.2%	0
110.135 PHPV/PTVL	3 0.2%	4 0.2%	0	0
110.320 vitreous degeneration syneresis	1 0.1%	7 0.3%	4 0.3%	0
110.330 vitreous degeneration anterior chamber	0	0	1 0.1%	0
FUNDUS				
97.110 choroidal hypoplasia	0	2 0.1%	0	0
RETINA				
120.170 retinal dysplasia, folds	10 0.8%	25 1.0%	7 0.6%	2 0.6%
120.180 retinal dysplasia, geographic	7 0.5%	2 0.1%	5 0.4%	1 0.3%
120.200 retinitis	0	0	0	1 0.3%
120.310 generalized progressive retinal atrophy (PRA)	68 5.3%	25 1.0%	4 0.3%	0
OPTIC NERVE				
130.110 micropapilla	2 0.2%	2 0.1%	4 0.3%	1 0.3%
130.120 optic nerve hypoplasia	4 0.3%	6 0.2%	1 0.1%	1 0.3%
130.150 optic disc coloboma	0	2 0.1%	1 0.1%	0
OTHER				
900.000 other, unspecified	0	35 1.4%	63 5.2%	0
900.100 other, not inherited	16 1.3%	262 10.8%	25 2.1%	13 3.8%
900.110 other, suspected as inherited	5 0.4%	11 0.5%	9 0.7%	0
NORMAL				
0.000 normal globe	917 71.7%	1905 78.6%	1046 85.8%	291 85.8%

OCULAR DISORDERS REPORT

OLD ENGLISH SHEEPDOG - 1

OLD ENGLISH SHEEPDOG

	DISORDER	INHERITANCE	REFERENCE	BREEDING ADVICE
A.	Microphthalmia with multiple ocular anomalies	Not defined	1, 2	NO
B.	Distichiasis	Not defined	3	Breeder option
C.	Corneal dystrophy - epithelial/stromal	Not defined	4	Breeder option
D.	Persistent pupillary membranes - iris to iris - all other forms	Not defined Not defined	1, 4 4	Breeder option NO
E.	Uveodermatologic syndrome	Not defined	1	NO
F.	Cataract	Not defined	1, 2, 5	NO
G.	Vitreous degeneration	Not defined	7	Breeder option
H.	Retinal atrophy - generalized	Not defined	1	NO
I.	Retinal dysplasia - folds	Not defined	1	Breeder option
J.	Persistent hyperplastic primary vitreous/ Persistent hyperplastic tunica vasculosa lentis	Not defined	6	NO
K.	Coloboma/ Staphyloma	Not defined	6	NO
L.	Retinal Detachment	Not defined	4	NO
M.	Micropapilla	Not defined	6	Breeder option

©2014, American College of Veterinary Ophthalmologists

OCULAR DISORDERS REPORT

OLD ENGLISH SHEEPDOG - 2

Description and Comments

A. Microphthalmia with multiple congenital ocular defects

Microphthalmia is a developmental anomaly in which the eyeball is abnormally small. This is often associated with other ocular malformations, including defects of the cornea, anterior chamber, lens and/or retina.

Microphthalmia with cataract and retinal abnormalities including retinal detachment, has been reported in litters of Old English Sheepdogs. Lesions were non-progressive. However, blindness did result in some dogs. The mode of inheritance is unknown, but affected dogs should not be bred.

B. Distichiasis

Eyelashes abnormally located on the eyelid margin which may cause ocular irritation. Distichiasis may occur at any time in the life of a dog. It is difficult to make a strong recommendation with regard to breeding dogs with this entity. The hereditary basis has not been established, although it seems probable due to the high incidence in some breeds. Reducing the incidence is a logical goal. When diagnosed, distichiasis should be recorded; breeding discretion is advised.

C. Corneal dystrophy - epithelial/stromal

A non-inflammatory corneal opacity (white to gray) present in one or more of the corneal layers. Corneal dystrophy implies a probable inherited basis and is usually bilateral.

D. Persistent pupillary membrane (PPM)

Persistent blood vessel remnants in the anterior chamber of the eye which fail to regress normally by 3 months of age. These strands may bridge from iris to iris, iris to cornea, iris to lens, or form sheets of tissue in the anterior chamber. The last three forms pose the greatest threat to vision and when severe, vision impairment or blindness may occur.

E. Uveodermatologic syndrome

Uveodermatologic syndrome in the Old English Sheepdog bears many similarities to a condition in people called Vogt-Koyanagi-Harada (or VKH) syndrome. Thus, the condition in dogs is often referred to as VKH or VKH-like syndrome. It is an immune-mediated syndrome of severe uveitis combined with dermal depigmentation (vitiligo) and hair depigmentation (poliosis). Secondary glaucoma and/or retinal detachment are frequent complications of this disease. Affected dogs are generally young ranging in age between 1 1/2-4 years. The first clinical signs are usually inflammation of the intraocular structures (or uveitis) in both eyes. The uveitis is very difficult to control medically and ultimately results in blindness in most affected dogs. A similar syndrome is seen in people and is called Vogt-Koyanagi-Harada syndrome (VKH).

OCULAR DISORDERS REPORT

OLD ENGLISH SHEEPDOG - 3

F. Cataract

A partial or complete opacity of the lens and/or its capsule. In cases where cataracts are complete and affect both eyes, blindness results. The prudent approach is to assume cataracts to be hereditary except in cases known to be associated with trauma, other causes of ocular inflammation, specific metabolic diseases, persistent pupillary membrane, persistent hyaloid or nutritional deficiencies. Cataracts may involve the lens completely (diffuse) or in a localized region. In one study of 66 interrelated Old English Sheepdogs, an autosomal recessive mode of inheritance was suggested. Retinal detachment was an associated finding in 5/43 affected dogs in this study. The location of the opacity within the lens and the age of onset was highly variable.

G. Vitreous degeneration

Liquefaction of the vitreous gel which may predispose to retinal detachment.

H. Retinal atrophy - generalized

A degenerative disease of the retinal visual cells which progresses to blindness. This abnormality, also known as progressive retinal atrophy or PRA, may be detected by electroretinogram (not part of a routine eye screening examination) before it is apparent clinically. Except for X-linked PRA in the Siberian Husky, in all breeds studied to date, PRA is inherited as an autosomal recessive trait.

I. Retinal dysplasia - folds

Linear, triangular, curved or curvilinear foci of retinal folding that may be single or multiple. When seen in puppies, this condition may partially or completely resolve with maturity. Its significance to vision is unknown. There are two other forms of retinal dysplasia (geographic, detached) which are known to be inherited in other breeds and, in their most severe form, cause blindness. The genetic relationship between folds and more severe forms of retinal dysplasia is undetermined.

J. Persistent hyperplastic primary vitreous (PHPV)/Persistent hyperplastic tunica vasculosa lentis (PHTVL)

Persistent hyperplastic primary vitreous is a congenital defect resulting from abnormalities in the development and regression of the hyaloid artery (the primary vitreous) and the interaction of this blood vessel with the posterior lens capsule/cortex during embryogenesis. This condition is often associated with persistent hyperplastic tunica vasculosa lentis which results from failure of regression of the embryologic vascular network which surrounds the developing lens.

The majority of affected dogs have a retrolental fibrovascular plaque and variable lenticular defects which include posterior lenticonus/globus, colobomata, intralenticular hemorrhage and/or secondary cataracts. Vision impairment may result. The disease is an inherited disorder in the breed, but the mode of inheritance has not been defined. The results of current studies cannot rule out autosomal recessive or a dominant trait with incomplete

OCULAR DISORDERS REPORT

OLD ENGLISH SHEEPDOG - 4

penetrance.

K. Coloboma/staphyloma (unassociated with microphthalmia)

A coloboma is a congenital defect which may affect the iris, choroid or optic disc. Iris colobomas are seen as notches in the pupillary margin. Scleral ectasia is defined as a congenital thinning and secondary distention of the sclera; when lined by uveal tissue it is called a staphyloma. These may be anteriorly located, apparent as a bulge beneath the upper eyelid or posteriorly located, requiring visualization with an ophthalmoscope. These conditions may or may not be genetically related to the same anomalies seen associated with microphthalmia (entity "A" above).

L. Retinal Detachment

A separation of the sensory retina from the underlying tissue. It results in blindness when complete.

M. Micropapilla

Micropapilla refers to a small optic disc which is not associated with vision impairment. May be difficult to differentiate between micropapilla and optic nerve hypoplasia on a routine (dilated) screening ophthalmoscopic exam.

Hypoplasia of the optic nerve is seen in the Old English Sheepdog. In this condition, the optic nerve fails to develop completely. The signs have a variety of expression and degrees of hypoplasia can be found. One or both eyes may be affected. Affected eyes may retain some function or be blind. The mode of inheritance is not clear.

References

1. ACVO Genetics Committee, 1999 and/or Data from CERF All-Breeds Report, 1991-1998.
2. Barrie K. Posterior lenticonus, microphthalmia, cataracts and retinal folds in Old English Sheepdogs. *J Am Anim Hosp Assoc.* 1979;15:715.
3. ACVO Genetics Committee, 2002-2003 and/or Data from CERF All-Breeds Report, 2002-2003.
4. ACVO Genetics Committee, 2005 and/or Data from CERF All-Breeds Report 2003-2004.
5. Koch SA. Cataracts in interrelated old English Sheepdogs. *J Am Vet Med Assoc.* 1972 Feb 1;160:299-301.
6. ACVO Genetics Committee, 2000-2002 and/or Data from CERF All-Breeds Report, 2000-2002.
7. ACVO Genetics Committee, 2014 and/or Data from OFA All-Breeds Report, 2013-2014.

OCULAR DISORDERS REPORT OLD ENGLISH SHEEPDOG

Diagnostic Name	TOTAL DOGS EXAMINED	1991-1999 1825		2000-2009 1997		2010-2013 789		2014 221		
		#	%	#	%	#	%	#	%	
GLOBE										
0.110	microphthalmia	8	0.4%	1	0.1%	1	0.1%	0		
10.000	glaucoma	4	0.2%	0		0		0		
EYELIDS										
20.160	macropalpebral fissure	0		1	0.1%	0		0		
21.000	entropion, unspecified	7	0.4%	4	0.2%	1	0.1%	0		
22.000	ectropion, unspecified	1	0.1%	1	0.1%	0		0		
25.110	distichiasis	27	1.5%	26	1.3%	19	2.4%	3	1.4%	
NASOLACRIMAL										
32.110	imperforate lower nasolacrimal punctum	1	0.1%	0		0		0		
NICTITANS										
51.100	third eyelid cartilage anomaly	1	0.1%	0		0		0		
52.110	prolapsed gland of the third eyelid	0		0		1	0.1%	0		
CORNEA										
70.700	corneal dystrophy	2	0.1%	6	0.3%	1	0.1%	0		
UVEA										
93.140	corneal endothelial pigment without PPM	0		1	0.1%	0		0		
93.150	iris coloboma	0		1	0.1%	0		0		
93.710	persistent pupillary membranes, iris to iris	110	6.0%	182	9.1%	102	12.9%	16	7.2%	
93.720	persistent pupillary membranes, iris to lens	2	0.1%	5	0.3%	0		0		
93.730	persistent pupillary membranes, iris to cornea	3	0.2%	6	0.3%	0		0		
93.740	persistent pupillary membranes, iris sheets	2	0.1%	8	0.4%	0		0		
93.750	persistent pupillary membranes, lens pigment foci/no strands	0		0		0		2	0.9%	
93.760	persistent pupillary membranes, endothelial opacity/no strands	0		0		3	0.4%	0		
LENS										
100.200	cataract, unspecified	35	1.9%	0		0		0		
100.210	cataract, significance unknown	77	4.2%	116	5.8%	52	6.6%	12	5.4%	
100.301	punctate cataract, anterior cortex	9	0.5%	17	0.9%	9	1.1%	2	0.9%	
100.302	punctate cataract, posterior cortex	2	0.1%	5	0.3%	1	0.1%	1	0.5%	
100.303	punctate cataract, equatorial cortex	1	0.1%	3	0.2%	0		0		
100.304	punctate cataract, anterior sutures	4	0.2%	0		1	0.1%	0		
100.305	punctate cataract, posterior sutures	3	0.2%	1	0.1%	0		0		
100.306	punctate cataract, nucleus	9	0.5%	2	0.1%	1	0.1%	0		
100.307	punctate cataract, capsular	2	0.1%	3	0.2%	1	0.1%	0		
100.311	incipient cataract, anterior cortex	21	1.2%	20	1.0%	3	0.4%	0		
100.312	incipient cataract, posterior cortex	21	1.2%	19	1.0%	3	0.4%	0		
100.313	incipient cataract, equatorial cortex	6	0.3%	6	0.3%	3	0.4%	0		
100.314	incipient cataract, anterior sutures	2	0.1%	9	0.5%	0		0		
100.315	incipient cataract, posterior sutures	4	0.2%	8	0.4%	1	0.1%	0		
100.316	incipient cataract, nucleus	16	0.9%	12	0.6%	1	0.1%	0		
100.317	incipient cataract, capsular	1	0.1%	4	0.2%	0		0		
100.321	incomplete cataract, anterior cortex	0		0		1	0.1%	0		
100.330	generalized/complete cataract	43	2.4%	10	0.5%	7	0.9%	1	0.5%	
100.340	resorbing/hypermature cataract	0		0		1	0.1%	1	0.5%	

OCULAR DISORDERS REPORT OLD ENGLISH SHEEPDOG

LENS CONTINUED	1991-1999	2000-2009	2010-2013	2014
100.375 subluxation/luxation, unspecified	4 0.2%	2 0.1%	0	0
VITREOUS				
110.120 persistant hyaloid artery/remnant	10 0.5%	6 0.3%	0	0
110.135 PHPV/PTVL	0	3 0.2%	0	0
110.200 vitritis	0	0	2 0.3%	1 0.5%
110.320 vitreous degeneration syneresis	6 0.3%	13 0.7%	7 0.9%	0
FUNDUS				
97.110 choroidal hypoplasia	1 0.1%	0	1 0.1%	0
97.120 coloboma	0	1 0.1%	0	0
RETINA				
120.170 retinal dysplasia, folds	32 1.8%	40 2.0%	12 1.5%	1 0.5%
120.180 retinal dysplasia, geographic	5 0.3%	1 0.1%	2 0.3%	0
120.190 retinal dysplasia, detached	0	0	2 0.3%	0
120.310 generalized progressive retinal atrophy (PRA)	7 0.4%	2 0.1%	4 0.5%	0
120.400 retinal hemorrhage	1 0.1%	0	0	0
120.910 retinal detachment without dialysis	4 0.2%	5 0.3%	0	0
OPTIC NERVE				
130.110 micropapilla	1 0.1%	8 0.4%	3 0.4%	1 0.5%
130.120 optic nerve hypoplasia	7 0.4%	8 0.4%	0	0
130.150 optic disc coloboma	2 0.1%	1 0.1%	1 0.1%	0
OTHER				
900.000 other, unspecified	0	13 0.7%	22 2.8%	0
900.100 other, not inherited	3 0.2%	73 3.7%	8 1.0%	9 4.1%
900.110 other, suspected as inherited	8 0.4%	11 0.6%	4 0.5%	0
NORMAL				
0.000 normal globe	1448 79.3%	1637 82.0%	668 84.7%	206 93.2%

OCULAR DISORDERS REPORT

PAPILLON - 1

PAPILLON

	DISORDER	INHERITANCE	REFERENCE	BREEDING ADVICE
A.	Distichiasis	Not defined	1,2	Breeder option
B.	Corneal dystrophy - epithelial/stromal	Not defined	3	Breeder option
C.	Persistent pupillary membranes			
	- iris to iris	Not defined	2,4	Breeder option
	- all other forms	Not defined	2	NO
D.	Cataract	Not defined	4	NO
E.	Vitreous degeneration	Not defined	4	Breeder option
F.	Retinal atrophy - generalized * a DNA test is available	Presumed autosomal recessive	4-9	NO
G.	Retinal dysplasia - folds	Not defined	10	Breeder option
H.	Optic nerve - micropapilla	Not defined	11	Breeder option

Description and Comments

A. Distichiasis

Eyelashes abnormally located on the eyelid margin which may cause ocular irritation. Distichiasis may occur at any time in the life of a dog. It is difficult to make a strong recommendation with regard to breeding dogs with this entity. The hereditary basis has not been established although it seems probable due to the high incidence in some breeds. Reducing the incidence is a logical goal. When diagnosed, distichiasis should be recorded; breeding discretion is advised.

B. Corneal dystrophy- epithelial/stromal

A non-inflammatory corneal opacity (white to gray) present in one or more of the corneal layers. Corneal dystrophy implies a probable inherited basis and is usually bilateral.

OCULAR DISORDERS REPORT

PAPILLON - 2

C. Persistent pupillary membranes (PPM)

Persistent blood vessel remnants in the anterior chamber of the eye which fail to regress normally by 3 months of age. These strands may bridge from iris to iris, iris to cornea, iris to lens, or form sheets of tissue in the anterior chamber. The last three forms pose the greatest threat to vision and when severe, vision impairment or blindness may occur

D. Cataract

A partial or complete opacity of the lens and/or its capsule. In cases where cataracts are complete and affect both eyes, blindness results. The prudent approach is to assume cataracts to be hereditary except in cases known to be associated with trauma, other causes of ocular inflammation, specific metabolic diseases, persistent pupillary membrane, persistent hyaloid or nutritional deficiencies. Cataracts may involve the lens completely (diffuse) or in a localized region.

Nuclear and posterior cortical cataracts have been reported in the Papillon.

E. Vitreous degeneration

A liquefaction of the vitreous gel, which may predispose to retinal detachment resulting in blindness.

F. Retinal atrophy - generalized

A degenerative disease of the retinal visual cells which progresses to blindness. This abnormality, also known as progressive retinal atrophy or PRA, may be detected by electroretinogram (not part of a routine eye screening examination) before it is apparent clinically. In one study of 707 dogs in Sweden an autosomal recessive mode of inheritance was suggested. Clinical onset is reported at 5-6 years of age. In approximately 70% of cases of PRA in the Papillon, a CNGB1 mutation is present, leading to an abnormal CNGA1 protein in the rod outer segments. The mode of transmission is autosomal recessive. A genetic test is available.

G. Retinal dysplasia – folds

Linear, triangular, curved or curvilinear foci of retinal folding that may be single or multiple. When seen in puppies, this condition may partially or completely resolve with maturity. Its significance to vision is unknown. There are two other forms of retinal dysplasia (geographic, detached) which are known to be inherited in other breeds and, in their most severe form, cause blindness. The genetic relationship between folds and more severe forms of retinal dysplasia is undetermined.

G. Micropapilla

Hypoplasia of the optic nerve is seen in the Papillon. In this condition, the optic nerve fails to develop completely. The signs have a variety of expression and degrees of hypoplasia can be found. One or both eyes may be affected. Affected eyes may retain some function or be

OCULAR DISORDERS REPORT

PAPILLON - 3

blind. The mode of inheritance is not clear.

References

There are few references providing detailed descriptions of hereditary ocular conditions of the Papillon breed. The conditions listed above are generally recognized to exist in this breed, as evidenced by identification on breed eye screening examinations and/or clinical experience of veterinary ophthalmologists.

1. ACVO Genetics Committee, 2002-2003 and/or Data from CERF All-Breeds Report, 2002-2003.
2. ACVO Genetics Committee, 2005 and/or Data from CERF All-Breeds Report 2003-2004.
3. ACVO Genetics Committee, 2008 and/or Data from CERF All-Breeds Report, 2003-2007.
4. ACVO Genetics Committee, 1999 and/or Data from CERF All-Breeds Report, 1991-1998.
5. Haakanson N, Narfstrom K. Progressive retinal atrophy in papillon dogs in Sweden: A clinical survey. *Prog Vet Comp Ophthalmol*. 1995;5:83.
6. Petersen-Jones SM, Bartoe JT, Winkler P. Characterization of retinal dystrophies in papillons. *ECVO*, 2011.
7. Narfstrom K, Ekesten B. Electroretinographic evaluation of Papillons with and without hereditary retinal degeneration. *Am J Vet Res*. 1998;59:221-226.
8. Ahonen SJ, Arumilli M, Lohi H. A CNGB1 frameshift mutation in Papillon and Phalene dogs with progressive retinal atrophy. *PLoS One*. 2013;8:e72122.
9. Winkler PA, Ekenstedt KJ, Occelli LM, et al. A large animal model for CNGB1 autosomal recessive retinitis pigmentosa. *PLoS One*. 2013;8:e72229.
10. ACVO Genetics Committee, 2013-2014 and Data from OFA All-Breeds Report, 2013-2014.
11. ACVO Genetics Committee, 2000-2002 and/or Data from CERF All-Breeds Report, 2000-2002.

OCULAR DISORDERS REPORT PAPILLON

Diagnostic Name	TOTAL DOGS EXAMINED		1991-1999 3446		2000-2009 4886		2010-2013 1587		2014 402	
	#	%	#	%	#	%	#	%	#	%
GLOBE										
0.110	microphthalmia	3	0.1%	5	0.1%	0		0		0
10.000	glaucoma	1	0.0%	0		0		0		0
EYELIDS										
21.000	entropion, unspecified	5	0.1%	6	0.1%	4	0.3%	0		0
25.110	distichiasis	39	1.1%	74	1.5%	23	1.4%	5	1.2%	
NASOLACRIMAL										
32.110	imperforate lower nasolacrimal punctum	1	0.0%	0		0		0		0
NICTITANS										
52.110	prolapsed gland of the third eyelid	3	0.1%	0		0		0		0
CORNEA										
70.210	corneal pannus	3	0.1%	2	0.0%	0		0		0
70.220	pigmentary keratitis	0		1	0.0%	0		0		1 0.2%
70.700	corneal dystrophy	28	0.8%	48	1.0%	16	1.0%	3	0.7%	
70.730	corneal endothelial degeneration	1	0.0%	2	0.0%	0		1	0.2%	
UVEA										
93.110	iris hypoplasia	0		0		0		1	0.2%	
93.120	iris cyst	1	0.0%	3	0.1%	0		0		0
93.140	corneal endothelial pigment without PPM	0		1	0.0%	0		0		0
93.710	persistent pupillary membranes, iris to iris	51	1.5%	160	3.3%	63	4.0%	20	5.0%	
93.720	persistent pupillary membranes, iris to lens	4	0.1%	3	0.1%	0		0		0
93.730	persistent pupillary membranes, iris to cornea	4	0.1%	3	0.1%	0		1	0.2%	
93.740	persistent pupillary membranes, iris sheets	4	0.1%	2	0.0%	0		0		0
93.750	persistent pupillary membranes, lens pigment foci/no strands	0		2	0.0%	6	0.4%	3	0.7%	
93.760	persistent pupillary membranes, endothelial opacity/no strands	0		0		6	0.4%	0		0
LENS										
100.200	cataract, unspecified	19	0.6%	0		0		0		0
100.210	cataract, significance unknown	98	2.8%	159	3.3%	50	3.2%	15	3.7%	
100.301	punctate cataract, anterior cortex	24	0.7%	20	0.4%	8	0.5%	3	0.7%	
100.302	punctate cataract, posterior cortex	8	0.2%	8	0.2%	2	0.1%	0		0
100.303	punctate cataract, equatorial cortex	4	0.1%	5	0.1%	2	0.1%	1	0.2%	
100.304	punctate cataract, anterior sutures	3	0.1%	1	0.0%	0		0		0
100.305	punctate cataract, posterior sutures	4	0.1%	3	0.1%	0		0		0
100.306	punctate cataract, nucleus	6	0.2%	5	0.1%	5	0.3%	1	0.2%	
100.307	punctate cataract, capsular	1	0.0%	6	0.1%	2	0.1%	0		0
100.311	incipient cataract, anterior cortex	32	0.9%	40	0.8%	6	0.4%	2	0.5%	
100.312	incipient cataract, posterior cortex	22	0.6%	26	0.5%	1	0.1%	1	0.2%	
100.313	incipient cataract, equatorial cortex	11	0.3%	14	0.3%	4	0.3%	1	0.2%	
100.314	incipient cataract, anterior sutures	2	0.1%	4	0.1%	0		0		0
100.315	incipient cataract, posterior sutures	4	0.1%	6	0.1%	0		0		0
100.316	incipient cataract, nucleus	7	0.2%	8	0.2%	4	0.3%	0		0
100.317	incipient cataract, capsular	0		5	0.1%	0		2	0.5%	
100.322	incomplete cataract, posterior cortex	0		0		0		1	0.2%	
100.323	incomplete cataract, equatorial cortex	0		0		0		1	0.2%	

OCULAR DISORDERS REPORT PAPILLON

LENS CONTINUED	1991-1999	2000-2009	2010-2013	2014
100.326 incomplete cataract, nucleus	0	0	0	2 0.5%
100.330 generalized/complete cataract	22 0.6%	21 0.4%	3 0.2%	0
100.375 subluxation/luxation, unspecified	1 0.0%	3 0.1%	1 0.1%	0
VITREOUS				
110.120 persistent hyaloid artery/remnant	13 0.4%	16 0.3%	5 0.3%	1 0.2%
110.135 PHPV/PTVL	5 0.1%	7 0.1%	2 0.1%	0
110.200 vitritis	0	0	2 0.1%	0
110.320 vitreous degeneration syneresis	78 2.3%	136 2.8%	52 3.3%	4 1.0%
110.330 vitreous degeneration anterior chamber	0	19 0.4%	8 0.5%	0
FUNDUS				
97.120 coloboma	2 0.1%	0	0	0
RETINA				
120.170 retinal dysplasia, folds	24 0.7%	24 0.5%	14 0.9%	2 0.5%
120.180 retinal dysplasia, geographic	0	8 0.2%	2 0.1%	0
120.190 retinal dysplasia, detached	1 0.0%	1 0.0%	0	1 0.2%
120.200 retinitis	0	0	1 0.1%	0
120.310 generalized progressive retinal atrophy (PRA)	49 1.4%	49 1.0%	9 0.6%	1 0.2%
120.400 retinal hemorrhage	1 0.0%	0	0	0
120.910 retinal detachment without dialysis	3 0.1%	4 0.1%	1 0.1%	0
120.920 retinal detachment with dialysis	0	0	0	1 0.2%
120.960 retinopathy	0	0	1 0.1%	0
OPTIC NERVE				
130.110 micropapilla	0	7 0.1%	1 0.1%	0
130.120 optic nerve hypoplasia	6 0.2%	4 0.1%	0	0
130.150 optic disc coloboma	3 0.1%	0	0	0
OTHER				
900.000 other, unspecified	0	25 0.5%	52 3.3%	0
900.100 other, not inherited	16 0.5%	185 3.8%	19 1.2%	16 4.0%
900.110 other, suspected as inherited	11 0.3%	12 0.2%	6 0.4%	0
NORMAL				
0.000 normal globe	2985 86.6%	4280 87.6%	1429 90.0%	367 91.3%

OCULAR DISORDERS REPORT

PARSON RUSSELL TERRIER - 1

PARSON RUSSELL TERRIER

	DISORDER	INHERITANCE	REFERENCE	BREEDING ADVICE
A.	Distichiasis	Not defined	1	Breeder option
B.	Persistent pupillary membranes - iris to iris	Not defined	1	Breeder option
C.	Cataract	Not defined	1, 2	NO
D.	Lens luxation * a DNA test is available	Not defined	3, 5	NO
E.	Vitreous degeneration	Not defined	4	Breeder option
F.	Retinal atrophy - generalized	Not defined	6	NO

Description and Comments

A. Distichiasis

Eyelashes abnormally located on the eyelid margin which may cause ocular irritation. Distichiasis may occur at any time in the life of a dog. It is difficult to make a strong recommendation with regard to breeding dogs with this entity. The hereditary basis has not been established although it seems probable due to the high incidence in some breeds. Reducing the incidence is a logical goal. When diagnosed, distichiasis should be recorded; breeding discretion is advised.

B. Persistent pupillary membranes (PPM)

Persistent blood vessel remnants in the anterior chamber of the eye which fail to regress normally by 3 months of age. These strands may bridge from iris to iris, iris to cornea, iris to lens, or form sheets of tissue in the anterior chamber. The last three forms pose the greatest threat to vision and when severe, vision impairment or blindness may occur.

C. Cataract

A partial or complete opacity of the lens and/or its capsule. In cases where cataracts are

OCULAR DISORDERS REPORT

PARSON RUSSELL TERRIER - 2

complete and affect both eyes, blindness results. The prudent approach is to assume cataracts to be hereditary except in cases known to be associated with trauma, other causes of ocular inflammation, specific metabolic diseases, persistent pupillary membrane, persistent hyaloid or nutritional deficiencies. Cataracts may involve the lens completely (diffuse) or in a localized region.

D. Lens luxation

Partial (subluxation) or complete displacement of the lens from the normal anatomic site behind the pupil. Lens luxation may result in blinding retinal detachment and/or elevated intraocular pressure (glaucoma) causing vision impairment, pain, and blindness. A DNA test is available.

E. Vitreous degeneration

Liquefaction of the vitreous gel which may predispose to retinal detachment resulting in blindness.

F. Retinal atrophy - generalized

A degenerative disease of the retinal visual cells which progresses to blindness. This abnormality, also known as Progressive Retinal Atrophy or PRA, may be detected by electroretinogram (not part of a routine eye screening examination) before it is apparent clinically. Except for X-linked PRA in the Siberian Husky, in all breeds studied to date, PRA is inherited as an autosomal recessive trait.

References

1. ACVO Genetics Committee, 2005 and/or Data from CERF All-Breeds Report 2003-2004.
2. Oberbauer AM, Hollingsworth SR, Belanger JM, et al. Inheritance of cataracts and primary lens luxation in Jack Russell Terriers. *Am J Vet Res.* 2008; 69: 222-227.
3. Farias FH, Johnson GS, Taylor JF, et al. An ADAMTS17 splice donor site mutation in dogs with primary lens luxation. *Invest Ophthalmol Vis Sci.* 2010; 51: 4716-4721.
4. ACVO Genetics Committee, 2007 and/or Data from CERF All-Breeds Report 2002-2006.
5. Gould D et al. ADAMTS17 mutation associated with primary lens luxation is widespread among breeds. *Vet Ophthalmol* 14 (6): 378-384.
6. ACVO Genetics Committee, 2014 and/or Data from OFA All-Breeds Report 2013-2014.

OCULAR DISORDERS REPORT PARSON RUSSELL TERRIER

Diagnostic Name	TOTAL DOGS EXAMINED	1991-1999		2000-2009		2010-2013		2014	
		#	%	#	%	#	%	#	%
EYELIDS									
25.110	distichiasis	0		44	2.3%	21	3.9%	1	0.9%
CORNEA									
70.700	corneal dystrophy	0		11	0.6%	2	0.4%	1	0.9%
70.730	corneal endothelial degeneration	0		2	0.1%	0		0	
UVEA									
93.120	iris cyst	0		2	0.1%	0		0	
93.710	persistent pupillary membranes, iris to iris	1	50.0%	93	4.8%	54	9.9%	12	11.1%
93.720	persistent pupillary membranes, iris to lens	0		1	0.1%	0		0	
93.730	persistent pupillary membranes, iris to cornea	0		1	0.1%	2	0.4%	0	
93.740	persistent pupillary membranes, iris sheets	0		1	0.1%	0		0	
93.750	persistent pupillary membranes, lens pigment foci/no strands	0		0		5	0.9%	0	
93.760	persistent pupillary membranes, endothelial opacity/no strands	0		0		4	0.7%	0	
LENS									
100.210	cataract, significance unknown	0		45	2.3%	31	5.7%	6	5.6%
100.301	punctate cataract, anterior cortex	0		7	0.4%	5	0.9%	0	
100.302	punctate cataract, posterior cortex	0		6	0.3%	2	0.4%	0	
100.303	punctate cataract, equatorial cortex	0		1	0.1%	3	0.6%	0	
100.304	punctate cataract, anterior sutures	0		0		1	0.2%	0	
100.305	punctate cataract, posterior sutures	0		3	0.2%	2	0.4%	0	
100.306	punctate cataract, nucleus	0		1	0.1%	1	0.2%	0	
100.307	punctate cataract, capsular	0		1	0.1%	0		1	0.9%
100.311	incipient cataract, anterior cortex	0		12	0.6%	3	0.6%	0	
100.312	incipient cataract, posterior cortex	0		36	1.9%	4	0.7%	0	
100.313	incipient cataract, equatorial cortex	0		5	0.3%	1	0.2%	0	
100.314	incipient cataract, anterior sutures	0		0		2	0.4%	0	
100.315	incipient cataract, posterior sutures	0		12	0.6%	1	0.2%	0	
100.316	incipient cataract, nucleus	0		1	0.1%	0		0	
100.317	incipient cataract, capsular	0		8	0.4%	1	0.2%	0	
100.322	incomplete cataract, posterior cortex	0		0		4	0.7%	0	
100.330	generalized/complete cataract	0		6	0.3%	5	0.9%	0	
100.375	subluxation/luxation, unspecified	0		1	0.1%	0		0	
VITREOUS									
110.120	persistant hyaloid artery/remnant	0		4	0.2%	0		0	
110.135	PHPV/PTVL	0		1	0.1%	0		0	
110.320	vitreous degeneration syneresis	0		21	1.1%	14	2.6%	0	
110.330	vitreous degeneration anterior chamber	0		6	0.3%	3	0.6%	0	
FUNDUS									
97.120	coloboma	0		1	0.1%	0		0	
RETINA									
120.170	retinal dysplasia, folds	0		3	0.2%	2	0.4%	2	1.9%
120.180	retinal dysplasia, geographic	0		0		2	0.4%	0	
120.200	retinitis	0		0		1	0.2%	0	
120.310	generalized progressive retinal atrophy (PRA)	0		19	1.0%	6	1.1%	1	0.9%

OCULAR DISORDERS REPORT PARSON RUSSELL TERRIER

RETINA CONTINUED	1991-1999	2000-2009	2010-2013	2014
120.910 retinal detachment without dialysis	0	1 0.1%	0	0
120.960 retinopathy	0	0	1 0.2%	0
OPTIC NERVE				
130.110 micropapilla	0	2 0.1%	0	0
130.120 optic nerve hypoplasia	0	2 0.1%	0	0
OTHER				
900.000 other, unspecified	0	18 0.9%	21 3.9%	0
900.100 other, not inherited	0	97 5.0%	10 1.8%	5 4.6%
900.110 other, suspected as inherited	0	2 0.1%	1 0.2%	0
NORMAL				
0.000 normal globe	1 50.0%	1733 89.7%	467 85.7%	98 90.7%

OCULAR DISORDERS REPORT

PATTERDALE TERRIER - 1

PATTERDALE TERRIER

	DISORDER	INHERITANCE	REFERENCE	BREEDING ADVICE
A.	Lens luxation *a DNA is available	Not defined	1	NO

Description and Comments

A. Lens Luxation

Partial (subluxation) or complete displacement of the lens from the normal anatomic site behind the pupil. Lens luxation not associated with trauma or inflammation is presumed to be inherited. Lens luxation may result in elevated intraocular pressure (glaucoma), causing vision impairment or blindness. A DNA test is available.

References

1. Gould D, Pettitt L, McLaughlin B, et al. ADAMTS17 mutation associated with primary lens luxation is widespread among breeds. *Vet Ophthalmol.* 2011; 14: 378-384.

OCULAR DISORDERS REPORT PATTERDALE TERRIER

Diagnostic Name	TOTAL DOGS EXAMINED	1991-1999		2000-2009		2010-2013		2014	
		#	%	#	%	#	%	#	%
EYELIDS									
25.110 distichiasis		0		0		2	15.4%	0	
NORMAL									
0.000 normal globe		0		0		11	84.6%	1	100.0%

OCULAR DISORDERS REPORT

PEKINGESE - 1

PEKINGESE

	DISORDER	INHERITANCE	REFERENCE	BREEDING ADVICE
A.	Distichiasis	Not defined	1-3	Breeder option
B.	Ectopic cilia	Not defined	1	Breeder option
C.	Entropion	Not defined	1	Breeder option
D.	Exposure keratopathy syndrome/ macroblepharon	Not defined	1	Breeder option
E.	Keratoconjunctivitis sicca (dry eye)	Not defined	1	NO
F.	Cataract	Not defined	1	NO
G.	Retinal atrophy - generalized	Not defined	1, 4	NO

Description and Comments

A. Distichiasis

Eyelashes abnormally located on the eyelid margin which may cause ocular irritation. Distichiasis may occur at any time in the life of a dog. It is difficult to make a strong recommendation with regard to breeding dogs with this entity. The hereditary basis has not been established although it seems probable due to the high incidence in some breeds. Reducing the incidence is a logical goal. When diagnosed, distichiasis should be recorded; breeding discretion is advised.

B. Ectopic cilia

Aberrant hair emerging through the eyelid conjunctiva. Ectopic cilia occur more frequently in younger dogs. They may cause discomfort and corneal disease.

C. Entropion

A conformational defect resulting in an "in-rolling" of one or both of the eyelids which may cause ocular irritation. It is likely that entropion is influenced by several genes (polygenic), defining the skin and other structures which make up the eyelids, the amount and weight of the skin covering the head and face, the orbital contents, and the conformation of the skull.

OCULAR DISORDERS REPORT

PEKINGESE - 2

D. Exposure keratopathy syndrome/macroblepharon

A corneal disease involving all or part of the cornea, resulting from inadequate blinking. This results from a combination of anatomic features including shallow orbits, exophthalmos, macroblepharon and lagophthalmos. Macroblepharon is defined as an exceptionally large palpebral fissure, macroblepharon in conjunction with laxity of the lateral canthal structures may lead to lower lid ectropion and upper lid entropion. Either of these conditions may lead to severe ocular irritation.

E. Keratoconjunctivitis sicca (dry eye)

An abnormality of the tear film, most commonly a deficiency of the aqueous portion, although the mucin and/or lipid layers may be affected; results in ocular irritation and/or vision impairment.

F. Cataract

A partial or complete opacity of the lens and/or its capsule. In cases where cataracts are complete and affect both eyes, blindness results. The prudent approach is to assume cataracts to be hereditary except in cases known to be associated with trauma, other causes of ocular inflammation, specific metabolic diseases, persistent pupillary membrane, persistent hyaloid or nutritional deficiencies. Cataracts may involve the lens completely (diffuse) or in a localized region.

G. Retinal atrophy - generalized

A degenerative disease of the retinal visual cells which progresses to blindness. This abnormality, also known as progressive retinal atrophy or PRA, may be detected by electroretinogram (not part of a routine eye screening examination) before it is apparent clinically. Except for X-linked PRA in the Siberian Husky, in all breeds studied to date, PRA is inherited as an autosomal recessive trait.

References

There are few references providing detailed descriptions of hereditary ocular conditions of the Pekingese breed. The conditions listed above are generally recognized to exist in this breed, as evidenced by identification on breed eye screening examinations and/or clinical experience of veterinary ophthalmologists.

1. ACVO Genetics Committee, 1999 and/or Data from CERF All-Breeds Report, 1991-1998.
2. Barnett KC. Comparative aspects of canine hereditary eye disease. *Adv Vet Sci Comp Med.* 1976;20:39-67.
3. Gelatt KN. Pediatric ophthalmology in small animal practice. *Vet Clin North Am.* 1973;3:321.
4. Priester W. Canine progressive retinal atrophy: Occurrence by age, breed, and sex.

OCULAR DISORDERS REPORT

PEKINGESE - 3

American Journal of Veterinary Research. 1974;35:571-574.

OCULAR DISORDERS REPORT PEKINGESE

Diagnostic Name	TOTAL DOGS EXAMINED	1991-1999		2000-2009		2010-2013		2014	
		#	%	#	%	#	%	#	%
EYELIDS									
20.140	ectopic cilia	2	2.0%	0		0		0	
20.160	macropalpebral fissure	11	11.1%	1	1.5%	0		0	
21.000	entropion, unspecified	7	7.1%	3	4.6%	0		0	
22.000	ectropion, unspecified	0		1	1.5%	0		0	
25.110	distichiasis	10	10.1%	6	9.2%	6	27.3%	0	
NASOLACRIMAL									
40.910	keratoconjunctivitis sicca	0		0		0		1	25.0%
CORNEA									
70.210	corneal pannus	5	5.1%	2	3.1%	0		0	
70.220	pigmentary keratitis	15	15.2%	8	12.3%	2	9.1%	2	50.0%
LENS									
100.200	cataract, unspecified	3	3.0%	0		0		0	
100.210	cataract, significance unknown	1	1.0%	0		2	9.1%	0	
100.301	punctate cataract, anterior cortex	1	1.0%	2	3.1%	0		0	
100.302	punctate cataract, posterior cortex	0		2	3.1%	0		0	
100.305	punctate cataract, posterior sutures	0		1	1.5%	0		0	
100.311	incipient cataract, anterior cortex	3	3.0%	2	3.1%	0		0	
100.312	incipient cataract, posterior cortex	2	2.0%	0		1	4.5%	0	
100.313	incipient cataract, equatorial cortex	2	2.0%	1	1.5%	2	9.1%	0	
100.315	incipient cataract, posterior sutures	0		3	4.6%	0		0	
100.316	incipient cataract, nucleus	1	1.0%	0		0		0	
100.330	generalized/complete cataract	1	1.0%	1	1.5%	0		0	
100.375	subluxation/luxation, unspecified	2	2.0%	0		0		0	
RETINA									
120.190	retinal dysplasia, detached	0		1	1.5%	0		0	
120.310	generalized progressive retinal atrophy (PRA)	1	1.0%	2	3.1%	0		0	
OPTIC NERVE									
130.120	optic nerve hypoplasia	0		1	1.5%	0		0	
OTHER									
900.000	other, unspecified	0		3	4.6%	3	13.6%	0	
900.100	other, not inherited	2	2.0%	8	12.3%	2	9.1%	0	
900.110	other, suspected as inherited	4	4.0%	0		1	4.5%	0	
NORMAL									
0.000	normal globe	53	53.5%	38	58.5%	11	50.0%	2	50.0%

OCULAR DISORDERS REPORT

PEMBROKE WELSH CORGI - 1

PEMBROKE WELSH CORGI

	DISORDER	INHERITANCE	REFERENCE	BREEDING ADVICE
A.	Distichiasis	Not defined	1	Breeder option
B.	Persistent pupillary membranes			
	- iris to iris	Not defined	2	Breeder option
	- iris to cornea	Not defined	3	NO
	- all other forms	Not defined	1, 2	NO
C.	Cataract	Not defined	1	NO
D.	Vitreous degeneration	Not defined	4	Breeder option
E.	Retinal dysplasia - folds	Not defined	1	Breeder option
F.	Retinal dysplasia - geographic - detached	Not defined	1	NO

It is recommended that this breed be examined prior to pharmacological dilation to best facilitate identification of persistent pupillary membranes.

Description and Comments

A. Distichiasis

Eyelashes abnormally located on the eyelid margin which may cause ocular irritation. Distichiasis may occur at any time in the life of a dog. It is difficult to make a strong recommendation with regard to breeding dogs with this entity. The hereditary basis has not been established although it seems probable due to the high incidence in some breeds. Reducing the incidence is a logical goal. When diagnosed, distichiasis should be recorded; breeding discretion is advised.

B. Persistent pupillary membranes (PPM)

Persistent blood vessel remnants in the anterior chamber of the eye which fail to regress normally by 3 months of age. These strands may bridge from iris to iris, iris to cornea, iris to lens, or form sheets of tissue in the anterior chamber. The last three forms pose the greatest

©2014, American College of Veterinary Ophthalmologists

OCULAR DISORDERS REPORT

PEMBROKE WELSH CORGI - 2

threat to vision and when severe, vision impairment or blindness may occur.

Persistent pupillary membranes are a significant problem in this breed with frequent documentation of strands bridging from the iris to the cornea noted on routine screening eye examinations. These may be associated with corneal opacity which may result in vision impairment thus the recommendation against breeding Pembroke Welsh Corgis with PPM.

C. Cataract

A partial or complete opacity of the lens and/or its capsule. In cases where cataracts are complete and affect both eyes, blindness results. The prudent approach is to assume cataracts to be hereditary except in cases known to be associated with trauma, other causes of ocular inflammation, specific metabolic diseases, persistent pupillary membrane, persistent hyaloid or nutritional deficiencies. Cataracts may involve the lens completely (diffuse) or in a localized region.

D. Vitreous degeneration

Liquefaction of the vitreous gel which may predispose to retinal detachment.

E. Retinal dysplasia - folds

Linear, triangular, curved or curvilinear foci of retinal folding that may be single or multiple. When seen in puppies, this condition may partially or completely resolve with maturity. Its significance to vision is unknown. There are two other forms of retinal dysplasia (geographic, detached) which are known to be inherited in other breeds and, in their most severe form, cause blindness. The genetic relationship between folds and more severe forms of retinal dysplasia is undetermined.

F. Retinal dysplasia - geographic, detached

Abnormal development of the retina present at birth.

Retinal dysplasia - geographic: Any irregularly shaped area of abnormal retinal development containing both areas of thinning and areas of elevation representing folds and retinal disorganization.

Retinal dysplasia - detached: Severe retinal disorganization associated with separation (detachment) of the retina.

These two forms are associated with vision impairment or blindness. Retinal dysplasia is known to be inherited in many breeds. The genetic relationship between the three forms of retinal dysplasia is not known for all breeds.

OCULAR DISORDERS REPORT

PEMBROKE WELSH CORGI - 3

References

There are no specific references providing detailed descriptions of hereditary ocular conditions of the Pembroke Welsh Corgi. The conditions listed above are generally recognized to exist in this breed, as evidenced by identification on breed eye screening examinations and/or clinical experience of veterinary ophthalmologists.

1. ACVO Genetics Committee, 1999 and/or Data from CERF All-Breeds Report, 1991-1998.
2. ACVO Genetics Committee, 2005 and/or Data from CERF All-Breeds Report 2003-2004.
3. ACVO Genetics Committee, 2009 and/or Data from CERF All-Breeds Report, 2008.
4. ACVO Genetics Committee, 2014 and/or Data from OFA All-Breeds Report, 2013-2014.

OCULAR DISORDERS REPORT PEMBROKE WELSH CORGI

Diagnostic Name	TOTAL DOGS EXAMINED		1991-1999 6851		2000-2009 8447		2010-2013 2630		2014 626	
	#	%	#	%	#	%	#	%	#	%
GLOBE										
0.110	microphthalmia	9	0.1%	7	0.1%	1	0.0%	1	0.2%	
10.000	glaucoma	1	0.0%	0		0		0		
EYELIDS										
20.140	ectopic cilia	2	0.0%	1	0.0%	0		0		
22.000	ectropion, unspecified	1	0.0%	0		0		0		
25.110	distichiasis	144	2.1%	129	1.5%	45	1.7%	10	1.6%	
NASOLACRIMAL										
32.110	imperforate lower nasolacrimal punctum	0		0		1	0.0%	2	0.3%	
40.910	keratoconjunctivitis sicca	1	0.0%	0		4	0.2%	2	0.3%	
NICTITANS										
51.100	third eyelid cartilage anomaly	1	0.0%	0		0		0		
52.110	prolapsed gland of the third eyelid	2	0.0%	0		0		0		
CORNEA										
70.210	corneal pannus	0		3	0.0%	0		0		
70.220	pigmentary keratitis	1	0.0%	0		0		0		
70.700	corneal dystrophy	21	0.3%	29	0.3%	8	0.3%	5	0.8%	
70.730	corneal endothelial degeneration	38	0.6%	17	0.2%	11	0.4%	0		
UVEA										
93.110	iris hypoplasia	0		1	0.0%	1	0.0%	1	0.2%	
93.120	iris cyst	2	0.0%	6	0.1%	0		0		
93.140	corneal endothelial pigment without PPM	0		5	0.1%	3	0.1%	0		
93.150	iris coloboma	4	0.1%	1	0.0%	0		0		
93.170	anterior chamber cyst	0		0		0		2	0.3%	
93.710	persistent pupillary membranes, iris to iris	1037	15.1%	1559	18.5%	508	19.3%	164	26.2%	
93.720	persistent pupillary membranes, iris to lens	31	0.5%	25	0.3%	3	0.1%	1	0.2%	
93.730	persistent pupillary membranes, iris to cornea	202	2.9%	147	1.7%	31	1.2%	10	1.6%	
93.740	persistent pupillary membranes, iris sheets	5	0.1%	10	0.1%	0		0		
93.750	persistent pupillary membranes, lens pigment foci/no strands	0		0		2	0.1%	0		
93.760	persistent pupillary membranes, endothelial opacity/no strands	0		9	0.1%	29	1.1%	4	0.6%	
LENS										
100.200	cataract, unspecified	79	1.2%	0		0		0		
100.210	cataract, significance unknown	144	2.1%	175	2.1%	85	3.2%	17	2.7%	
100.301	punctate cataract, anterior cortex	28	0.4%	16	0.2%	17	0.6%	0		
100.302	punctate cataract, posterior cortex	25	0.4%	20	0.2%	6	0.2%	0		
100.303	punctate cataract, equatorial cortex	10	0.1%	12	0.1%	4	0.2%	0		
100.304	punctate cataract, anterior sutures	0		2	0.0%	1	0.0%	0		
100.305	punctate cataract, posterior sutures	5	0.1%	7	0.1%	6	0.2%	0		
100.306	punctate cataract, nucleus	24	0.4%	19	0.2%	11	0.4%	0		
100.307	punctate cataract, capsular	0		16	0.2%	8	0.3%	0		
100.311	incipient cataract, anterior cortex	40	0.6%	38	0.4%	7	0.3%	4	0.6%	
100.312	incipient cataract, posterior cortex	71	1.0%	77	0.9%	17	0.6%	2	0.3%	
100.313	incipient cataract, equatorial cortex	28	0.4%	25	0.3%	7	0.3%	2	0.3%	
100.314	incipient cataract, anterior sutures	2	0.0%	2	0.0%	2	0.1%	1	0.2%	

OCULAR DISORDERS REPORT PEMBROKE WELSH CORGI

LENS CONTINUED	1991-1999		2000-2009		2010-2013		2014	
100.315 incipient cataract, posterior sutures	5	0.1%	11	0.1%	1	0.0%	1	0.2%
100.316 incipient cataract, nucleus	75	1.1%	79	0.9%	34	1.3%	7	1.1%
100.317 incipient cataract, capsular	0		12	0.1%	4	0.2%	1	0.2%
100.321 incomplete cataract, anterior cortex	0		0		3	0.1%	2	0.3%
100.322 incomplete cataract, posterior cortex	0		0		3	0.1%	0	
100.323 incomplete cataract, equatorial cortex	0		0		0		1	0.2%
100.326 incomplete cataract, nucleus	0		0		7	0.3%	3	0.5%
100.327 incomplete cataract, capsular	0		0		2	0.1%	0	
100.330 generalized/complete cataract	28	0.4%	39	0.5%	9	0.3%	0	
100.375 subluxation/luxation, unspecified	3	0.0%	2	0.0%	1	0.0%	0	
VITREOUS								
110.120 persistant hyaloid artery/remnant	22	0.3%	32	0.4%	3	0.1%	3	0.5%
110.135 PHPV/PTVL	4	0.1%	9	0.1%	5	0.2%	1	0.2%
110.200 vitritis	0		0		2	0.1%	1	0.2%
110.320 vitreous degeneration syneresis	14	0.2%	41	0.5%	21	0.8%	6	1.0%
110.330 vitreous degeneration anterior chamber	0		3	0.0%	0		0	
FUNDUS								
97.110 choroidal hypoplasia	0		2	0.0%	1	0.0%	1	0.2%
RETINA								
120.170 retinal dysplasia, folds	516	7.5%	449	5.3%	127	4.8%	25	4.0%
120.180 retinal dysplasia, geographic	88	1.3%	70	0.8%	7	0.3%	3	0.5%
120.190 retinal dysplasia, detached	2	0.0%	1	0.0%	0		0	
120.310 generalized progressive retinal atrophy (PRA)	13	0.2%	19	0.2%	2	0.1%	1	0.2%
120.400 retinal hemorrhage	4	0.1%	3	0.0%	0		0	
120.910 retinal detachment without dialysis	2	0.0%	1	0.0%	0		0	
120.920 retinal detachment with dialysis	0		0		1	0.0%	0	
120.960 retinopathy	0		0		4	0.2%	0	
OPTIC NERVE								
130.110 micropapilla	0		4	0.0%	1	0.0%	1	0.2%
130.120 optic nerve hypoplasia	5	0.1%	3	0.0%	0		1	0.2%
130.150 optic disc coloboma	1	0.0%	1	0.0%	0		0	
OTHER								
900.000 other, unspecified	0		37	0.4%	88	3.3%	0	
900.100 other, not inherited	28	0.4%	279	3.3%	29	1.1%	29	4.6%
900.110 other, suspected as inherited	69	1.0%	31	0.4%	8	0.3%	4	0.6%
NORMAL								
0.000 normal globe	4682	68.3%	6427	76.1%	2027	77.1%	461	73.6%

OCULAR DISORDERS REPORT

PETIT BASSET GRIFFON VENDEEN - 1

PETIT BASSET GRIFFON VENDEEN

	DISORDER	INHERITANCE	REFERENCE	BREEDING ADVICE
A.	Glaucoma	Not defined	1	NO
B.	Corneal dystrophy - epithelial/stromal	Not defined	2	Breeder option
C.	Corneal dystrophy - endothelial	Not defined	3	Breeder option
D.	Persistent pupillary membranes			
	- iris to iris	Not defined	2,3,4	Breeder option
	- iris to lens	Not defined	5	NO
	- iris to cornea	Not defined	5,4	NO
	- endothelial opacity no strands	Not defined	6	NO
	- all other forms	Not defined	2	NO
E.	Cataract	Not defined	3	NO
F.	Lens luxation	Not defined	7	NO
G.	Vitreous degeneration	Not defined	2	Breeder option
H.	Retinal dysplasia - folds	Not defined	3	Breeder option

Description and Comments

A. Glaucoma

An elevation of intraocular pressure (IOP) which, when sustained, causes intraocular damage resulting in blindness. The elevated IOP occurs because the fluid cannot leave through the iridocorneal angle. Diagnosis and classification of glaucoma require measurement of IOP (tonometry) and examination of the iridocorneal angle (gonioscopy). Neither of these tests is part of a routine breed eye screening exam.

OCULAR DISORDERS REPORT

PETIT BASSET GRIFFON VENDEEN - 2

B. Corneal dystrophy - epithelial/stromal

A non-inflammatory corneal opacity (white to gray) present in one or more of the corneal layers. Corneal dystrophy implies a probable inherited basis and is usually bilateral.

C. Corneal dystrophy - endothelial

Corneal endothelial dystrophy is an abnormal loss of the inner lining of the cornea that causes progressive fluid retention (edema). With time the edema results in keratitis and decreased vision. This usually does not occur until the animal is older.

D. Persistent pupillary membranes (PPM)

Persistent blood vessel remnants in the anterior chamber of the eye which fail to regress normally by 3 months of age. These strands may bridge from iris to iris, iris to cornea, iris to lens, or form sheets of tissue in the anterior chamber. The last three forms pose the greatest threat to vision and when severe, vision impairment or blindness may occur.

E. Cataract

A partial or complete opacity of the lens and/or its capsule. In cases where cataracts are complete and affect both eyes, blindness results. The prudent approach is to assume cataracts to be hereditary except in cases known to be associated with trauma, other causes of ocular inflammation, specific metabolic diseases, persistent pupillary membrane, persistent hyaloid or nutritional deficiencies. Cataracts may involve the lens completely (diffuse) or in a localized region.

F. Lens luxation

Partial (subluxation) or complete displacement of the lens from the normal anatomic site behind the pupil. Lens luxation not associated with trauma or inflammation is presumed to be inherited. Lens luxation may result in elevated intraocular pressure (glaucoma) causing vision impairment or blindness.

G. Vitreous degeneration

A liquefaction of the vitreous gel which may predispose to retinal detachment resulting in blindness.

H. Retinal dysplasia - folds

Linear, triangular, curved or curvilinear foci of retinal folding that may be single or multiple. When seen in puppies, this condition may partially or completely resolve with maturity. Its significance to vision is unknown. There are two other forms of retinal dysplasia (geographic, detached) which are known to be inherited in other breeds and, in their most severe form, cause blindness. The genetic relationship between folds and more severe forms of retinal dysplasia is undetermined.

OCULAR DISORDERS REPORT

PETIT BASSET GRIFFON VENDEEN - 3

References

There are few references providing detailed descriptions of hereditary conditions of the Petit Basset Griffon de Vendéen breed. The conditions listed above are generally recognized to exist in this breed, as evidenced by identification on breed eye screening examinations and/or clinical experience of veterinary ophthalmologists.

1. ACVO Genetics Committee, 2000-2002 and/or Data from CERF All-Breeds Report, 2000-2002.
2. ACVO Genetics Committee, 2005 and/or Data from CERF All-Breeds Report 2003-2004.
3. ACVO Genetics Committee, 1999 and/or Data from CERF All-Breeds Report, 1991-1998.
4. ACVO Genetics Committee, 2008 and/or Data from CERF All-Breeds Report, 2003-2007.
5. ACVO Genetics Committee, 2007 and/or Data from CERF All-Breeds Report 2002-2006.
6. ACVO Genetics Committee, 2011 and/or Data from CERF All-Breeds Report, 2009.
7. Chaudidu G, Clerc N. et al. Primary Lens Luxation in the Petite Bassett Griffon Vedeen in France. *ECVO Proceedings*. 2002.

OCULAR DISORDERS REPORT

PETIT BASSET GRIFFON VENDEEN

Diagnostic Name	TOTAL DOGS EXAMINED		1991-1999		2000-2009		2010-2013		2014	
	#	%	#	%	#	%	#	%	#	%
GLOBE										
10.000 glaucoma	0		2	0.2%	0		0		0	
EYELIDS										
21.000 entropion, unspecified	3	0.5%	0		0		0		0	
25.110 distichiasis	3	0.5%	5	0.4%	1	0.2%	1	1.6%		
NICTITANS										
52.110 prolapsed gland of the third eyelid	1	0.2%	0		0		0		0	
CORNEA										
70.220 pigmentary keratitis	0		1	0.1%	0		0		0	
70.700 corneal dystrophy	5	0.8%	10	0.8%	1	0.2%	1	1.6%		
70.730 corneal endothelial degeneration	12	2.0%	8	0.7%	6	1.5%	0			
UVEA										
93.120 iris cyst	0		2	0.2%	0		0		0	
93.140 corneal endothelial pigment without PPM	0		2	0.2%	0		0		0	
93.150 iris coloboma	1	0.2%	0		0		0		0	
93.710 persistent pupillary membranes, iris to iris	108	17.9%	259	21.3%	67	16.2%	11	17.5%		
93.720 persistent pupillary membranes, iris to lens	3	0.5%	24	2.0%	3	0.7%	2	3.2%		
93.730 persistent pupillary membranes, iris to cornea	58	9.6%	133	10.9%	12	2.9%	1	1.6%		
93.740 persistent pupillary membranes, iris sheets	14	2.3%	1	0.1%	0		0		0	
93.750 persistent pupillary membranes, lens pigment foci/no strands	0		0		8	1.9%	1	1.6%		
93.760 persistent pupillary membranes, endothelial opacity/no strands	0		14	1.2%	25	6.1%	3	4.8%		
95.120 ciliary body cyst	0		0		1	0.2%	0			
LENS										
100.200 cataract, unspecified	2	0.3%	0		0		0		0	
100.210 cataract, significance unknown	17	2.8%	53	4.4%	23	5.6%	6	9.5%		
100.301 punctate cataract, anterior cortex	6	1.0%	11	0.9%	13	3.1%	0			
100.302 punctate cataract, posterior cortex	2	0.3%	2	0.2%	1	0.2%	0			
100.303 punctate cataract, equatorial cortex	1	0.2%	0		2	0.5%	0			
100.304 punctate cataract, anterior sutures	0		3	0.2%	1	0.2%	0			
100.305 punctate cataract, posterior sutures	0		3	0.2%	4	1.0%	1	1.6%		
100.306 punctate cataract, nucleus	1	0.2%	1	0.1%	0		0			
100.307 punctate cataract, capsular	3	0.5%	9	0.7%	1	0.2%	0			
100.311 incipient cataract, anterior cortex	6	1.0%	11	0.9%	2	0.5%	3	4.8%		
100.312 incipient cataract, posterior cortex	1	0.2%	6	0.5%	0		0			
100.313 incipient cataract, equatorial cortex	2	0.3%	3	0.2%	0		0			
100.315 incipient cataract, posterior sutures	0		5	0.4%	0		0			
100.316 incipient cataract, nucleus	0		3	0.2%	0		0			
100.317 incipient cataract, capsular	0		10	0.8%	0		1	1.6%		
100.330 generalized/complete cataract	1	0.2%	11	0.9%	0		0			
100.375 subluxation/luxation, unspecified	3	0.5%	5	0.4%	0		0			
VITREOUS										
110.120 persistent hyaloid artery/remnant	3	0.5%	1	0.1%	3	0.7%	5	7.9%		
110.320 vitreous degeneration syneresis	6	1.0%	3	0.2%	0		0			
110.330 vitreous degeneration anterior chamber	0		2	0.2%	2	0.5%	0			

OCULAR DISORDERS REPORT PETIT BASSET GRIFFON VENDEEN

	1991-1999	2000-2009	2010-2013	2014
RETINA				
120.170 retinal dysplasia, folds	51 8.5%	42 3.5%	10 2.4%	0
120.180 retinal dysplasia, geographic	5 0.8%	2 0.2%	1 0.2%	0
120.310 generalized progressive retinal atrophy (PRA)	0	1 0.1%	2 0.5%	0
120.400 retinal hemorrhage	2 0.3%	0	0	0
OPTIC NERVE				
130.110 micropapilla	2 0.3%	1 0.1%	0	0
130.150 optic disc coloboma	1 0.2%	0	0	0
OTHER				
900.000 other, unspecified	0	20 1.6%	18 4.4%	0
900.100 other, not inherited	2 0.3%	72 5.9%	3 0.7%	0
900.110 other, suspected as inherited	8 1.3%	28 2.3%	2 0.5%	0
NORMAL				
0.000 normal globe	355 59.0%	802 66.0%	321 77.7%	45 71.4%

OCULAR DISORDERS REPORT

PHARAOH HOUND - 1

PHARAOH HOUND

	DISORDER	INHERITANCE	REFERENCE	BREEDING ADVICE
A.	Distichiasis	Not defined	1	Breeder option
B.	Persistent pupillary membranes - iris to iris	Not defined	1, 2	Breeder option
C.	Cataract	Not defined	3	NO
D.	Retinal dysplasia - folds	Not defined	4	Breeder option

Description and Comments

A. Distichiasis

Eyelashes abnormally located on the eyelid margin which may cause ocular irritation. Distichiasis may occur at any time in the life of a dog. It is difficult to make a strong recommendation with regard to breeding dogs with this entity. The hereditary basis has not been established, although it seems probable due to the high incidence in some breeds. Reducing the incidence is a logical goal. When diagnosed, distichiasis should be recorded; breeding discretion is advised.

B. Persistent pupillary membranes (PPM)

Persistent blood vessel remnants in the anterior chamber of the eye which fail to regress normally by 3 months of age. These strands may bridge from iris to iris, iris to cornea, iris to lens, or form sheets of tissue in the anterior chamber. The last three forms pose the greatest threat to vision and when severe, vision impairment or blindness may occur.

C. Cataract

A partial or complete opacity of the lens and/or its capsule. In cases where cataracts are complete and affect both eyes, blindness results. The prudent approach is to assume cataracts to be hereditary except in cases known to be associated with trauma, other causes of ocular inflammation, specific metabolic diseases, persistent pupillary membrane, persistent hyaloid or nutritional deficiencies. Cataracts may involve the lens completely (diffuse) or in a localized region.

OCULAR DISORDERS REPORT

PHARAOH HOUND - 2

D. Retinal dysplasia - folds

Linear, triangular, curved or curvilinear foci of retinal folding that may be single or multiple. When seen in puppies, this condition may partially or completely resolve with maturity. Its significance to vision is unknown. There are two other forms of retinal dysplasia (geographic, detached) which are known to be inherited in other breeds and, in their most severe form, cause blindness. The genetic relationship between folds and more severe forms of retinal dysplasia is undetermined.

References

There are no references providing detailed descriptions of hereditary ocular conditions of the Pharaoh Hound breed. The conditions listed above are generally recognized to exist in the breed, as evidenced by identification on breed eye screening examinations and/or clinical experience of veterinary ophthalmologists.

1. ACVO Genetics Committee, 2007 and/or Data from CERF All-Breeds Report 2002-2006.
2. ACVO Genetics Committee, 2008 and/or Data from CERF All-Breeds Report, 2003-2007.
3. ACVO Genetics Committee, 1999 and/or Data from CERF All-Breeds Report, 1991-1998.
4. ACVO Genetics Committee, 2000-2002 and/or Data from CERF All-Breeds Report, 2000-2002.

OCULAR DISORDERS REPORT PHARAOH HOUND

Diagnostic Name	TOTAL DOGS EXAMINED		1991-1999		2000-2009		2010-2013		2014	
	#	%	#	%	#	%	#	%	#	%
EYELIDS										
25.110 distichiasis	2	2.3%	4	2.5%	1	0.9%	0			
NICTITANS										
52.110 prolapsed gland of the third eyelid	0		0		1	0.9%	0			
CORNEA										
70.700 corneal dystrophy	0		0		3	2.8%	0			
UVEA										
93.120 iris cyst	0		1	0.6%	0		0		0	
93.140 corneal endothelial pigment without PPM	0		0		1	0.9%	0		0	
93.710 persistent pupillary membranes, iris to iris	3	3.5%	9	5.6%	19	17.9%	0		0	
93.720 persistent pupillary membranes, iris to lens	1	1.2%	0		0		0		0	
93.750 persistent pupillary membranes, lens pigment foci/no strands	0		0		5	4.7%	3	25.0%	0	
93.760 persistent pupillary membranes, endothelial opacity/no strands	0		0		1	0.9%	0		0	
LENS										
100.200 cataract, unspecified	1	1.2%	0		0		0		0	
100.210 cataract, significance unknown	2	2.3%	9	5.6%	10	9.4%	3	25.0%	0	
100.301 punctate cataract, anterior cortex	0		0		1	0.9%	1	8.3%	0	
100.305 punctate cataract, posterior sutures	0		0		2	1.9%	0		0	
100.306 punctate cataract, nucleus	0		0		1	0.9%	0		0	
100.307 punctate cataract, capsular	0		0		4	3.8%	0		0	
100.311 incipient cataract, anterior cortex	0		1	0.6%	0		0		0	
100.312 incipient cataract, posterior cortex	0		2	1.2%	0		0		0	
100.313 incipient cataract, equatorial cortex	0		2	1.2%	0		0		0	
100.315 incipient cataract, posterior sutures	0		3	1.9%	0		0		0	
100.316 incipient cataract, nucleus	0		0		1	0.9%	0		0	
100.330 generalized/complete cataract	0		1	0.6%	0		0		0	
RETINA										
120.170 retinal dysplasia, folds	0		3	1.9%	0		0		0	
120.180 retinal dysplasia, geographic	0		2	1.2%	0		0		0	
120.310 generalized progressive retinal atrophy (PRA)	0		3	1.9%	0		0		0	
OTHER										
900.000 other, unspecified	0		1	0.6%	3	2.8%	0		0	
900.100 other, not inherited	1	1.2%	6	3.7%	2	1.9%	0		0	
900.110 other, suspected as inherited	0		0		1	0.9%	0		0	
NORMAL										
0.000 normal globe	77	89.5%	134	83.2%	92	86.8%	10	83.3%		

OCULAR DISORDERS REPORT

POINTER - 1

POINTER

	DISORDER	INHERITANCE	REFERENCE	BREEDING ADVICE
A.	Corneal dystrophy-epithelial/stromal	Not defined	1	Breeder option
B.	Persistent pupillary membranes-iris to iris	Not defined	1	Breeder option
C.	Cataract	Not defined	2	NO
D.	Retinal dysplasia - folds	Presumed autosomal recessive	2	Breeder option

Description and Comments

A. Corneal dystrophy - epithelial/stromal

A non-inflammatory corneal opacity (white to gray) present in one or more of the corneal layers; usually inherited and bilateral.

B. Persistent pupillary membranes (PPM)

Persistent blood vessel remnants in the anterior chamber of the eye which fail to regress normally by 3 months of age. These strands may bridge from iris to iris, iris to cornea, iris to lens, or form sheets of tissue in the anterior chamber. The last three forms pose the greatest threat to vision and when severe, vision impairment or blindness may occur.

C. Cataract

A partial or complete opacity of the lens and/or its capsule. In cases where cataracts are complete and affect both eyes, blindness results. The prudent approach is to assume cataracts to be hereditary except in cases known to be associated with trauma, other causes of ocular inflammation, specific metabolic diseases, persistent pupillary membrane, persistent hyaloid or nutritional deficiencies. Cataracts may involve the lens completely (diffuse) or in a localized region.

OCULAR DISORDERS REPORT

POINTER - 2

D. Retinal dysplasia - folds

Linear, triangular, curved or curvilinear foci of retinal folding that may be single or multiple. When seen in puppies, this condition may partially or completely resolve with maturity. Its significance to vision is unknown. There are two other forms of retinal dysplasia (geographic, detached) which are known to be inherited in other breeds and, in their most severe form, cause blindness. The genetic relationship between folds and more severe forms of retinal dysplasia is undetermined.

References

There are no references providing detailed descriptions of hereditary ocular conditions of the Pointer breed. The conditions listed above are generally recognized to exist in the breed, as evidenced by identification on breed eye screening examinations and/or clinical experience of veterinary ophthalmologists.

1. ACVO Genetics Committee, 2000-2002 and/or Data from CERF All-Breeds Report, 2000-2002.
2. ACVO Genetics Committee, 1999 and/or Data from CERF All-Breeds Report, 1991-1998.

OCULAR DISORDERS REPORT POINTER

Diagnostic Name	TOTAL DOGS EXAMINED	1991-1999		2000-2009		2010-2013		2014	
		#	%	#	%	#	%	#	%
EYELIDS									
21.000	entropion, unspecified	1	0.4%	2	0.9%	1	0.8%	0	
22.000	ectropion, unspecified	1	0.4%	0		0		0	
25.110	distichiasis	2	0.9%	1	0.4%	1	0.8%	0	
NICTITANS									
52.110	prolapsed gland of the third eyelid	0		0		1	0.8%	0	
CORNEA									
70.700	corneal dystrophy	2	0.9%	2	0.9%	0		2	2.9%
UVEA									
93.710	persistent pupillary membranes, iris to iris	1	0.4%	3	1.3%	6	4.8%	2	2.9%
93.720	persistent pupillary membranes, iris to lens	1	0.4%	0		0		0	
93.730	persistent pupillary membranes, iris to cornea	0		1	0.4%	0		0	
LENS									
100.210	cataract, significance unknown	3	1.3%	8	3.4%	7	5.6%	0	
100.302	punctate cataract, posterior cortex	0		0		1	0.8%	0	
100.303	punctate cataract, equatorial cortex	1	0.4%	0		0		0	
100.306	punctate cataract, nucleus	1	0.4%	0		1	0.8%	0	
100.312	incipient cataract, posterior cortex	2	0.9%	0		1	0.8%	0	
100.313	incipient cataract, equatorial cortex	0		1	0.4%	0		0	
100.315	incipient cataract, posterior sutures	1	0.4%	0		0		0	
VITREOUS									
110.120	persistant hyaloid artery/remnant	0		1	0.4%	0		0	
RETINA									
120.170	retinal dysplasia, folds	2	0.9%	3	1.3%	0		1	1.4%
120.180	retinal dysplasia, geographic	0		3	1.3%	0		0	
120.310	generalized progressive retinal atrophy (PRA)	0		2	0.9%	0		0	
OPTIC NERVE									
130.110	micropapilla	0		1	0.4%	2	1.6%	1	1.4%
130.120	optic nerve hypoplasia	0		0		1	0.8%	0	
OTHER									
900.000	other, unspecified	0		2	0.9%	5	4.0%	0	
900.100	other, not inherited	0		6	2.6%	2	1.6%	4	5.7%
900.110	other, suspected as inherited	1	0.4%	0		1	0.8%	0	
NORMAL									
0.000	normal globe	214	92.6%	217	92.3%	114	90.5%	60	85.7%

OCULAR DISORDERS REPORT

POLISH LOWLAND SHEEPDOG - 1

POLISH LOWLAND SHEEPDOG (Polski Owczarek Nizinny)

	DISORDER	INHERITANCE	REFERENCE	BREEDING ADVICE
A.	Distichiasis	Not defined	1-3	Breeder option
B.	Corneal dystrophy - epithelial/stromal	Not defined	1-3	Breeder option
C.	Corneal dystrophy - endothelial	Not defined	4	NO
D.	Persistent pupillary membranes			
	- iris to iris	Not defined	3,5	Breeder option
	- all other forms	Not defined	3	NO
E.	Cataract	Not defined	4	NO
F.	Central progressive retinal atrophy	Not defined	4	NO
G.	Retinal atrophy - rod-cone dysplasia type 1 (<i>rcd4</i>) * a DNA test is available	Autosomal recessive	6	NO
H.	Ceroid lipofuscinosis	Not defined	2,7	NO

Description and Comments

A. Distichiasis

Eyelashes abnormally located on the eyelid margin which may cause ocular irritation. Distichiasis may occur at any time in the life of a dog. It is difficult to make a strong recommendation with regard to breeding dogs with this entity. The hereditary basis has not been established although it seems probable due to the high incidence in some breeds. Reducing the incidence is a logical goal. When diagnosed, distichiasis should be recorded; breeding discretion is advised.

B. Corneal Dystrophy - epithelial/stromal

A non-inflammatory corneal opacity (white to gray) present in one or more of the corneal

©2014, American College of Veterinary Ophthalmologists

OCULAR DISORDERS REPORT

POLISH LOWLAND SHEEPDOG - 2

layers. Corneal dystrophy implies a probable inherited basis and is usually bilateral.

C. Corneal dystrophy - endothelial

Corneal endothelial dystrophy is an abnormal loss of the inner lining of the cornea that causes progressive fluid retention (edema). With time the edema results in keratitis and decreased vision. This usually does not occur until the animal is older.

D. Persistent pupillary membranes (PPM)

Persistent blood vessel remnants in the anterior chamber of the eye which fail to regress normally by 3 months of age. These strands may bridge from iris to iris, iris to cornea, iris to lens, or form sheets of tissue in the anterior chamber. The last three forms pose the greatest threat to vision and when severe, vision impairment or blindness may occur.

E. Cataract

A partial or complete opacity of the lens and/or its capsule. In cases where cataracts are complete and affect both eyes, blindness results. The prudent approach is to assume cataracts to be hereditary except in cases known to be associated with trauma, other causes of ocular inflammation, specific metabolic diseases, persistent pupillary membrane, persistent hyaloid or nutritional deficiencies. Cataracts may involve the lens completely (diffuse) or in a localized region.

F. Central progressive retinal atrophy (CPRA)

A progressive retinal degeneration in which photoreceptor degeneration occurs secondary to disease of the underlying pigment epithelium. Progression is slow and some animals may never lose vision. CPRA is a frequent occurrence in England, but is uncommon elsewhere.

CPRA is characterized by the appearance of brown spots and patches primarily in the tapetal fundus and retinal degeneration. These areas are created by an accumulation of autofluorescent lipopigment within the retinal pigment epithelium cells. These changes are consistent with retinal changes observed in Vitamin E deficiency. Neurologic signs including ataxia and proprioceptive deficits have also been identified in affected dogs.

In the Nizzinis, retinal lesions of CPRA have been related to an underlying abnormal metabolism of Vitamin E resulting in a systemic deficiency.

G. Rod-cone dysplasia, type 4 (*rcd4*)

A form of PRA identified in the Gordon and Irish setter breeds. Clinical night blindness is observed on average as late as 10 years of age and progresses to total blindness. This form of PRA has been referred to as late-onset PRA (LOPRA). The disorder is caused by a mutation present in the C2orf71 gene. A DNA test is available.

OCULAR DISORDERS REPORT

POLISH LOWLAND SHEEPDOG - 3

H. Ceroid lipofuscinosis

A systemic metabolic disorder that affects the retina and retinal pigment epithelium with accumulation of lipopigments resulting in retinal degeneration. In Dalmatians, the age of onset is approximately 6 months.

References

1. ACVO Genetics Committee, 2002-2003 and/or Data from CERF All-Breeds Report, 2002-2003.
2. Brahm R and Matiasek K. Neuronal Ceroid Lipofuscinosis in two closely related Tibetan Terriers and on Polish Owczarek Nizinny (PON) dog: Clinical, ophthalmological and bioptical findings. *ECVO Proceedings*. 2004.
3. ACVO Genetics Committee, 2005 and/or Data from CERF All-Breeds Report 2003-2004.
4. ACVO Genetics Committee, 2000-2002 and/or Data from CERF All-Breeds Report, 2000-2002.
5. ACVO Genetics Committee, 1999 and/or Data from CERF All-Breeds Report, 1991-1998.
6. Downs LM, Bell JS, Freeman J, et al. Late-onset progressive retinal atrophy in the Gordon and Irish Setter breeds is associated with a frameshift mutation in C2orf71. *Anim Genet*. 2012 Jun 12.
7. Narfstrom K, Wrigstad A, Ekesten B, et al. Neuronal ceroid lipofuscinosis: clinical and morphologic findings in nine affected Polish Owczarek Nizinny (PON) dogs. *Vet Ophthalmol*. 2007 Mar-Apr;10:111-120.

OCULAR DISORDERS REPORT POLISH LOWLAND SHEEPDOG

Diagnostic Name	TOTAL DOGS EXAMINED	1991-1999		2000-2009		2010-2013		2014	
		#	%	#	%	#	%	#	%
EYELIDS									
25.110	distichiasis	5	2.1%	7	1.2%	3	1.6%	0	
NASOLACRIMAL									
32.110	imperforate lower nasolacrimal punctum	0		0		0		1	2.1%
CORNEA									
70.700	corneal dystrophy	5	2.1%	17	3.0%	6	3.3%	1	2.1%
70.730	corneal endothelial degeneration	0		1	0.2%	0		0	
UVEA									
93.120	iris cyst	0		2	0.4%	0		0	
93.710	persistent pupillary membranes, iris to iris	12	4.9%	42	7.5%	10	5.5%	2	4.2%
LENS									
100.210	cataract, significance unknown	9	3.7%	22	3.9%	8	4.4%	1	2.1%
100.301	punctate cataract, anterior cortex	0		2	0.4%	2	1.1%	0	
100.302	punctate cataract, posterior cortex	4	1.6%	2	0.4%	1	0.5%	0	
100.303	punctate cataract, equatorial cortex	0		1	0.2%	0		0	
100.305	punctate cataract, posterior sutures	1	0.4%	0		0		0	
100.307	punctate cataract, capsular	0		1	0.2%	0		0	
100.311	incipient cataract, anterior cortex	1	0.4%	2	0.4%	0		0	
100.312	incipient cataract, posterior cortex	1	0.4%	1	0.2%	1	0.5%	0	
100.313	incipient cataract, equatorial cortex	0		1	0.2%	0		0	
100.315	incipient cataract, posterior sutures	0		1	0.2%	0		0	
100.316	incipient cataract, nucleus	0		0		0		1	2.1%
100.317	incipient cataract, capsular	0		1	0.2%	1	0.5%	0	
100.330	generalized/complete cataract	0		1	0.2%	0		0	
VITREOUS									
110.320	vitreous degeneration syneresis	0		2	0.4%	0		0	
RETINA									
120.170	retinal dysplasia, folds	4	1.6%	6	1.1%	0		0	
120.310	generalized progressive retinal atrophy (PRA)	1	0.4%	13	2.3%	1	0.5%	1	2.1%
120.960	retinopathy	0		0		1	0.5%	0	
OTHER									
900.000	other, unspecified	0		2	0.4%	3	1.6%	0	
900.100	other, not inherited	1	0.4%	23	4.1%	0		0	
NORMAL									
0.000	normal globe	203	83.5%	488	86.7%	161	88.5%	42	87.5%

OCULAR DISORDERS REPORT

POMERANIAN - 1

POMERANIAN

	DISORDER	INHERITANCE	REFERENCE	BREEDING ADVICE
A.	Distichiasis	Not defined	1, 2	Breeder option
B.	Entropion	Not defined	1	Breeder option
C.	Persistent pupillary membranes- -iris to iris	Not defined	3	Breeder option
D.	Cataract	Not defined	4	NO
E.	Vitreous degeneration	Not defined	5	Breeder option
F.	Retinal atrophy-generalized	Not defined	6	NO

Description and Comments

A. Distichiasis

Eyelashes abnormally located on the eyelid margin which may cause ocular irritation. Distichiasis may occur at any time in the life of a dog. It is difficult to make a strong recommendation with regard to breeding dogs with this entity. The hereditary basis has not been established, although it seems probable due to the high incidence in some breeds. Reducing the incidence is a logical goal. When diagnosed, distichiasis should be recorded; breeding discretion is advised.

B. Entropion

A conformational defect resulting in an "in-rolling" of one or both of the eyelids which may cause ocular irritation. It is likely that entropion is influenced by several genes (polygenic), defining the skin and other structures which make up the eyelids, the amount and weight of the skin covering the head and face, the orbital contents, and the conformation of the skull. Selection should be directed against entropion and toward head conformation that minimizes or eliminates the likelihood of the defect.

C. Persistent pupillary membranes (PPM)

Persistent blood vessel remnants in the anterior chamber of the eye which fail to regress

OCULAR DISORDERS REPORT

POMERANIAN - 2

normally by 3 months of age. These strands may bridge from iris to iris, iris to cornea, iris to lens, or from sheets of tissue in the anterior chamber. The last three forms pose the greatest threat to vision and when severe, vision impairment or blindness may occur.

D. Cataract

A partial or complete opacity of the lens and/or its capsule. In cases where cataracts are complete and affect both eyes, blindness results. The prudent approach is to assume cataracts to be hereditary except in cases known to be associated with trauma, other causes of ocular inflammation, specific metabolic diseases, persistent pupillary membrane, persistent hyaloid or nutritional deficiencies. Cataracts may involve the lens completely (diffuse) or in a localized region.

E. Vitreous degeneration

A liquefaction of the vitreous gel which may predispose to retinal detachment resulting in blindness.

F. Retinal atrophy, generalized

A degenerative disease of the retinal visual cells which progresses to blindness. This abnormality is also known as progressive retinal atrophy or PRA, and may be detected by electroretinogram (not part of a routine eye screening examination) before there are detectable fundusoscopic changes seen by ophthalmoscopy. There are multiple genetic types of PRA including the rod cone dysplasias described elsewhere. Tests are available to identify the genetic mutation in some breeds.

References

There are no references providing detailed descriptions of hereditary ocular conditions of the Pomeranian breed. The conditions listed above are generally recognized to exist in this breed, as evidenced by identification on breed eye screening examinations and/or clinical experience of veterinary ophthalmologists.

1. ACVO Genetics Committee, 1999 and/or Data from CERF All-Breeds Report, 1991-1998.
2. ACVO Genetics Committee, 2002-2003 and/or Data from CERF All-Breeds Report, 2002-2003.
3. ACVO Genetics Committee, 2006 and/or Data from CERF All-Breeds Report, 2001-2005.
4. ACVO Genetics Committee, 2000-2002 and/or Data from CERF All-Breeds Report, 2000-2002.
5. ACVO Genetics Committee, 2005 and/or Data from CERF All-Breeds Report 2003-2004.
6. ACVO Genetics Committee, 2009 and/or Data from CERF All-Breeds Report, 2008.

OCULAR DISORDERS REPORT POMERANIAN

Diagnostic Name	TOTAL DOGS EXAMINED		1991-1999		2000-2009		2010-2013		2014	
	#	%	#	%	#	%	#	%	#	%
GLOBE										
0.110 microphthalmia	2	1.3%	0		0		0		0	
EYELIDS										
20.140 ectopic cilia	0		1	0.2%	0		0		0	
21.000 entropion, unspecified	0		0		1	0.3%	0		0	
22.000 ectropion, unspecified	0		1	0.2%	0		0		0	
25.110 distichiasis	8	5.2%	26	6.0%	13	4.3%	3	3.6%		
NASOLACRIMAL										
32.110 imperforate lower nasolacrimal punctum	1	0.6%	0		0		0		0	
40.910 keratoconjunctivitis sicca	1	0.6%	0		0		0		0	
CORNEA										
70.210 corneal pannus	1	0.6%	0		0		0		0	
70.220 pigmentary keratitis	0		1	0.2%	1	0.3%	0		0	
70.700 corneal dystrophy	3	1.9%	0		0		0		0	
70.730 corneal endothelial degeneration	0		2	0.5%	0		0		0	
UVEA										
93.710 persistent pupillary membranes, iris to iris	6	3.9%	25	5.8%	22	7.2%	3	3.6%		
93.720 persistent pupillary membranes, iris to lens	2	1.3%	1	0.2%	0		0		0	
93.730 persistent pupillary membranes, iris to cornea	1	0.6%	2	0.5%	1	0.3%	0		0	
93.750 persistent pupillary membranes, lens pigment foci/no strands	0		0		2	0.7%	1	1.2%		
93.760 persistent pupillary membranes, endothelial opacity/no strands	0		1	0.2%	0		0		0	
93.810 uveal melanoma	0		1	0.2%	0		0		0	
LENS										
100.200 cataract, unspecified	1	0.6%	0		0		0		0	
100.210 cataract, significance unknown	2	1.3%	11	2.5%	11	3.6%	2	2.4%		
100.301 punctate cataract, anterior cortex	0		2	0.5%	0		0		0	
100.302 punctate cataract, posterior cortex	1	0.6%	1	0.2%	0		0		0	
100.303 punctate cataract, equatorial cortex	0		1	0.2%	0		0		0	
100.304 punctate cataract, anterior sutures	0		1	0.2%	0		0		0	
100.305 punctate cataract, posterior sutures	2	1.3%	1	0.2%	0		0		0	
100.306 punctate cataract, nucleus	0		1	0.2%	0		0		0	
100.307 punctate cataract, capsular	0		1	0.2%	0		0		0	
100.311 incipient cataract, anterior cortex	2	1.3%	4	0.9%	3	1.0%	0		0	
100.312 incipient cataract, posterior cortex	1	0.6%	3	0.7%	1	0.3%	0		0	
100.313 incipient cataract, equatorial cortex	1	0.6%	2	0.5%	0		0		0	
100.316 incipient cataract, nucleus	2	1.3%	0		0		0		0	
100.330 generalized/complete cataract	5	3.2%	5	1.2%	0		0		0	
VITREOUS										
110.120 persistent hyaloid artery/remnant	2	1.3%	1	0.2%	0		0		0	
110.135 PHPV/PTVL	0		1	0.2%	0		0		0	
110.200 vitritis	0		0		1	0.3%	1	1.2%		
110.320 vitreous degeneration syneresis	0		7	1.6%	3	1.0%	1	1.2%		

OCULAR DISORDERS REPORT POMERANIAN

	1991-1999	2000-2009	2010-2013	2014
RETINA				
120.170 retinal dysplasia, folds	2 1.3%	0	0	0
120.180 retinal dysplasia, geographic	1 0.6%	1 0.2%	1 0.3%	0
120.310 generalized progressive retinal atrophy (PRA)	6 3.9%	10 2.3%	0	0
120.400 retinal hemorrhage	0	1 0.2%	0	0
120.910 retinal detachment without dialysis	1 0.6%	1 0.2%	0	0
OPTIC NERVE				
130.120 optic nerve hypoplasia	0	2 0.5%	0	0
130.150 optic disc coloboma	2 1.3%	0	0	0
OTHER				
900.000 other, unspecified	0	4 0.9%	6 2.0%	0
900.100 other, not inherited	0	26 6.0%	1 0.3%	1 1.2%
900.110 other, suspected as inherited	2 1.3%	3 0.7%	0	1 1.2%
NORMAL				
0.000 normal globe	115 74.2%	359 82.9%	275 90.2%	79 95.2%

OCULAR DISORDERS REPORT

POODLE - 1

POODLE (Toy, Miniature, and Standard)

* All varieties of the Poodle are basically the same genetic makeup, having their size governed by differences in an "insulin-like growth factor". (See Reference 2).

	DISORDER	INHERITANCE	REFERENCE	BREEDING ADVICE
A.	Microphthalmia	Not defined	1	NO
B.	Distichiasis	Not defined	1	Breeder option
C.	Imperforate lacrimal puncta	Not defined	1	Breeder option
D.	Corneal dystrophy - epithelial/stromal	Not defined	2	Breeder option
E.	Persistent pupillary membranes			
	- iris to iris	Not defined	1, 3	Breeder option
	- all other forms	Not defined	3	NO
F.	Glaucoma	Not defined	1, 4-6	NO
G.	Cataract	Not defined	1, 7-9	NO
H.	Vitreous degeneration	Not defined	1, 10	Breeder option
I.	Retinal atrophy - generalized (<i>prcd</i>) * a DNA test is available	Autosomal recessive	1, 10-30	NO
J.	Optic nerve hypoplasia	Not defined	1, 31, 32	NO
K.	Micropapilla	Not defined	1	Breeder option

Description and Comments

A. Microphthalmia

Microphthalmia is a developmental anomaly in which the eyeball is abnormally small. This is

©2014, American College of Veterinary Ophthalmologists

OCULAR DISORDERS REPORT

POODLE - 2

often associated with other ocular malformations, including defects in the cornea, anterior chamber, lens and/or retina. It can be found in one or both eyes.

B. Distichiasis

Eyelashes abnormally located on the eyelid margin which may cause ocular irritation. Distichiasis may occur at any time in the life of a dog. It is difficult to make a strong recommendation with regard to breeding dogs with this entity. The hereditary basis has not been established although it seems probable due to the high incidence in some breeds. Reducing the incidence is a logical goal. When diagnosed, distichiasis should be recorded; breeding discretion is advised.

C. Imperforate lacrimal punctum

A developmental abnormality resulting in failure of opening of the lacrimal duct adjacent to the eye. The lower punctum is more frequently affected. This defect usually results in epiphora, an overflow of tears onto the face.

D. Corneal Dystrophy - epithelial/stromal

A non-inflammatory corneal opacity (white to gray) present in one or more of the corneal layers. Corneal dystrophy implies a probable inherited basis and is usually bilateral.

E. Persistent pupillary membranes (PPM)

Persistent blood vessel remnants in the anterior chamber of the eye which fail to regress normally by 3 months of age. These strands may bridge from iris to iris, iris to cornea, iris to lens, or form sheets of tissue in the anterior chamber. The last three forms pose the greatest threat to vision and when severe, vision impairment or blindness may occur.

F. Glaucoma

An elevation of intraocular pressure (IOP) which, when sustained, causes intraocular damage resulting in blindness. The elevated IOP occurs because the fluid cannot leave through the iridocorneal angle. Diagnosis and classification of glaucoma requires measurement of IOP (tonometry) and examination of the iridocorneal angle (gonioscopy). Neither of these tests is part of a routine breed eye screening exam.

The Poodle form is usually a narrow angle variety and often associated with a condition of goniodysgenesis (a condition of incomplete formation and development of the iridocorneal angle).

G. Cataract

A partial or complete opacity of the lens and/or its capsule. In cases where cataracts are complete and affect both eyes, blindness results. The prudent approach is to assume cataracts to be hereditary except in cases known to be associated with trauma, other causes of ocular inflammation, specific metabolic diseases, persistent pupillary membrane,

OCULAR DISORDERS REPORT

POODLE - 3

persistent hyaloid or nutritional deficiencies. Cataracts may involve the lens completely (diffuse) or in a localized region.

The Poodle cataract can involve the lens cortex and lens nucleus. The rate and degree of progression are variable. A familial form of cataract has been described in the Standard Poodle, beginning with an equatorial opacity initially observed in dogs prior to 2 years of age.

H. Vitreous degeneration

A liquefaction of the vitreous gel which may predispose to retinal detachment and/or glaucoma. Either condition may cause blindness.

I. Retinal atrophy - generalized (*prcd*)

A degenerative disease of the retinal visual cells which progresses to blindness. This abnormality, also known as progressive retinal atrophy or PRA, may be detected by electroretinogram (not part of a routine eye screening examination) before it is apparent clinically. In an ERG study of PRA in miniature Poodles in southern France, a possible correlation with coat color was noted with black and gray Poodles affected more often than apricot and white Poodles.

Progressive rod/cone degeneration is the term used for the entity described as PRA in the Poodle. It may be detected ophthalmoscopically as early as 3 years of age; however, some animals may be detected earlier. Diagnostic electroretinography (ERG) is usually required in younger animals to detect signs of retinal rod/cone cell failure before signs can be seen ophthalmoscopically. The mode of inheritance is considered to be autosomal recessive. A DNA test is available

J. Optic nerve hypoplasia

Hypoplasia of the optic nerve is seen in the Poodle. In this condition, the optic nerve fails to develop completely. The signs have a variety of expression and degrees of hypoplasia can be found. One or both eyes may be affected. Affected eyes may retain some function or be blind. The mode of inheritance is not clear.

K. Micropapilla

Micropapilla refers to a small optic disc which is not associated with vision impairment. Optic nerve hypoplasia refers to a congenital defect of the optic nerve which causes blindness and abnormal pupil response in the affected eye. May be difficult to differentiate between micropapilla and optic nerve hypoplasia on a routine (dilated) screening ophthalmoscopic exam.

References

1. ACVO Genetics Committee, 1999 and/or Data from CERF All-Breeds Report, 1991-1998.

OCULAR DISORDERS REPORT

POODLE - 4

2. ACVO Genetics Committee, 2000-2002 and/or Data from CERF All-Breeds Report, 2000-2002.
3. ACVO Genetics Committee, 2005 and/or Data from CERF All-Breeds Report 2003-2004.
4. Slater MR and Erb HN. Effects of risk factors and prophylactic treatment on primary glaucoma in the dog. *J Am Vet Med Assoc.* 1986 May 1;188:1028-1030.
5. Gelatt KN and MacKay EO. Prevalence of the breed-related glaucomas in pure-bred dogs in North America. *Vet Ophthalmol.* 2004 Mar-Apr;7:97-111.
6. Gelatt KN and MacKay EO. Secondary glaucomas in the dog in North America. *Vet Ophthalmol.* 2004 Jul-Aug;7:245-259.
7. Rubin LF and Flowers RD. Inherited cataract in a family of Standard Poodles. *J Am Vet Med Assoc.* 1972 Jul 15;161:207-208.
8. Barnett KC and Startup FG. Hereditary cataract in the Standard Poodle. *Vet Rec.* 1985 Jul 6;117:15-16.
9. Gelatt KN and Mackay EO. Prevalence of primary breed-related cataracts in the dog in North America. *Vet Ophthalmol.* 2005 Mar-Apr;8:101-111.
10. ACVO Genetics Committee, 2009 and/or Data from CERF All-Breeds Report, 2008.
11. Barnett KC. Canine retinopathies III. The other breeds. *J Small Anim Pract.* 1965;6:185.
12. Aguirre G, Alligood J, O'Brien P, et al. Pathogenesis of progressive rod-cone degeneration in miniature Poodles. *Invest Ophthalmol Vis Sci.* 1982 Nov;23:610-630.
13. Barnett KC. Hereditary retinal atrophy in the Poodle. *Vet Rec.* 1962;74:672.
14. Barnett KC. Two forms of hereditary and progressive retinal atrophy in the dog. I. The miniature Poodle. II. The Labrador retriever. *J Am Anim Hosp Assoc.* 1965:234.
15. Aguirre GD and Rubin LF. Progressive retinal atrophy in the miniature Poodle: an electrophysiologic study. *J Am Vet Med Assoc.* 1972;160:191.
16. Aguirre GD. Inherited retinal degeneration in the dog. *Trans Acad Ophth Otol.* 1976;81:667.
17. Aguirre GD, et al. Hereditary retinal degeneration in the dog: Specificity of abnormal cyclic nucleotide metabolism to diseases of arrested photoreceptor development. *Birth Defects.* 1982;18:119.
18. Parkes JH, Aguirre G, Rockey JH, et al. Progressive rod-cone degeneration in the dog: characterization of the visual pigment. *Invest Ophthalmol Vis Sci.* 1982 Nov;23:674-678.
19. Sandberg MA, Pawlyk BS and Berson EL. Full-field electroretinograms in miniature Poodles with progressive rod-cone degeneration. *Invest Ophthalmol Vis Sci.* 1986 Jul;27:1179-1184.

©2014, American College of Veterinary Ophthalmologists

OCULAR DISORDERS REPORT

POODLE - 5

20. Aguirre G and O'Brien P. Morphological and biochemical studies of canine progressive rod-cone degeneration. 3H-fucose autoradiography. *Invest Ophthalmol Vis Sci*. 1986 May;27:635-655.
21. Aguirre GD and Acland GM. Variation in retinal degeneration phenotype inherited at the prcd locus. *Exp Eye Res*. 1988 May;46:663-687.
22. Ray K, Acland GM and Aguirre GD. Nonallelism of erd and prcd and exclusion of the canine RDS/peripherin gene as a candidate for both retinal degeneration loci. *Invest Ophthalmol Vis Sci*. 1996 Apr;37:783-794.
23. Alvarez RA, Aguirre GD, Acland GM, et al. Docosapentaenoic acid is converted to docosahexaenoic acid in the retinas of normal and prcd-affected miniature Poodle dogs. *Invest Ophthalmol Vis Sci*. 1994 Feb;35:402-408.
24. Kemp CM and Jacobson SG. Rhodopsin levels in the central retinas of normal miniature Poodles and those with progressive rod-cone degeneration. *Exp Eye Res*. 1992 Jun;54:947-956.
25. Wetzel MG, Fahlman C, Maude MB, et al. Fatty acid metabolism in normal miniature Poodles and those affected with progressive rod-cone degeneration (prcd). *Progress in clinical and biological research*. 1989;314:427-439.
26. Anderson RE. Plasma levels of docosahexaenoic acid in miniature Poodles with an inherited retinal degeneration. *Invest Ophthalmol Vis Sci (Supp)*. 1988;169.
27. Gaiddon J, Lallemeal PE and Peiffer RL, Jr. Positive correlation between coat color and electroretinographically diagnosed progressive retinal atrophy in miniature Poodles in southern France. *Prog Vet Comp Ophthal*. 1995;5:74.
28. Wang GM, Acland GM and Aguirre GD. Exclusion of rhodopsin and probable exclusion of rds/peripherin as candidates for caning progressive rod-cone degeneration. *Invest Ophthalmol Vis Sci (Supp)*. 1995;36:3570.
29. Zangerl B, Goldstein O, Philp AR, et al. Identical mutation in a novel retinal gene causes progressive rod-cone degeneration in dogs and retinitis pigmentosa in humans. *Genomics*. 2006 Nov;88:551-563.
30. Pawlyk KBS, Sandberg MA and Berson EL. temporal aspects of the electroretinogram of miniature Poodles with progressive retinal atrophy. *Invest Ophthalmol Vis Sci*. 1984;25:196.
31. Kern TJ and Riis RC. Optic nerve hypoplasia in three Miniature Poodles. *J Am Vet Med Assoc*. 1981 Jan 1;178:49-54.
32. Vestre WA and Brightman AH. Congenital blindness due to optic nerve hypoplasia. *Canine Pract*. 1980;7:45.

OCULAR DISORDERS REPORT POODLE

Diagnostic Name	TOTAL DOGS EXAMINED		1991-1999 18466		2000-2009 19429		2010-2013 7173		2014 1632	
	#	%	#	%	#	%	#	%	#	%
GLOBE										
0.110 microphthalmia	7	0.0%	10	0.1%	3	0.0%	0			
10.000 glaucoma	4	0.0%	1	0.0%	0		0			
EYELIDS										
20.110 eyelid dermoid	1	0.0%	0		0		0		0	
20.140 ectopic cilia	14	0.1%	13	0.1%	8	0.1%	1	0.1%	1	0.1%
20.160 macropalpebral fissure	0		0		1	0.0%	0		0	
21.000 entropion, unspecified	41	0.2%	56	0.3%	19	0.3%	4	0.2%	4	0.2%
22.000 ectropion, unspecified	1	0.0%	4	0.0%	0		0		0	
25.110 distichiasis	1467	7.9%	1002	5.2%	345	4.8%	60	3.7%	60	3.7%
NASOLACRIMAL										
32.110 imperforate lower nasolacrimal punctum	2	0.0%	0		6	0.1%	1	0.1%	1	0.1%
40.910 keratoconjunctivitis sicca	0		5	0.0%	3	0.0%	0		0	
NICTITANS										
50.210 pannus of third eyelid	0		0		2	0.0%	0		0	
51.100 third eyelid cartilage anomaly	12	0.1%	14	0.1%	9	0.1%	4	0.2%	4	0.2%
52.110 prolapsed gland of the third eyelid	0		6	0.0%	12	0.2%	0		0	
CORNEA										
70.210 corneal pannus	24	0.1%	15	0.1%	0		0		0	
70.220 pigmentary keratitis	6	0.0%	15	0.1%	3	0.0%	0		0	
70.700 corneal dystrophy	113	0.6%	96	0.5%	35	0.5%	4	0.2%	4	0.2%
70.730 corneal endothelial degeneration	4	0.0%	4	0.0%	2	0.0%	2	0.1%	2	0.1%
UVEA										
90.250 pigmentary uveitis	0		0		2	0.0%	0		0	
93.110 iris hypoplasia	0		1	0.0%	0		0		0	
93.120 iris cyst	1	0.0%	3	0.0%	3	0.0%	1	0.1%	1	0.1%
93.140 corneal endothelial pigment without PPM	0		5	0.0%	0		0		0	
93.150 iris coloboma	2	0.0%	3	0.0%	0		0		0	
93.710 persistent pupillary membranes, iris to iris	363	2.0%	660	3.4%	304	4.2%	71	4.4%	71	4.4%
93.720 persistent pupillary membranes, iris to lens	30	0.2%	33	0.2%	15	0.2%	3	0.2%	3	0.2%
93.730 persistent pupillary membranes, iris to cornea	9	0.0%	18	0.1%	6	0.1%	0		0	
93.740 persistent pupillary membranes, iris sheets	19	0.1%	19	0.1%	0		0		0	
93.750 persistent pupillary membranes, lens pigment foci/no strands	0		11	0.1%	88	1.2%	28	1.7%	28	1.7%
93.760 persistent pupillary membranes, endothelial opacity/no strands	0		0		3	0.0%	1	0.1%	1	0.1%
93.810 uveal melanoma	0		0		2	0.0%	1	0.1%	1	0.1%
97.150 chorioretinal coloboma, congenital	0		0		1	0.0%	0		0	
LENS										
100.200 cataract, unspecified	384	2.1%	0		0		0		0	
100.210 cataract, significance unknown	721	3.9%	1193	6.1%	433	6.0%	132	8.1%	132	8.1%
100.301 punctate cataract, anterior cortex	196	1.1%	161	0.8%	84	1.2%	9	0.6%	9	0.6%
100.302 punctate cataract, posterior cortex	85	0.5%	71	0.4%	28	0.4%	6	0.4%	6	0.4%
100.303 punctate cataract, equatorial cortex	47	0.3%	51	0.3%	18	0.3%	1	0.1%	1	0.1%
100.304 punctate cataract, anterior sutures	25	0.1%	19	0.1%	11	0.2%	2	0.1%	2	0.1%
100.305 punctate cataract, posterior sutures	41	0.2%	47	0.2%	27	0.4%	4	0.2%	4	0.2%

OCULAR DISORDERS REPORT POODLE

LENS CONTINUED	1991-1999	2000-2009	2010-2013	2014
100.306 punctate cataract, nucleus	15 0.1%	16 0.1%	5 0.1%	0
100.307 punctate cataract, capsular	2 0.0%	26 0.1%	26 0.4%	2 0.1%
100.311 incipient cataract, anterior cortex	223 1.2%	185 1.0%	51 0.7%	8 0.5%
100.312 incipient cataract, posterior cortex	179 1.0%	154 0.8%	52 0.7%	7 0.4%
100.313 incipient cataract, equatorial cortex	100 0.5%	115 0.6%	31 0.4%	8 0.5%
100.314 incipient cataract, anterior sutures	19 0.1%	15 0.1%	3 0.0%	1 0.1%
100.315 incipient cataract, posterior sutures	29 0.2%	46 0.2%	9 0.1%	2 0.1%
100.316 incipient cataract, nucleus	28 0.2%	24 0.1%	10 0.1%	0
100.317 incipient cataract, capsular	2 0.0%	19 0.1%	13 0.2%	4 0.2%
100.321 incomplete cataract, anterior cortex	0	0	3 0.0%	1 0.1%
100.322 incomplete cataract, posterior cortex	0	0	3 0.0%	2 0.1%
100.323 incomplete cataract, equatorial cortex	0	0	7 0.1%	1 0.1%
100.326 incomplete cataract, nucleus	0	0	2 0.0%	0
100.330 generalized/complete cataract	267 1.4%	140 0.7%	12 0.2%	4 0.2%
100.340 resorbing/hypermature cataract	0	0	0	1 0.1%
100.375 subluxation/luxation, unspecified	13 0.1%	10 0.1%	1 0.0%	1 0.1%
VITREOUS				
110.120 persistant hyaloid artery/remnant	33 0.2%	24 0.1%	9 0.1%	4 0.2%
110.130 PHPV/PTVL	0	0	1 0.0%	0
110.135 PHPV/PTVL	9 0.0%	8 0.0%	6 0.1%	0
110.200 vitritis	0	0	5 0.1%	3 0.2%
110.320 vitreous degeneration syneresis	93 0.5%	123 0.6%	47 0.7%	12 0.7%
110.330 vitreous degeneration anterior chamber	0	16 0.1%	12 0.2%	0
FUNDUS				
97.110 choroidal hypoplasia	1 0.0%	1 0.0%	1 0.0%	0
97.120 coloboma	8 0.0%	3 0.0%	1 0.0%	0
RETINA				
120.170 retinal dysplasia, folds	41 0.2%	59 0.3%	22 0.3%	4 0.2%
120.180 retinal dysplasia, geographic	2 0.0%	14 0.1%	2 0.0%	0
120.190 retinal dysplasia, detached	3 0.0%	6 0.0%	0	0
120.200 retinitis	0	0	1 0.0%	1 0.1%
120.310 generalized progressive retinal atrophy (PRA)	336 1.8%	214 1.1%	25 0.3%	4 0.2%
120.400 retinal hemorrhage	3 0.0%	0	0	0
120.910 retinal detachment without dialysis	13 0.1%	13 0.1%	1 0.0%	0
120.920 retinal detachment with dialysis	0	0	1 0.0%	0
120.960 retinopathy	0	0	7 0.1%	0
OPTIC NERVE				
130.110 micropapilla	10 0.1%	81 0.4%	33 0.5%	13 0.8%
130.120 optic nerve hypoplasia	133 0.7%	46 0.2%	19 0.3%	6 0.4%
130.150 optic disc coloboma	28 0.2%	18 0.1%	2 0.0%	1 0.1%
OTHER				
900.000 other, unspecified	0	118 0.6%	315 4.4%	0
900.100 other, not inherited	73 0.4%	801 4.1%	77 1.1%	82 5.0%
900.110 other, suspected as inherited	127 0.7%	68 0.3%	34 0.5%	2 0.1%
NORMAL				
0.000 normal globe	14496 78.5%	16227 83.5%	6279 87.5%	1409 86.3%

OCULAR DISORDERS REPORT

PORTUGUESE PODENGO PEQUENO - 1

PORTUGUESE PODENGO PEQUENO

DISORDER	INHERITANCE	REFERENCE	BREEDING ADVICE
A. Persistent pupillary membranes			
- iris to iris	Not defined	1	Breeder option
- all other forms	Not defined	1	NO

Description and Comments

A. Persistent pupillary membranes (PPM)

Persistent blood vessel remnants in the anterior chamber of the eye which fail to regress normally by 3 months of age. These strands may bridge from iris to iris, iris to cornea, iris to lens, or form sheets of tissue in the anterior chamber. The last three forms pose the greatest threat to vision and when severe, vision impairment or blindness may occur.

References

There are no references providing detailed descriptions of hereditary ocular conditions of the Portuguese Podengo Pequeno breed. The conditions listed above are generally recognized to exist in this breed, as evidenced by identification on breed eye screening examinations and/or clinical experience of veterinary ophthalmologists.

1. ACVO Genetics Committee, 2014 and/or Data from OFA All-Breeds Report, 2013-2014.

OCULAR DISORDERS REPORT PORTUGUESE PODENGO PEQUENO

Diagnostic Name	TOTAL DOGS EXAMINED	1991-1999		2000-2009		2010-2013		2014	
		#	%	#	%	#	%	#	%
EYELIDS									
20.140	ectopic cilia	0		0		1	1.3%	0	
25.110	distichiasis	0		0		2	2.6%	1	4.0%
UVEA									
93.710	persistent pupillary membranes, iris to iris	0		0		6	7.7%	1	4.0%
LENS									
100.210	cataract, significance unknown	0		0		3	3.8%	0	
100.301	punctate cataract, anterior cortex	0		0		1	1.3%	0	
100.312	incipient cataract, posterior cortex	0		0		1	1.3%	0	
100.317	incipient cataract, capsular	0		0		1	1.3%	0	
VITREOUS									
110.320	vitreous degeneration syneresis	0		0		1	1.3%	0	
110.330	vitreous degeneration anterior chamber	0		0		1	1.3%	0	
RETINA									
120.170	retinal dysplasia, folds	0		0		1	1.3%	0	
120.310	generalized progressive retinal atrophy (PRA)	0		0		0		1	4.0%
120.960	retinopathy	0		0		2	2.6%	0	
OTHER									
900.000	other, unspecified	0		1	7.1%	0		0	
900.100	other, not inherited	0		0		0		1	4.0%
NORMAL									
0.000	normal globe	0		14	100.0%	70	89.7%	23	92.0%

OCULAR DISORDERS REPORT

PORTUGUESE WATER DOG - 1

PORTUGUESE WATER DOG

	DISORDER	INHERITANCE	REFERENCE	BREEDING ADVICE
A.	Microphthalmia with multiple ocular defects	Not defined	1, 2	NO
B.	Distichiasis	Not defined	1	Breeder option
C.	Corneal dystrophy - epithelial/stromal	Not defined	8	Breeder option
D.	Persistent pupillary membranes - iris to iris - all other forms	Not defined Not defined	1, 3 3	Breeder option NO
E.	Cataract	Not defined	1	NO
F.	Retinal atrophy - generalized (<i>prcd</i>) * a DNA test is available	Autosomal recessive	1, 4-7	NO
G.	Retinal dysplasia - folds	Not defined	3	Breeder option

Description and Comments

A. Microphthalmia with multiple congenital ocular defects

This is a congenital abnormality present bilaterally and characterized by a small globe and associated ocular defects which can affect the cornea, anterior chamber, lens and/or retina. These associated defects may be variable in severity. Several cases have been identified, all of which appeared to have a common ancestry. All affected animals so far identified have been the progeny of dogs that were phenotypically normal, suggesting that the defect is not dominantly inherited.

B. Distichiasis

Eyelashes abnormally located on the eyelid margin which may cause ocular irritation. Distichiasis may occur at any time in the life of a dog. It is difficult to make a strong recommendation with regard to breeding dogs with this entity. The hereditary basis has not been established, although it seems probable due to the high incidence in some

OCULAR DISORDERS REPORT

PORTUGUESE WATER DOG - 2

breeds. Reducing the incidence is a logical goal. When diagnosed, distichiasis should be recorded; breeding discretion is advised.

C. Corneal dystrophy - epithelial/stromal

A non-inflammatory corneal opacity (white to gray) present in one or more of the corneal layers. Corneal dystrophy implies a probable inherited basis and is usually bilateral.

D. Persistent pupillary membranes

Persistent blood vessel remnants in the anterior chamber of the eye which fail to regress normally by 3 months of age. These strands may bridge from iris to iris, iris to cornea, iris to lens, or form sheets of tissue in the anterior chamber. The last three forms pose the greatest threat to vision and when severe, vision impairment or blindness may occur.

E. Cataract

A partial or complete opacity of the lens and/or its capsule. In cases where cataracts are complete and affect both eyes, blindness results. The prudent approach is to assume cataracts to be hereditary except in cases known to be associated with trauma, other causes of ocular inflammation, specific metabolic diseases, persistent pupillary membrane, persistent hyaloid or nutritional deficiencies. Cataracts may involve the lens completely (diffuse) or in a localized region.

F. Retinal atrophy - generalized (*prcd*)

A degenerative disease of the retinal visual cells which progresses to blindness. This abnormality, also known as progressive retinal atrophy or PRA, may be detected by electroretinogram (not part of a routine eye screening examination) before it is apparent clinically. Except for X-linked PRA in the Siberian Husky, in all breeds studied to date, PRA is inherited as an autosomal recessive trait.

The disease in the Portuguese Water Dog has not been characterized sufficiently to establish a disease frequency, the disease mechanism, or the age when early diagnosis by ophthalmoscopy and/or electroretinography is possible. In most affected dogs to date, the disease is recognized clinically in dogs 3-5 years of age or older; this suggests that the disease represents one of the late-onset forms of PRA. This photoreceptor degeneration is characterized by slow death of visual cells following their normal development. The disease begins clinically with signs of night blindness followed by day blindness.

Studies have shown that PRA in the Portuguese Water Dog is inherited as autosomal recessive. The mutation is allelic to that present in Miniature Poodles, Labrador Retrievers, English and American Cocker Spaniels and others. The locus is termed the progressive rod-cone degeneration (*prcd*) gene. A DNA test is available.

G. Retinal dysplasia - folds

©2014, American College of Veterinary Ophthalmologists

OCULAR DISORDERS REPORT

PORTUGUESE WATER DOG - 3

Linear, triangular, curved or curvilinear foci of retinal folding that may be single or multiple. When seen in puppies, this condition may partially or completely resolve with maturity. Its significance to vision is unknown. There are two other forms of retinal dysplasia (geographic, detached) which are known to be inherited in other breeds and, in their most severe form, cause blindness. The genetic relationship between folds and more severe forms of retinal dysplasia is undetermined.

References

1. ACVO Genetics Committee, 1999 and/or Data from CERF All-Breeds Report, 1991-1998.
2. Case records (1986-1994), Section of Medical Genetics, School of Veterinary Medicine, University of Pennsylvania.
3. ACVO Genetics Committee, 2005 and/or Data from CERF All-Breeds Report 2003-2004.
4. Aguirre GD and Acland GM. Use and misuse of electroretinography in the diagnosis of inherited retinal diseases in dogs. *Proc Am Coll Vet Ophthalmol.* 1997;27:37.
5. Zangerl B, Goldstein O, Philp AR, et al. Identical mutation in a novel retinal gene causes progressive rod-cone degeneration in dogs and retinitis pigmentosa in humans. *Genomics.* 2006 Nov;88:551-563.
6. Riis RC and Loew E. Ocular lesions in Portuguese water dogs known to be homozygous for progressive retinal atrophy. *Proc Am Coll Vet Ophthalmol.* 1993;24.
7. Acland GM, Ray K and Aguirre GD. Genetic tests for PRA in Portuguese Water Dogs and for Congenital Stationary Night Blindness in Briards. *Proc Am Coll Vet Ophthalmol.* 1998;28.
8. ACVO Genetics Committee, 2014 and/or Data from OFA All-Breeds Report 2013-2014.

OCULAR DISORDERS REPORT PORTUGUESE WATER DOG

Diagnostic Name	TOTAL DOGS EXAMINED		1991-1999 8302		2000-2009 11876		2010-2013 6240		2014 1417	
	#	%	#	%	#	%	#	%	#	%
GLOBE										
0.110	microphthalmia	9	0.1%	4	0.0%	2	0.0%	0		
10.000	glaucoma	5	0.1%	0		0		0		
EYELIDS										
20.140	ectopic cilia	0		2	0.0%	1	0.0%	0		
20.160	macropalpebral fissure	0		0		1	0.0%	0		
21.000	entropion, unspecified	14	0.2%	16	0.1%	14	0.2%	4	0.3%	
22.000	ectropion, unspecified	0		3	0.0%	0		0		
25.110	distichiasis	228	2.7%	455	3.8%	295	4.7%	54	3.8%	
NASOLACRIMAL										
40.910	keratoconjunctivitis sicca	2	0.0%	2	0.0%	2	0.0%	0		
NICTITANS										
52.110	prolapsed gland of the third eyelid	0		0		1	0.0%	0		
CORNEA										
70.210	corneal pannus	3	0.0%	1	0.0%	0		0		
70.220	pigmentary keratitis	0		3	0.0%	0		1	0.1%	
70.700	corneal dystrophy	54	0.7%	64	0.5%	34	0.5%	16	1.1%	
70.730	corneal endothelial degeneration	1	0.0%	1	0.0%	2	0.0%	0		
UVEA										
93.110	iris hypoplasia	0		1	0.0%	1	0.0%	0		
93.120	iris cyst	1	0.0%	6	0.1%	2	0.0%	1	0.1%	
93.140	corneal endothelial pigment without PPM	0		1	0.0%	1	0.0%	0		
93.150	iris coloboma	1	0.0%	0		0		0		
93.170	anterior chamber cyst	0		0		0		1	0.1%	
93.710	persistent pupillary membranes, iris to iris	282	3.4%	747	6.3%	489	7.8%	99	7.0%	
93.720	persistent pupillary membranes, iris to lens	13	0.2%	15	0.1%	6	0.1%	2	0.1%	
93.730	persistent pupillary membranes, iris to cornea	12	0.1%	14	0.1%	3	0.0%	2	0.1%	
93.740	persistent pupillary membranes, iris sheets	8	0.1%	34	0.3%	0		0		
93.750	persistent pupillary membranes, lens pigment foci/no strands	0		0		13	0.2%	4	0.3%	
93.760	persistent pupillary membranes, endothelial opacity/no strands	0		0		5	0.1%	3	0.2%	
93.810	uveal melanoma	0		1	0.0%	5	0.1%	0		
95.120	ciliary body cyst	0		0		0		1	0.1%	
LENS										
100.200	cataract, unspecified	69	0.8%	0		0		0		
100.210	cataract, significance unknown	383	4.6%	804	6.8%	494	7.9%	135	9.5%	
100.301	punctate cataract, anterior cortex	31	0.4%	59	0.5%	95	1.5%	5	0.4%	
100.302	punctate cataract, posterior cortex	17	0.2%	25	0.2%	18	0.3%	0		
100.303	punctate cataract, equatorial cortex	20	0.2%	24	0.2%	14	0.2%	0		
100.304	punctate cataract, anterior sutures	0		11	0.1%	12	0.2%	4	0.3%	
100.305	punctate cataract, posterior sutures	5	0.1%	9	0.1%	20	0.3%	4	0.3%	
100.306	punctate cataract, nucleus	4	0.0%	4	0.0%	6	0.1%	0		
100.307	punctate cataract, capsular	2	0.0%	14	0.1%	14	0.2%	0		
100.311	incipient cataract, anterior cortex	29	0.3%	44	0.4%	23	0.4%	3	0.2%	
100.312	incipient cataract, posterior cortex	14	0.2%	54	0.5%	9	0.1%	5	0.4%	

OCULAR DISORDERS REPORT PORTUGUESE WATER DOG

LENS CONTINUED	1991-1999		2000-2009		2010-2013		2014	
100.313 incipient cataract, equatorial cortex	19	0.2%	43	0.4%	18	0.3%	3	0.2%
100.314 incipient cataract, anterior sutures	2	0.0%	5	0.0%	3	0.0%	3	0.2%
100.315 incipient cataract, posterior sutures	3	0.0%	7	0.1%	5	0.1%	1	0.1%
100.316 incipient cataract, nucleus	3	0.0%	10	0.1%	7	0.1%	1	0.1%
100.317 incipient cataract, capsular	1	0.0%	12	0.1%	5	0.1%	1	0.1%
100.321 incomplete cataract, anterior cortex	0		0		3	0.0%	2	0.1%
100.322 incomplete cataract, posterior cortex	0		0		3	0.0%	3	0.2%
100.323 incomplete cataract, equatorial cortex	0		0		1	0.0%	0	
100.324 incomplete cataract, anterior sutures	0		0		0		1	0.1%
100.325 incomplete cataract, posterior sutures	0		0		1	0.0%	0	
100.326 incomplete cataract, nucleus	0		0		1	0.0%	0	
100.330 generalized/complete cataract	27	0.3%	31	0.3%	8	0.1%	3	0.2%
100.340 resorbing/hypermature cataract	0		0		0		1	0.1%
100.375 subluxation/luxation, unspecified	4	0.0%	3	0.0%	3	0.0%	0	
VITREOUS								
110.120 persistent hyaloid artery/remnant	9	0.1%	22	0.2%	3	0.0%	0	
110.135 PHPV/PTVL	0		11	0.1%	5	0.1%	0	
110.200 vitritis	0		0		0		1	0.1%
110.320 vitreous degeneration syneresis	5	0.1%	16	0.1%	12	0.2%	4	0.3%
110.330 vitreous degeneration anterior chamber	0		3	0.0%	1	0.0%	0	
FUNDUS								
97.110 choroidal hypoplasia	2	0.0%	0		0		0	
RETINA								
120.170 retinal dysplasia, folds	47	0.6%	102	0.9%	46	0.7%	8	0.6%
120.180 retinal dysplasia, geographic	5	0.1%	9	0.1%	5	0.1%	0	
120.190 retinal dysplasia, detached	2	0.0%	0		0		0	
120.310 generalized progressive retinal atrophy (PRA)	118	1.4%	45	0.4%	8	0.1%	1	0.1%
120.400 retinal hemorrhage	2	0.0%	6	0.1%	0		0	
120.910 retinal detachment without dialysis	2	0.0%	1	0.0%	0		0	
120.920 retinal detachment with dialysis	0		0		1	0.0%	1	0.1%
OPTIC NERVE								
130.110 micropapilla	0		6	0.1%	3	0.0%	3	0.2%
130.120 optic nerve hypoplasia	4	0.0%	6	0.1%	1	0.0%	0	
130.150 optic disc coloboma	4	0.0%	2	0.0%	0		0	
OTHER								
900.000 other, unspecified	0		75	0.6%	238	3.8%	0	
900.100 other, not inherited	29	0.3%	501	4.2%	67	1.1%	59	4.2%
900.110 other, suspected as inherited	57	0.7%	10	0.1%	27	0.4%	2	0.1%
NORMAL								
0.000 normal globe	7108	85.6%	10245	86.3%	5494	88.0%	1214	85.7%

OCULAR DISORDERS REPORT

PUG - 1

PUG

	DISORDER	INHERITANCE	REFERENCE	BREEDING ADVICE
A.	Distichiasis	Not defined	1	Breeder option
B.	Entropion	Not defined	1	Breeder option
C.	Exposure/Pigmentary Keratitis	Not defined	1	Breeder option
D.	Pigmentary Keratopathy	Not defined	2	Breeder option
E.	Macroblepharon	Not defined	1	Breeder option
F.	Persistent pupillary membranes - iris to iris	Not defined	3	Breeder option
G.	Cataract	Not defined	3, 4	NO
H.	Lens luxation * a DNA test is available	Not defined	8, 9	NO
I.	Vitreous degeneration - syneresis	Not defined	3	Breeder option
J.	Retinal dysplasia - folds	Presumed autosomal recessive	5	Breeder option
K.	Retinal dysplasia - geographic/ detached	Presumed autosomal recessive	6	NO
L.	Micropapilla	Not defined	7	Breeder option

Description and Comments

A. Distichiasis

©2014, American College of Veterinary Ophthalmologists

OCULAR DISORDERS REPORT

PUG - 2

Eyelashes abnormally located on the eyelid margin which may cause ocular irritation. Distichiasis may occur at any time in the life of a dog. It is difficult to make a strong recommendation with regard to breeding dogs with this entity. The hereditary basis has

not been established although it seems probable due to the high incidence in some breeds. Reducing the incidence is a logical goal. When diagnosed, distichiasis should be recorded; breeding discretion is advised.

B. Entropion

A conformational defect resulting in an "in-rolling" of one or both of the eyelids which may cause ocular irritation. It is likely that entropion is influenced by several genes (polygenic), defining the skin and other structures which make up the eyelids, the amount and weight of the skin covering the head and face, the orbital contents, and the conformation of the skull. In the Pug, entropion usually involves the medial canthal margin of the lower eyelid(s).

C. Exposure/Pigmentary keratitis

A corneal disease involving all or part of the cornea, resulting from inadequate blinking. This results from a combination of anatomic features including shallow orbits, exophthalmos, macroblepharon and lagophthalmos. Exposure keratopathy syndrome or macroblepharon may lead to severe ocular irritation.

The breed standard indicates the Pug should have a "large massive round head with very large, bold and prominent eyes". These characteristics give rise to the ocular exposure and irritative problems common in the breed.

D. Pigmentary keratopathy

Pigmentary keratopathy is a condition reported in Pugs in which the cornea becomes pigmented, often resulting in vision impairment. Development of pigmentary keratopathy is associated with congenital uveal pathology – iris hypoplasia and the presence of persistent pupillary membranes – but not with other factors such as Schirmer tear test values or medial canthal entropion.

E. Macroblepharon

Defined as an exceptionally large palpebral fissure, macroblepharon in conjunction with laxity of the lateral canthal structures may lead to lower lid ectropion and upper lid entropion. Exposure keratopathy syndrome or macroblepharon may lead to severe ocular irritation.

F. Persistent pupillary membranes (PPM)

Persistent blood vessel remnants in the anterior chamber of the eye which fail to regress normally in the neonatal period. These strands may bridge from iris to iris, iris to cornea,

OCULAR DISORDERS REPORT

PUG - 3

iris to lens, or from sheets of tissue in the anterior chamber. The last three forms pose the greatest threat to vision and when severe, vision impairment or blindness may occur.

G. Cataract

A partial or complete opacity of the lens and/or its capsule. In cases where cataracts are complete and affect both eyes, blindness results. The prudent approach is to assume cataracts to be hereditary except in cases known to be associated with trauma, other causes of ocular inflammation, specific metabolic diseases, persistent pupillary membrane, persistent hyaloid or nutritional deficiencies. Cataracts may involve the lens completely (diffuse) or in a localized region.

H. Lens luxation

Partial (subluxation) or complete displacement of the lens from the normal anatomic site behind the pupil. Lens luxation may result in blinding retinal detachment and/or elevated intraocular pressure (glaucoma) causing vision impairment, pain, and blindness. A DNA test is available.

I. Vitreous degeneration

Liquefaction of the vitreous gel which may predispose to retinal detachment.

J. Retinal dysplasia - folds

Linear, triangular, curved or curvilinear foci of retinal folding that may be single or multiple. When seen in puppies, this condition may partially or completely resolve with maturity. Its significance to vision is unknown. There are two other forms of retinal dysplasia (geographic, detached) which are known to be inherited in other breeds and, in their most severe form, cause blindness. The genetic relationship between folds and more severe forms of retinal dysplasia is undetermined.

K. Retinal dysplasia - geographic / detached

Abnormal development of the retina present at birth.

Retinal dysplasia - geographic: Any irregularly shaped area of abnormal retinal development containing both areas of thinning and areas of elevation representing folds and retinal disorganization.

Retinal dysplasia - detached: Severe retinal disorganization associated with separation (detachment) of the retina.

These two forms are associated with vision impairment or blindness. Retinal dysplasia is known to be inherited in many breeds. The genetic relationship between the three forms of retinal dysplasia is not known for all breeds.

OCULAR DISORDERS REPORT

PUG - 4

L. Micropapilla

Micropapilla refers to a small optic disc which is not associated with vision impairment. Optic nerve hypoplasia refers to a congenital defect of the optic nerve which causes blindness and abnormal pupil response in the affected eye. It may be difficult to differentiate between micropapilla and optic nerve hypoplasia on a routine (dilated) screening ophthalmoscopic exam.

References

There are no references providing detailed descriptions of hereditary ocular conditions of the Pug breed. The conditions listed above are generally recognized to exist in this breed, as evidenced by identification on breed eye screening examinations and/or clinical experience of veterinary ophthalmologists.

1. ACVO Genetics Committee, 1999 and/or Data from CERF All-Breeds Report, 1991-1998.
2. Labelle AL, Dresser CB, Hamor RE, et al. Characteristics of, prevalence of, and risk factors for corneal pigmentation (pigmentary keratopathy) in Pugs. *J Am Vet Med Assoc*. 2013 Sep 1;243:667-674.
3. ACVO Genetics Committee, 2002-2003 and/or Data from CERF All-Breeds Report, 2002-2003.
4. Gelatt KN and Mackay EO. Prevalence of primary breed-related cataracts in the dog in North America. *Vet Ophthalmol*. 2005 Mar-Apr;8:101-111.
5. ACVO Genetics Committee, 2009 and/or Data from CERF All-Breeds Report, 2008.
6. ACVO Genetics Committee, 2011 and/or Data from CERF All-Breeds Report, 2009.
7. ACVO Genetics Committee, 2000-2002 and/or Data from CERF All-Breeds Report, 2000-2002.
8. Farias FH, Johnson GS, Taylor JF, et al. An ADAMTS17 splice donor site mutation in dogs with primary lens luxation. *Invest Ophthalmol Vis Sci*. 2010; 51: 4716-4721.
9. Gould D et al. ADAMTS17 mutation associated with primary lens luxation is widespread among breeds. *Vet Ophthalmol* 14 (6): 378-384.

OCULAR DISORDERS REPORT PUG

Diagnostic Name	TOTAL DOGS EXAMINED		1991-1999		2000-2009		2010-2013		2014	
	#	%	#	%	#	%	#	%	#	%
GLOBE										
0.110 microphthalmia	0		3	0.2%	0		0		0	
EYELIDS										
20.110 eyelid dermoid	1	0.2%	0		0		0		0	
20.140 ectopic cilia	3	0.5%	10	0.8%	1	0.2%	0		0	
20.160 macropalpebral fissure	17	2.7%	45	3.6%	5	1.1%	0		0	
21.000 entropion, unspecified	138	21.8%	251	19.9%	72	15.3%	9	6.9%		
22.000 ectropion, unspecified	3	0.5%	6	0.5%	1	0.2%	1	0.8%		
25.110 distichiasis	74	11.7%	105	8.3%	24	5.1%	14	10.7%		
NASOLACRIMAL										
40.910 keratoconjunctivitis sicca	0		2	0.2%	0		3	2.3%		
CORNEA										
70.210 corneal pannus	53	8.4%	27	2.1%	0		0		0	
70.220 pigmentary keratitis	118	18.6%	290	22.9%	275	58.4%	74	56.5%		
70.700 corneal dystrophy	6	0.9%	6	0.5%	0		2	1.5%		
70.730 corneal endothelial degeneration	0		3	0.2%	1	0.2%	0			
UVEA										
93.120 iris cyst	1	0.2%	0		1	0.2%	0		0	
93.150 iris coloboma	0		2	0.2%	0		0		0	
93.170 anterior chamber cyst	0		0		1	0.2%	0		0	
93.710 persistent pupillary membranes, iris to iris	35	5.5%	128	10.1%	59	12.5%	15	11.5%		
93.720 persistent pupillary membranes, iris to lens	2	0.3%	4	0.3%	0		0		0	
93.730 persistent pupillary membranes, iris to cornea	5	0.8%	9	0.7%	0		1	0.8%		
93.740 persistent pupillary membranes, iris sheets	0		1	0.1%	0		0		0	
93.760 persistent pupillary membranes, endothelial opacity/no strands	0		1	0.1%	2	0.4%	0		0	
LENS										
100.200 cataract, unspecified	4	0.6%	0		0		0		0	
100.210 cataract, significance unknown	2	0.3%	28	2.2%	13	2.8%	6	4.6%		
100.301 punctate cataract, anterior cortex	1	0.2%	1	0.1%	3	0.6%	0		0	
100.302 punctate cataract, posterior cortex	2	0.3%	0		2	0.4%	0		0	
100.303 punctate cataract, equatorial cortex	0		5	0.4%	0		0		0	
100.304 punctate cataract, anterior sutures	0		1	0.1%	0		1	0.8%		
100.305 punctate cataract, posterior sutures	0		5	0.4%	1	0.2%	0		0	
100.306 punctate cataract, nucleus	1	0.2%	1	0.1%	3	0.6%	0		0	
100.307 punctate cataract, capsular	0		1	0.1%	0		1	0.8%		
100.311 incipient cataract, anterior cortex	7	1.1%	6	0.5%	4	0.8%	0		0	
100.312 incipient cataract, posterior cortex	5	0.8%	5	0.4%	7	1.5%	0		0	
100.313 incipient cataract, equatorial cortex	1	0.2%	4	0.3%	3	0.6%	1	0.8%		
100.315 incipient cataract, posterior sutures	5	0.8%	0		0		3	2.3%		
100.316 incipient cataract, nucleus	1	0.2%	1	0.1%	2	0.4%	0		0	
100.317 incipient cataract, capsular	0		3	0.2%	3	0.6%	0		0	
100.321 incomplete cataract, anterior cortex	0		0		1	0.2%	0		0	
100.322 incomplete cataract, posterior cortex	0		0		1	0.2%	1	0.8%		
100.325 incomplete cataract, posterior sutures	0		0		2	0.4%	0		0	
100.326 incomplete cataract, nucleus	0		0		1	0.2%	0		0	

OCULAR DISORDERS REPORT PUG

LENS CONTINUED	1991-1999	2000-2009	2010-2013	2014
100.330 generalized/complete cataract	5 0.8%	3 0.2%	5 1.1%	1 0.8%
VITREOUS				
110.120 persistant hyaloid artery/remnant	6 0.9%	3 0.2%	0	0
110.135 PHPV/PTVL	0	1 0.1%	1 0.2%	1 0.8%
110.200 vitritis	0	0	1 0.2%	0
110.320 vitreous degeneration syneresis	5 0.8%	11 0.9%	7 1.5%	0
110.330 vitreous degeneration anterior chamber	0	3 0.2%	0	0
FUNDUS				
97.120 coloboma	0	1 0.1%	0	0
RETINA				
120.170 retinal dysplasia, folds	2 0.3%	13 1.0%	2 0.4%	0
120.180 retinal dysplasia, geographic	0	9 0.7%	0	1 0.8%
120.310 generalized progressive retinal atrophy (PRA)	1 0.2%	2 0.2%	0	0
120.400 retinal hemorrhage	1 0.2%	0	0	0
120.910 retinal detachment without dialysis	0	1 0.1%	0	0
OPTIC NERVE				
130.120 optic nerve hypoplasia	1 0.2%	0	0	0
130.150 optic disc coloboma	0	1 0.1%	0	0
OTHER				
900.000 other, unspecified	0	15 1.2%	21 4.5%	0
900.100 other, not inherited	11 1.7%	146 11.6%	7 1.5%	11 8.4%
900.110 other, suspected as inherited	38 6.0%	28 2.2%	3 0.6%	0
NORMAL				
0.000 normal globe	270 42.7%	592 46.8%	161 34.2%	45 34.4%

OCULAR DISORDERS REPORT

PULI - 1

PULI

	DISORDER	INHERITANCE	REFERENCE	BREEDING ADVICE
A.	Corneal dystrophy-epithelial/stromal	Not defined	1, 2	Breeder option
B.	Persistent pupillary Membranes			
	-iris to iris	Not defined	2	Breeder option
	-iris to lens	Not defined	2	NO
C.	Cataract	Not defined	3	NO
D.	Persistent hyaloid artery	Not defined	3	Breeder option
E.	Retinal dysplasia -folds	Not defined	4	Breeder option

A. Corneal Dystrophy- epithelial/stromal

A non-inflammatory corneal opacity (white to gray) present in one or more of the corneal layers. Corneal dystrophy implies a probable inherited basis and is usually bilateral.

B. Persistent pupillary membranes (PPM)

Persistent blood vessel remnants in the anterior chamber of the eye which fail to regress normally by 3 months of age. These strands may bridge from iris to iris, iris to cornea, iris to lens, or form sheets of tissue in the anterior chamber. The last three forms pose the greatest threat to vision and when severe, vision impairment or blindness may occur.

C. Cataract

A partial or complete opacity of the lens and/or its capsule. In cases where cataracts are complete and affect both eyes, blindness results. The prudent approach is to assume cataracts to be hereditary except in cases known to be associated with trauma, other causes of ocular inflammation, specific metabolic diseases, persistent pupillary membrane, persistent hyaloid or nutritional deficiencies. Cataracts may involve the lens completely (diffuse) or in a localized region.

OCULAR DISORDERS REPORT

PULI - 2

D. Persistent hyaloid artery (PHA) - congenital defect resulting from abnormalities in the development and regression of the hyaloid artery. The blood vessel remnant can be present in the vitreous as a small patent vascular strand (PHA) or as a non-vascular strand that appears gray-white (persistent hyaloid remnant).

E. Retinal dysplasia - folds

Linear, triangular, curved or curvilinear foci of retinal folding that may be single or multiple. When seen in puppies, this condition may partially or completely resolve with maturity. Its significance to vision is unknown. There are two other forms of retinal dysplasia (geographic, detached) which are known to be inherited in other breeds and, in their most severe form, cause blindness. The genetic relationship between folds and more severe forms of retinal dysplasia is undetermined.

References

There are no references providing detailed descriptions of hereditary ocular conditions of the Puli breed. The conditions listed above are generally recognized to exist in the breed, as evidenced by identification on breed eye screening examinations and/or clinical experience of veterinary ophthalmologists.

1. ACVO Genetics Committee, 2002-2003 and/or Data from CERF All-Breeds Report, 2002-2003.
2. ACVO Genetics Committee, 2005 and/or Data from CERF All-Breeds Report 2003-2004.
3. ACVO Genetics Committee, 2000-2002 and/or Data from CERF All-Breeds Report, 2000-2002.
4. ACVO Genetics Committee, 1999 and/or Data from CERF All-Breeds Report, 1991-1998.

OCULAR DISORDERS REPORT

PULI

Diagnostic Name	TOTAL DOGS EXAMINED	1991-1999		2000-2009		2010-2013		2014	
		#	%	#	%	#	%	#	%
EYELIDS									
20.110	eyelid dermoid	1	0.3%	0		0		0	
20.140	ectopic cilia	0		1	0.2%	0		0	
20.160	macropalpebral fissure	0		1	0.2%	0		0	
21.000	entropion, unspecified	4	1.1%	2	0.4%	1	0.5%	1	2.3%
25.110	distichiasis	3	0.8%	2	0.4%	1	0.5%	0	
CORNEA									
70.220	pigmentary keratitis	2	0.5%	3	0.6%	0		0	
70.700	corneal dystrophy	13	3.5%	5	1.0%	0		0	
70.730	corneal endothelial degeneration	1	0.3%	0		0		0	
UVEA									
93.120	iris cyst	0		1	0.2%	0		0	
93.710	persistent pupillary membranes, iris to iris	68	18.5%	138	28.9%	29	15.9%	8	18.6%
93.720	persistent pupillary membranes, iris to lens	3	0.8%	9	1.9%	1	0.5%	1	2.3%
93.730	persistent pupillary membranes, iris to cornea	3	0.8%	3	0.6%	2	1.1%	0	
93.750	persistent pupillary membranes, lens pigment foci/no strands	0		0		1	0.5%	3	7.0%
93.760	persistent pupillary membranes, endothelial opacity/no strands	0		1	0.2%	0		0	
LENS									
100.200	cataract, unspecified	3	0.8%	0		0		0	
100.210	cataract, significance unknown	22	6.0%	30	6.3%	9	4.9%	0	
100.301	punctate cataract, anterior cortex	2	0.5%	2	0.4%	1	0.5%	0	
100.302	punctate cataract, posterior cortex	0		2	0.4%	0		0	
100.305	punctate cataract, posterior sutures	5	1.4%	0		1	0.5%	0	
100.306	punctate cataract, nucleus	2	0.5%	0		2	1.1%	0	
100.307	punctate cataract, capsular	0		1	0.2%	2	1.1%	1	2.3%
100.311	incipient cataract, anterior cortex	4	1.1%	2	0.4%	3	1.6%	0	
100.312	incipient cataract, posterior cortex	2	0.5%	1	0.2%	0		1	2.3%
100.313	incipient cataract, equatorial cortex	4	1.1%	2	0.4%	2	1.1%	0	
100.315	incipient cataract, posterior sutures	0		1	0.2%	0		0	
100.316	incipient cataract, nucleus	2	0.5%	1	0.2%	0		0	
100.317	incipient cataract, capsular	0		1	0.2%	0		0	
100.330	generalized/complete cataract	6	1.6%	1	0.2%	0		0	
100.375	subluxation/luxation, unspecified	1	0.3%	0		0		0	
VITREOUS									
110.120	persistant hyaloid artery/remnant	0		1	0.2%	0		1	2.3%
110.135	PHPV/PTVL	0		0		0		1	2.3%
110.320	vitreous degeneration syneresis	0		1	0.2%	0		0	
RETINA									
120.170	retinal dysplasia, folds	10	2.7%	30	6.3%	2	1.1%	1	2.3%
120.180	retinal dysplasia, geographic	0		3	0.6%	0		0	
120.310	generalized progressive retinal atrophy (PRA)	2	0.5%	2	0.4%	0		0	
120.400	retinal hemorrhage	1	0.3%	0		0		0	
120.910	retinal detachment without dialysis	1	0.3%	1	0.2%	0		0	

OCULAR DISORDERS REPORT

PULI

	1991-1999	2000-2009	2010-2013	2014
OPTIC NERVE				
130.110 micropapilla	2 0.5%	0	0	0
130.120 optic nerve hypoplasia	3 0.8%	0	0	0
OTHER				
900.000 other, unspecified	0	1 0.2%	12 6.6%	0
900.100 other, not inherited	13 3.5%	33 6.9%	1 0.5%	0
900.110 other, suspected as inherited	0	4 0.8%	1 0.5%	0
NORMAL				
0.000 normal globe	250 68.1%	299 62.6%	155 85.2%	36 83.7%

OCULAR DISORDERS REPORT

PYRENEAN SHEPHERD - 1

PYRENEAN SHEPHERD

	DISORDER	INHERITANCE	REFERENCE	BREEDING ADVICE
A.	Persistent pupillary membranes - iris to iris	Not defined	1	Breeder option
B.	Cataract	Not defined	1	NO
C.	Choroidal hypoplasia	Not defined	1, 2	NO
D.	Lens luxation	Not defined	1	NO
E.	Retinal dysplasia - folds	Not defined	3	Breeder option

Description and Comments

A. Persistent pupillary membranes (PPM)

Persistent blood vessel remnants in the anterior chamber of the eye which fail to regress normally by 3 months of age. These strands may bridge from iris to iris, iris to cornea, iris to lens, or form sheets of tissue in the anterior chamber. The last three forms pose the greatest threat to vision and when severe, vision impairment or blindness may occur.

B. Cataract

A partial or complete opacity of the lens and/or its capsule. In cases where cataracts are complete and affect both eyes, blindness results. The prudent approach is to assume cataracts to be hereditary except in cases known to be associated with trauma, other causes of ocular inflammation, specific metabolic diseases, persistent pupillary membrane, persistent hyaloid or nutritional deficiencies. Cataracts may involve the lens completely (diffuse) or in a localized region.

C. Choroidal hypoplasia

Inadequate development of the choroid present at birth and non-progressive. This condition is more commonly identified in the Collie breed where it is a manifestation of "Collie Eye Anomaly".

OCULAR DISORDERS REPORT

PYRENEAN SHEPHERD - 2

D. Lens luxation

Partial (subluxation) or complete displacement of the lens from the normal anatomic site behind the pupil. Lens luxation not associated with trauma or inflammation is presumed to be inherited. Lens luxation may result in elevated intraocular pressure (glaucoma) causing vision impairment or blindness.

G. Retinal dysplasia - folds

Linear, triangular, curved or curvilinear foci of retinal folding that may be single or multiple. When seen in puppies, this condition may partially or completely resolve with maturity. Its significance to vision is unknown. There are two other forms of retinal dysplasia (geographic, detached) which are known to be inherited in other breeds and, in their most severe form, cause blindness. The genetic relationship between folds and more severe forms of retinal dysplasia is undetermined.

References

There are no references providing detailed descriptions of hereditary ocular conditions of the Pyrenean Shepherd. The conditions listed above are generally recognized to exist in this breed, as evidenced by identification on breed eye screening examinations and/or clinical experience of veterinary ophthalmologists.

1. ACVO Genetics Committee, 2000-2002 and/or Data from CERF All-Breeds Report, 2000-2002.
2. Acland GM, Goldstein O, Kukekova AV, et al. Genetic and phenotypic heterogeneity in canine colobomatous syndromes. *ARVO abstract* 4147. 2009.
3. ACVO Genetics Committee, 2014 and/or Data from OFA All-Breeds Report, 2013-2014.

OCULAR DISORDERS REPORT PYRENEAN SHEPHERD

Diagnostic Name	TOTAL DOGS EXAMINED		1991-1999		2000-2009		2010-2013		2014	
	#	%	#	%	#	%	#	%	#	%
NASOLACRIMAL										
32.110 imperforate lower nasolacrimal punctum	0		0		2	1.0%	0			
NICTITANS										
52.110 prolapsed gland of the third eyelid	0		1	0.6%	0		0			
CORNEA										
70.700 corneal dystrophy	0		1	0.6%	0		0			
UVEA										
93.110 iris hypoplasia	0		0		1	0.5%	0			
93.150 iris coloboma	0		0		1	0.5%	0			
93.710 persistent pupillary membranes, iris to iris	2	22.2%	10	6.4%	15	7.4%	1	2.1%		
93.740 persistent pupillary membranes, iris sheets	0		1	0.6%	0		0			
LENS										
100.210 cataract, significance unknown	0		6	3.8%	2	1.0%	3	6.2%		
100.301 punctate cataract, anterior cortex	0		2	1.3%	0		0			
100.302 punctate cataract, posterior cortex	0		1	0.6%	0		0			
100.303 punctate cataract, equatorial cortex	1	11.1%	0		0		0			
100.305 punctate cataract, posterior sutures	0		1	0.6%	0		0			
100.311 incipient cataract, anterior cortex	0		2	1.3%	3	1.5%	0			
100.312 incipient cataract, posterior cortex	0		1	0.6%	0		0			
100.313 incipient cataract, equatorial cortex	1	11.1%	1	0.6%	0		0			
100.315 incipient cataract, posterior sutures	0		0		0		1	2.1%		
100.316 incipient cataract, nucleus	0		0		1	0.5%	2	4.2%		
100.322 incomplete cataract, posterior cortex	0		0		0		2	4.2%		
100.375 subluxation/luxation, unspecified	0		1	0.6%	0		0			
VITREOUS										
110.120 persistant hyaloid artery/remnant	0		1	0.6%	3	1.5%	0			
110.320 vitreous degeneration syneresis	0		0		0		1	2.1%		
FUNDUS										
97.110 choroidal hypoplasia	0		6	3.8%	4	2.0%	5	10.4%		
RETINA										
120.170 retinal dysplasia, folds	0		3	1.9%	6	2.9%	0			
120.180 retinal dysplasia, geographic	0		0		1	0.5%	0			
OTHER										
900.000 other, unspecified	0		1	0.6%	8	3.9%	0			
900.100 other, not inherited	0		11	7.1%	2	1.0%	2	4.2%		
NORMAL										
0.000 normal globe	6	66.7%	129	82.7%	188	92.2%	41	85.4%		

OCULAR DISORDERS REPORT

RAT TERRIER - 1

RAT TERRIER

	DISORDER	INHERITANCE	REFERENCE	BREEDING ADVICE
A.	Distichiasis	Not defined	1	Breeder option
B.	Persistent pupillary membranes			
	- iris to iris	Not defined	1	Breeder option
	- iris to cornea	Not defined	1	NO
C.	Cataract	Not defined	1	NO
D.	Lens luxation	Not defined	2, 3	NO
	* a DNA test is available			

Description and Comments

A. Distichiasis

Eyelashes abnormally located on the eyelid margin which may cause ocular irritation. Distichiasis may occur at any time in the life of a dog. It is difficult to make a strong recommendation with regard to breeding dogs with this entity. The hereditary basis has not been established although it seems probable due to the high incidence in some breeds. Reducing the incidence is a logical goal. When diagnosed, distichiasis should be recorded; breeding discretion is advised.

B. Persistent pupillary membranes (PPM)

Persistent blood vessel remnants in the anterior chamber of the eye which fail to regress normally by 3 months of age. These strands may bridge from iris to iris, iris to cornea, iris to lens, or form sheets of tissue in the anterior chamber. The last three forms pose the greatest threat to vision and when severe, vision impairment or blindness may occur.

C. Cataract

A partial or complete opacity of the lens and/or its capsule. In cases where cataracts are complete and affect both eyes, blindness results. The prudent approach is to assume cataracts to be hereditary except in cases known to be associated with trauma, other causes of ocular inflammation, specific metabolic diseases, persistent pupillary membrane, persistent hyaloid or nutritional deficiencies. Cataracts may involve the lens completely (diffuse) or in a localized region.

OCULAR DISORDERS REPORT

RAT TERRIER - 2

D. Lens luxation

Partial (subluxation) or complete displacement of the lens from the normal anatomic site behind the pupil. Lens luxation not associated with trauma or inflammation is presumed to be inherited. Lens luxation may result in elevated intraocular pressure (glaucoma), causing vision impairment or blindness. A DNA test is available.

References

There are no references providing detailed descriptions of hereditary ocular conditions of the Rat Terrier. The conditions listed above are generally recognized to exist in this breed, as evidenced by identification on breed eye screening examinations and/or clinical experience of veterinary ophthalmologists.

1. ACVO Genetics Committee, 2000-2002 and/or Data from CERF All-Breeds Report, 2000-2002.
2. Farias FH, Johnson GS, Taylor JF, et al. An ADAMTS17 splice donor site mutation in dogs with primary lens luxation. *Invest Ophthalmol Vis Sci*. 2010 Sep;51:4716-4721.
3. Gould D, Pettitt L, McLaughlin B, et al. ADAMTS17 mutation associated with primary lens luxation is widespread among breeds. *Vet Ophthalmol*. 2011 Nov;14:378-384.

OCULAR DISORDERS REPORT RAT TERRIER

Diagnostic Name	TOTAL DOGS EXAMINED		1991-1999		2000-2009		2010-2013		2014	
	#	%	#	%	#	%	#	%	#	%
EYELIDS										
25.110 distichiasis	1	12.5%	1	0.6%	1	2.2%	0			
UVEA										
93.710 persistent pupillary membranes, iris to iris	0		5	2.8%	1	2.2%	0			
93.730 persistent pupillary membranes, iris to cornea	0		1	0.6%	0		0			
93.750 persistent pupillary membranes, lens pigment foci/no strands	0		0		0		1	5.6%		
LENS										
100.210 cataract, significance unknown	0		2	1.1%	1	2.2%	0			
100.303 punctate cataract, equatorial cortex	0		0		0		1	5.6%		
100.311 incipient cataract, anterior cortex	0		2	1.1%	1	2.2%	0			
100.312 incipient cataract, posterior cortex	0		2	1.1%	0		1	5.6%		
100.313 incipient cataract, equatorial cortex	0		1	0.6%	0		1	5.6%		
100.315 incipient cataract, posterior sutures	0		1	0.6%	0		0			
100.316 incipient cataract, nucleus	0		1	0.6%	0		0			
100.330 generalized/complete cataract	0		4	2.2%	0		0			
100.375 subluxation/luxation, unspecified	0		1	0.6%	2	4.3%	0			
VITREOUS										
110.200 vitritis	0		0		1	2.2%	0			
110.320 vitreous degeneration syneresis	0		3	1.7%	0		0			
RETINA										
120.190 retinal dysplasia, detached	0		0		1	2.2%	0			
120.310 generalized progressive retinal atrophy (PRA)	0		1	0.6%	0		0			
OTHER										
900.000 other, unspecified	0		1	0.6%	2	4.3%	0			
900.110 other, suspected as inherited	0		1	0.6%	0		0			
NORMAL										
0.000 normal globe	7	87.5%	164	91.6%	42	91.3%	17	94.4%		

OCULAR DISORDERS REPORT

RHODESIAN RIDGEBACK - 1

RHODESIAN RIDGEBACK

	DISORDER	INHERITANCE	REFERENCE	BREEDING ADVICE
A.	Distichiasis	Not defined	1	Breeder option
B.	Entropion	Not defined	2	NO
C.	Persistent pupillary membranes			
	- iris to iris	Not defined	3-5	Breeder option
	- all other forms	Not defined	5	NO
D.	Cataract	Not defined	1	NO

Description and Comments

A. Distichiasis

Eyelashes abnormally located on the eyelid margin which may cause ocular irritation. Distichiasis may occur at any time in the life of a dog. It is difficult to make a strong recommendation with regard to breeding dogs with this entity. The hereditary basis has not been established although it seems probable due to the high incidence in some breeds. Reducing the incidence is a logical goal. When diagnosed, distichiasis should be recorded; breeding discretion is advised.

B. Entropion

A conformational defect resulting in an "in-rolling" of one or both of the eyelids which may cause ocular irritation. It is likely that entropion is influenced by several genes (polygenic), defining the skin and other structures which make up the eyelids, the amount and weight of the skin covering the head and face, the orbital contents, and the conformation of the skull.

C. Persistent pupillary membranes (PPM)

Persistent blood vessel remnants in the anterior chamber of the eye which fail to regress normally by 3 months of age. These strands may bridge from iris to iris, iris to cornea, iris to lens, or form sheets of tissue in the anterior chamber. The last three forms pose the greatest threat to vision and when severe, vision impairment or blindness may occur.

OCULAR DISORDERS REPORT

RHODESIAN RIDGEBACK - 2

D. Cataract

A partial or complete opacity of the lens and/or its capsule. In cases where cataracts are complete and affect both eyes, blindness results. The prudent approach is to assume cataracts to be hereditary except in cases known to be associated with trauma, other causes of ocular inflammation, specific metabolic diseases, persistent pupillary membrane, persistent hyaloid or nutritional deficiencies. Cataracts may involve the lens completely (diffuse) or in a localized region.

References

There are no references providing detailed descriptions of hereditary ocular conditions of the Rhodesian Ridgeback breed. The conditions listed above are generally recognized to exist in this breed, as evidenced by identification on breed eye screening examinations and/or clinical experience of veterinary ophthalmologists.

1. ACVO Genetics Committee, 1999 and/or Data from CERF All-Breeds Report, 1991-1998.
2. Breed club request to ACVO Genetics Committee, 2008.
3. ACVO Genetics Committee, 2000-2002 and/or Data from CERF All-Breeds Report, 2000-2002.
4. ACVO Genetics Committee, 2002-2003 and/or Data from CERF All-Breeds Report, 2002-2003.
5. ACVO Genetics Committee, 2005 and/or Data from CERF All-Breeds Report 2003-2004.

OCULAR DISORDERS REPORT RHODESIAN RIDGEBACK

Diagnostic Name	TOTAL DOGS EXAMINED		1991-1999 544		2000-2009 2308		2010-2013 1147		2014 340	
	#	%	#	%	#	%	#	%	#	%
GLOBE										
0.110 microphthalmia	0		2	0.1%	0		0		0	
EYELIDS										
21.000 entropion, unspecified	4	0.7%	8	0.3%	1	0.1%	1	0.3%	1	0.3%
22.000 ectropion, unspecified	0		1	0.0%	0		0		0	
25.110 distichiasis	14	2.6%	63	2.7%	45	3.9%	7	2.1%	7	2.1%
NICTITANS										
51.100 third eyelid cartilage anomaly	0		0		2	0.2%	0		0	
52.110 prolapsed gland of the third eyelid	0		0		3	0.3%	0		0	
CORNEA										
70.210 corneal pannus	0		3	0.1%	3	0.3%	0		0	
70.700 corneal dystrophy	4	0.7%	15	0.6%	2	0.2%	1	0.3%	1	0.3%
UVEA										
93.110 iris hypoplasia	0		1	0.0%	0		0		0	
93.120 iris cyst	0		2	0.1%	0		2	0.6%	2	0.6%
93.140 corneal endothelial pigment without PPM	0		0		4	0.3%	0		0	
93.710 persistent pupillary membranes, iris to iris	20	3.7%	126	5.5%	94	8.2%	22	6.5%	22	6.5%
93.720 persistent pupillary membranes, iris to lens	4	0.7%	2	0.1%	0		0		0	
93.730 persistent pupillary membranes, iris to cornea	0		2	0.1%	0		0		0	
93.740 persistent pupillary membranes, iris sheets	0		1	0.0%	0		0		0	
93.750 persistent pupillary membranes, lens pigment foci/no strands	0		1	0.0%	33	2.9%	18	5.3%	18	5.3%
93.760 persistent pupillary membranes, endothelial opacity/no strands	0		0		3	0.3%	2	0.6%	2	0.6%
93.810 uveal melanoma	0		0		1	0.1%	1	0.3%	1	0.3%
LENS										
100.200 cataract, unspecified	4	0.7%	0		0		0		0	
100.210 cataract, significance unknown	32	5.9%	108	4.7%	52	4.5%	20	5.9%	20	5.9%
100.301 punctate cataract, anterior cortex	1	0.2%	3	0.1%	9	0.8%	1	0.3%	1	0.3%
100.302 punctate cataract, posterior cortex	8	1.5%	22	1.0%	10	0.9%	3	0.9%	3	0.9%
100.303 punctate cataract, equatorial cortex	1	0.2%	1	0.0%	2	0.2%	0		0	
100.305 punctate cataract, posterior sutures	4	0.7%	9	0.4%	11	1.0%	2	0.6%	2	0.6%
100.307 punctate cataract, capsular	0		8	0.3%	4	0.3%	0		0	
100.311 incipient cataract, anterior cortex	0		0		4	0.3%	2	0.6%	2	0.6%
100.312 incipient cataract, posterior cortex	22	4.0%	44	1.9%	14	1.2%	2	0.6%	2	0.6%
100.313 incipient cataract, equatorial cortex	2	0.4%	4	0.2%	2	0.2%	1	0.3%	1	0.3%
100.315 incipient cataract, posterior sutures	3	0.6%	7	0.3%	2	0.2%	2	0.6%	2	0.6%
100.316 incipient cataract, nucleus	0		4	0.2%	0		1	0.3%	1	0.3%
100.317 incipient cataract, capsular	1	0.2%	13	0.6%	2	0.2%	0		0	
100.322 incomplete cataract, posterior cortex	0		0		0		1	0.3%	1	0.3%
100.324 incomplete cataract, anterior sutures	0		0		1	0.1%	0		0	
100.330 generalized/complete cataract	2	0.4%	1	0.0%	0		0		0	
100.375 subluxation/luxation, unspecified	0		3	0.1%	0		0		0	
VITREOUS										
110.120 persistent hyaloid artery/remnant	0		1	0.0%	0		0		0	
110.135 PHPV/PTVL	0		1	0.0%	0		0		0	

OCULAR DISORDERS REPORT RHODESIAN RIDGEBACK

VITREOUS CONTINUED	1991-1999	2000-2009	2010-2013	2014
110.320 vitreous degeneration syneresis	3 0.6%	2 0.1%	0	0
110.330 vitreous degeneration anterior chamber	0	4 0.2%	1 0.1%	0
RETINA				
120.170 retinal dysplasia, folds	1 0.2%	3 0.1%	1 0.1%	1 0.3%
120.180 retinal dysplasia, geographic	0	1 0.0%	0	0
120.190 retinal dysplasia, detached	0	1 0.0%	0	0
120.310 generalized progressive retinal atrophy (PRA)	1 0.2%	2 0.1%	1 0.1%	0
120.910 retinal detachment without dialysis	0	2 0.1%	0	0
OPTIC NERVE				
130.110 micropapilla	0	1 0.0%	0	0
130.120 optic nerve hypoplasia	1 0.2%	0	0	0
130.150 optic disc coloboma	0	5 0.2%	0	0
OTHER				
900.000 other, unspecified	0	21 0.9%	30 2.6%	0
900.100 other, not inherited	4 0.7%	84 3.6%	12 1.0%	10 2.9%
900.110 other, suspected as inherited	2 0.4%	6 0.3%	6 0.5%	0
NORMAL				
0.000 normal globe	433 79.6%	2019 87.5%	995 86.7%	302 88.8%

OCULAR DISORDERS REPORT

ROTTWEILER - 1

ROTTWEILER

	DISORDER	INHERITANCE	REFERENCE	BREEDING ADVICE
A.	Entropion	Not defined	1, 2	Breeder option
B.	Corneal dystrophy - epithelial/stromal	Not defined	1	Breeder option
C.	Uveal cysts	Not defined	1, 3, 4	Breeder option
D.	Persistent pupillary membranes - iris to iris	Not defined	5	Breeder option
E.	Cataract	Not defined	1, 3	NO
F.	Retinal atrophy - generalized	Not defined	1	NO
G.	Retinal dysplasia - folds	Not defined	1, 4	Breeder option

Description and Comments

A. Entropion

A conformational defect resulting in an "in-rolling" of one or both of the eyelids which may cause ocular irritation. It is likely that entropion is influenced by several genes (polygenic), defining the skin and other structures which make up the eyelids, the amount and weight of the skin covering the head and face, the orbital contents, and the conformation of the skull.

Entropion in the Rottweiler has been observed with increasing frequency in the past few years. Selection should be directed against entropion and toward a head conformation that minimizes or eliminates the likelihood of the defect. The entropion usually involves the lower eyelids in this breed and requires surgical correction.

B. Corneal dystrophy - epithelial/stromal

A non-inflammatory corneal opacity (white to gray) present in one or more of the corneal layers; usually inherited and bilateral.

OCULAR DISORDERS REPORT

ROTTWEILER - 2

C. Uveal cysts

A pigmented, fluid-filled epithelial-lined structure arising from the posterior iris or ciliary body epithelium. Cysts may remain attached to the pupil margin, iris, or ciliary body, or may detach and be free-floating within the anterior chamber. They may rupture and adhere to the cornea or anterior lens capsule. Uveal cysts may occur in any breed. Uveal cysts are commonly benign, although they may be associated with other pathologic conditions in various breeds.

D. Persistent pupillary membranes (PPM)

Persistent blood vessel remnants in the anterior chamber of the eye which fail to regress normally by 3 months of age. These strands may bridge from iris to iris, iris to cornea, iris to lens, or form sheets of tissue in the anterior chamber. The last three forms pose the greatest threat to vision and when severe, vision impairment or blindness may occur.

E. Cataract

A partial or complete opacity of the lens and/or its capsule. In cases where cataracts are complete and affect both eyes, blindness results. The prudent approach is to assume cataracts to be hereditary except in cases known to be associated with trauma, other causes of ocular inflammation, specific metabolic diseases, persistent pupillary membrane, persistent hyaloid or nutritional deficiencies. Cataracts may involve the lens completely (diffuse) or in a localized region.

A variety of cataracts have been observed in this breed ranging from the posterior polar cataract similar to that in the Golden Retriever and cataracts involving multiple areas of the nucleus and cortex. Further studies need to be performed as to the exact mode of inheritance, but it is our recommendation that the individually afflicted dog should not be bred.

F. Retinal atrophy - generalized

A degenerative disease of the retinal visual cells which progresses to blindness. This abnormality, also known as progressive retinal atrophy or PRA, may be detected by electroretinogram (not part of a routine eye screening examination) before it is apparent clinically. Except for X-linked PRA in the Siberian Husky, in all breeds studied to date, PRA is inherited as an autosomal recessive trait.

G. Retinal dysplasia - folds

Linear, triangular, curved or curvilinear foci of retinal folding that may be single or multiple. When seen in puppies, this condition may partially or completely resolve with maturity. Its significance to vision is unknown. There are two other forms of retinal dysplasia (geographic, detached) which are known to be inherited in other breeds and, in their most severe form, cause blindness. The genetic relationship between folds and more severe forms of retinal dysplasia is undetermined.

OCULAR DISORDERS REPORT

ROTTWEILER - 3

References

1. ACVO Genetics Committee, 1999 and/or Data from CERF All-Breeds Report, 1991-1998.
2. ACVO Genetics Committee, 2001 and/or Data from CERF All-Breeds Report, 2001.
3. Bjerkas E. Progressive retinal atrophy in dogs in Norway. *Norsk Veterinaertidsskrift*. 1991;103:601-610.
4. Bedford PG. Multifocal retinal dysplasia in the rottweiler. *Vet Rec*. 1982 Sep 25;111:304-305.
5. ACVO Genetics Committee, 2006 and/or Data from CERF AllBreeds Report, 2001-2005.

OCULAR DISORDERS REPORT ROTTWEILER

Diagnostic Name	TOTAL DOGS EXAMINED		1991-1999 5756		2000-2009 5416		2010-2013 2563		2014 569	
	#	%	#	%	#	%	#	%	#	%
GLOBE										
0.110 microphthalmia	1	0.0%	1	0.0%	1	0.0%	0		0	
EYELIDS										
20.140 ectopic cilia	0		1	0.0%	0		0		0	
20.160 macropalpebral fissure	1	0.0%	9	0.2%	0		0		0	
21.000 entropion, unspecified	63	1.1%	34	0.6%	15	0.6%	3	0.5%		
22.000 ectropion, unspecified	13	0.2%	15	0.3%	2	0.1%	0			
25.110 distichiasis	29	0.5%	33	0.6%	15	0.6%	5	0.9%		
NASOLACRIMAL										
40.910 keratoconjunctivitis sicca	0		0		2	0.1%	1	0.2%		
NICTITANS										
51.100 third eyelid cartilage anomaly	3	0.1%	0		0		1	0.2%		
52.110 prolapsed gland of the third eyelid	5	0.1%	2	0.0%	7	0.3%	0			
CORNEA										
70.210 corneal pannus	3	0.1%	0		0		0		0	
70.220 pigmentary keratitis	0		1	0.0%	1	0.0%	0		0	
70.700 corneal dystrophy	60	1.0%	46	0.8%	17	0.7%	6	1.1%		
70.730 corneal endothelial degeneration	3	0.1%	3	0.1%	1	0.0%	0			
UVEA										
93.110 iris hypoplasia	0		3	0.1%	7	0.3%	0		0	
93.120 iris cyst	45	0.8%	88	1.6%	77	3.0%	12	2.1%		
93.140 corneal endothelial pigment without PPM	0		1	0.0%	0		0		0	
93.150 iris coloboma	21	0.4%	19	0.4%	6	0.2%	1	0.2%		
93.170 anterior chamber cyst	0		0		7	0.3%	6	1.1%		
93.710 persistent pupillary membranes, iris to iris	26	0.5%	42	0.8%	50	2.0%	5	0.9%		
93.720 persistent pupillary membranes, iris to lens	17	0.3%	18	0.3%	2	0.1%	0			
93.730 persistent pupillary membranes, iris to cornea	22	0.4%	16	0.3%	12	0.5%	1	0.2%		
93.740 persistent pupillary membranes, iris sheets	6	0.1%	2	0.0%	0		0			
93.750 persistent pupillary membranes, lens pigment foci/no strands	0		6	0.1%	53	2.1%	25	4.4%		
93.760 persistent pupillary membranes, endothelial opacity/no strands	0		2	0.0%	9	0.4%	0			
93.810 uveal melanoma	0		1	0.0%	2	0.1%	0			
95.120 ciliary body cyst	0		0		3	0.1%	8	1.4%		
LENS										
100.200 cataract, unspecified	229	4.0%	0		0		0		0	
100.210 cataract, significance unknown	225	3.9%	416	7.7%	154	6.0%	44	7.7%		
100.301 punctate cataract, anterior cortex	32	0.6%	34	0.6%	42	1.6%	5	0.9%		
100.302 punctate cataract, posterior cortex	126	2.2%	78	1.4%	40	1.6%	6	1.1%		
100.303 punctate cataract, equatorial cortex	4	0.1%	4	0.1%	1	0.0%	0			
100.304 punctate cataract, anterior sutures	4	0.1%	9	0.2%	2	0.1%	0			
100.305 punctate cataract, posterior sutures	38	0.7%	31	0.6%	7	0.3%	1	0.2%		
100.306 punctate cataract, nucleus	10	0.2%	8	0.1%	12	0.5%	0			
100.307 punctate cataract, capsular	3	0.1%	19	0.4%	11	0.4%	5	0.9%		
100.311 incipient cataract, anterior cortex	39	0.7%	46	0.8%	14	0.5%	3	0.5%		
100.312 incipient cataract, posterior cortex	178	3.1%	236	4.4%	71	2.8%	13	2.3%		

OCULAR DISORDERS REPORT ROTTWEILER

LENS CONTINUED	1991-1999	2000-2009	2010-2013	2014
100.313 incipient cataract, equatorial cortex	9 0.2%	23 0.4%	4 0.2%	1 0.2%
100.314 incipient cataract, anterior sutures	4 0.1%	5 0.1%	1 0.0%	1 0.2%
100.315 incipient cataract, posterior sutures	40 0.7%	28 0.5%	1 0.0%	2 0.4%
100.316 incipient cataract, nucleus	25 0.4%	18 0.3%	10 0.4%	0
100.317 incipient cataract, capsular	0	18 0.3%	12 0.5%	5 0.9%
100.322 incomplete cataract, posterior cortex	0	0	5 0.2%	2 0.4%
100.327 incomplete cataract, capsular	0	0	2 0.1%	1 0.2%
100.330 generalized/complete cataract	30 0.5%	17 0.3%	1 0.0%	0
100.375 subluxation/luxation, unspecified	1 0.0%	1 0.0%	0	1 0.2%
VITREOUS				
110.120 persistant hyaloid artery/remnant	12 0.2%	6 0.1%	1 0.0%	0
110.135 PHPV/PTVL	3 0.1%	3 0.1%	1 0.0%	0
110.200 vitritis	0	0	0	1 0.2%
110.320 vitreous degeneration syneresis	23 0.4%	25 0.5%	6 0.2%	1 0.2%
110.330 vitreous degeneration anterior chamber	0	4 0.1%	5 0.2%	0
RETINA				
120.170 retinal dysplasia, folds	53 0.9%	47 0.9%	17 0.7%	4 0.7%
120.180 retinal dysplasia, geographic	23 0.4%	12 0.2%	7 0.3%	1 0.2%
120.190 retinal dysplasia, detached	0	0	1 0.0%	0
120.200 retinitis	0	0	0	1 0.2%
120.310 generalized progressive retinal atrophy (PRA)	118 2.1%	47 0.9%	7 0.3%	1 0.2%
120.910 retinal detachment without dialysis	1 0.0%	0	0	0
120.920 retinal detachment with dialysis	0	0	0	1 0.2%
120.960 retinopathy	0	0	11 0.4%	0
OPTIC NERVE				
130.110 micropapilla	0	6 0.1%	4 0.2%	2 0.4%
130.120 optic nerve hypoplasia	10 0.2%	6 0.1%	1 0.0%	0
130.150 optic disc coloboma	0	2 0.0%	0	0
OTHER				
900.000 other, unspecified	0	49 0.9%	88 3.4%	0
900.100 other, not inherited	22 0.4%	297 5.5%	27 1.1%	31 5.4%
900.110 other, suspected as inherited	106 1.8%	33 0.6%	13 0.5%	4 0.7%
NORMAL				
0.000 normal globe	4483 77.9%	4431 81.8%	2257 88.1%	473 83.1%

OCULAR DISORDERS REPORT

RUSSELL TERRIER - 1

RUSSELL TERRIER

	DISORDER	INHERITANCE	REFERENCE	BREEDING ADVICE
A.	Distichiasis	Not defined	1	Breeder option
B.	Persistent pupillary membranes			
	- iris to iris	Not defined	2, 3	Breeder option
	- all other forms	Not defined	3	NO

Description and Comments

A. Distichiasis

Eyelashes abnormally located on the eyelid margin which may cause ocular irritation. Distichiasis may occur at any time in the life of a dog. It is difficult to make a strong recommendation with regard to breeding dogs with this entity. The hereditary basis has not been established although it seems probable due to the high incidence in some breeds. Reducing the incidence is a logical goal. When diagnosed, distichiasis should be recorded; breeding discretion is advised.

B. Persistent pupillary membranes (PPM)

Persistent blood vessel remnants in the anterior chamber of the eye which fail to regress normally by 3 months of age. These strands may bridge from iris to iris, iris to cornea, iris to lens, or form sheets of tissue in the anterior chamber. The last three forms pose the greatest threat to vision and when severe, vision impairment or blindness may occur.

References

There are no references providing detailed descriptions of hereditary conditions of the Russell Terrier breed. The conditions listed above are generally recognized to exist in this breed, as evidenced by identification on breed eye screening examinations and/or clinical experience of veterinary ophthalmologists.

1. ACVO Genetics Committee, 1999 and/or Data from CERF All Breeds Report, 1991-1998.
2. ACVO Genetics Committee, 2000-2002 and/or Data from CERF All-Breeds Report, 2000-2002.

OCULAR DISORDERS REPORT

RUSSELL TERRIER - 2

3. ACVO Genetics Committee, 2005 and/or Data from CERF All-Breeds Report 2003-2004.

OCULAR DISORDERS REPORT RUSSELL TERRIER

Diagnostic Name	TOTAL DOGS EXAMINED	1991-1999		2000-2009		2010-2013		2014	
		#	%	#	%	#	%	#	%
EYELIDS									
25.110 distichiasis		0		0		5	3.6%	6	5.5%
NASOLACRIMAL									
40.910 keratoconjunctivitis sicca		0		0		0		1	0.9%
UVEA									
93.110 iris hypoplasia		0		0		0		1	0.9%
93.120 iris cyst		0		0		1	0.7%	0	
93.150 iris coloboma		0		0		0		1	0.9%
93.710 persistent pupillary membranes, iris to iris		0		0		4	2.9%	5	4.6%
93.750 persistent pupillary membranes, lens pigment foci/no strands		0		0		1	0.7%	0	
LENS									
100.210 cataract, significance unknown		0		0		2	1.4%	4	3.7%
100.301 punctate cataract, anterior cortex		0		0		1	0.7%	0	
100.322 incomplete cataract, posterior cortex		0		0		0		2	1.8%
RETINA									
120.170 retinal dysplasia, folds		0		0		2	1.4%	0	
120.310 generalized progressive retinal atrophy (PRA)		0		1	11.1%	0		0	
OPTIC NERVE									
130.110 micropapilla		0		0		0		1	0.9%
OTHER									
900.000 other, unspecified		0		0		2	1.4%	0	
900.100 other, not inherited		0		0		1	0.7%	4	3.7%
900.110 other, suspected as inherited		0		0		1	0.7%	0	
NORMAL									
0.000 normal globe		0		9	100.0%	132	95.7%	102	93.6%

OCULAR DISORDERS REPORT

RUSSIAN TSVETNAYA BOLONKA - 1

RUSSIAN TSVETNAYA BOLONKA

	DISORDER	INHERITANCE	REFERENCE	BREEDING ADVICE
A.	Vitreous Degeneration	Not defined	1	Breeder option

Description and Comments

A. Vitreous degeneration

Liquefaction of the vitreous gel which may predispose to retinal detachment which results in blindness when complete.

References

There are no references providing detailed descriptions of hereditary conditions of the Russian Tsvetnaya Bolonka breed. The conditions listed above are generally recognized to exist in this breed, as evidenced by identification on breed eye screening examinations and/or clinical experience of veterinary ophthalmologists.

1. ACVO Genetics Committee, 2008 and/or Data from CERF All-Breeds Report, 2003-2007.

OCULAR DISORDERS REPORT RUSSIAN TSVETNAYA BOLONKA

Diagnostic Name	TOTAL DOGS EXAMINED	1991-1999		2000-2009		2010-2013		2014	
		#	%	#	%	#	%	#	%
EYELIDS									
25.110 distichiasis		0		1	2.0%	0		0	
NASOLACRIMAL									
40.910 keratoconjunctivitis sicca		0		0		0		1	16.7%
CORNEA									
70.220 pigmentary keratitis		0		0		0		1	16.7%
UVEA									
93.750 persistent pupillary membranes, lens pigment foci/no strands		0		0		1	3.1%	0	
LENS									
100.210 cataract, significance unknown		0		1	2.0%	4	12.5%	0	
100.305 punctate cataract, posterior sutures		0		0		2	6.2%	0	
100.313 incipient cataract, equatorial cortex		0		1	2.0%	0		0	
100.375 subluxation/luxation, unspecified		0		0		1	3.1%	0	
VITREOUS									
110.135 PHPV/PTVL		0		1	2.0%	0		0	
110.200 vitritis		0		0		2	6.2%	0	
110.320 vitreous degeneration syneresis		0		3	5.9%	2	6.2%	0	
110.330 vitreous degeneration anterior chamber		0		5	9.8%	0		0	
OTHER									
900.000 other, unspecified		0		0		1	3.1%	0	
900.100 other, not inherited		0		2	3.9%	0		0	
NORMAL									
0.000 normal globe		0		46	90.2%	27	84.4%	5	83.3%

OCULAR DISORDERS REPORT

SAINT BERNARD - 1

SAINT BERNARD

	DISORDER	INHERITANCE	REFERENCE	BREEDING ADVICE
A.	Microphthalmia with multiple ocular defects	Not defined	1, 2	NO
B.	Macroblepharon	Not defined	3	Breeder option
C.	Ectropion	Not defined	1	Breeder option
D.	Entropion	Not defined	1, 4, 5	Breeder option
E.	Dermoid	Not defined	1, 4, 6-8	Breeder option
F.	Persistent pupillary membrane - iris to iris	Not defined	9	Breeder option
G.	Cataract	Not defined	1	NO

Description and Comments

A. Microphthalmia with multiple ocular defects

Multiple ocular defects have been described in Saint Bernard puppies. The syndrome was composed of microphthalmia, microphakia, aphakia, acoria, peripheral anterior synechia, and retinal dysplasia. Glaucoma was also reported. Although the cause was not proven to be hereditary, the fact that several of these dogs were related suggests a hereditary basis. Affected dogs should not be bred.

B. Macroblepharon

Defined as an exceptionally large palpebral fissure, macroblepharon in conjunction with laxity of the lateral canthal structures may lead to lower lid ectropion and upper lid entropion. Either of these conditions may lead to severe ocular irritation.

OCULAR DISORDERS REPORT

SAINT BERNARD - 2

C. Ectropion

A conformational defect resulting in eversion of the eyelids which may cause ocular irritation. It is likely that ectropion is influenced by several genes (polygenic) defining the skin and other structures which make up the eyelids, the amount and weight of the skin covering the head and face, the orbital contents and the conformation of the skull.

D. Entropion

A conformational defect resulting in an "in-rolling" of one or both of the eyelids which may cause ocular irritation. It is likely that entropion is influenced by several genes (polygenic), defining the skin and other structures which make up the eyelids, the amount and weight of the skin covering the head and face, the orbital contents, and the conformation of the skull. In this breed, entropion is associated with an exceptionally large palpebral fissure.

E. Dermoid

A patch of skin, usually located on the cornea; its presence usually causes ocular irritation.

F. Persistent pupillary membranes (PPM)

Persistent blood vessel remnants in the anterior chamber of the eye which fail to regress normally by 3 months of age. These strands may bridge from iris to iris, iris to cornea, iris to lens, or form sheets of tissue in the anterior chamber. The last three forms pose the greatest threat to vision and when severe, vision impairment or blindness may occur.

G. Cataract

A partial or complete opacity of the lens and/or its capsule. In cases where cataracts are complete and affect both eyes, blindness results. The prudent approach is to assume cataracts to be hereditary except in cases known to be associated with trauma, other causes of ocular inflammation, specific metabolic diseases, persistent pupillary membrane, persistent hyaloid or nutritional deficiencies. Cataracts may involve the lens completely (diffuse) or in a localized region.

References

1. ACVO Genetics Committee, 1999 and/or Data from CERF All-Breeds Report, 1991-1998.
2. Martin CL and Leipold HW. Aphakia and multiple ocular defects in Saint Bernard puppies. *Vet Med Small Anim Clin.* 1974 Apr;69:448-453.
3. ACVO Genetics Committee, 2000-2002 and/or Data from CERF All-Breeds Report, 2000-2002.
4. Priester WA. Congenital ocular defects in cattle, horses, cats, and dogs. *J Am Vet Med Assoc.* 1972 Jun 1;160:1504-1511.

OCULAR DISORDERS REPORT

SAINT BERNARD - 3

5. ACVO Genetics Committee, 2001 and/or Data from CERF All-Breeds Report, 2001.
6. Gelatt KN. Bilateral corneal dermoids and distichiasis in a dog. *Vet Med Small Anim Clin.* 1971 Jul;66:658-659.
7. Kittel H. *Deut Tieraerztl Wochenschr.* 1931;52:793.
8. Szczudlowska M. Dermoid cyst of the eye in relation to heredity and overfeeding. *Med Vet.* 1967;23:567.
9. ACVO Genetics Committee, 2007 and/or Data from CERF All-Breeds Report 2002-2006.

OCULAR DISORDERS REPORT SAINT BERNARD

Diagnostic Name	TOTAL DOGS EXAMINED	1991-1999		2000-2009		2010-2013		2014	
		#	%	#	%	#	%	#	%
EYELIDS									
20.160	macropalpebral fissure	2	3.4%	16	18.2%	3	10.7%	0	
21.000	entropion, unspecified	19	32.8%	12	13.6%	6	21.4%	4	23.5%
22.000	ectropion, unspecified	24	41.4%	32	36.4%	5	17.9%	5	29.4%
25.110	distichiasis	4	6.9%	3	3.4%	1	3.6%	3	17.6%
NICTITANS									
51.100	third eyelid cartilage anomaly	1	1.7%	0		0		0	
52.110	prolapsed gland of the third eyelid	1	1.7%	0		0		0	
CORNEA									
70.700	corneal dystrophy	0		1	1.1%	1	3.6%	0	
UVEA									
93.120	iris cyst	0		0		0		1	5.9%
93.710	persistent pupillary membranes, iris to iris	2	3.4%	6	6.8%	7	25.0%	0	
LENS									
100.210	cataract, significance unknown	5	8.6%	4	4.5%	0		1	5.9%
100.302	punctate cataract, posterior cortex	0		1	1.1%	0		0	
100.303	punctate cataract, equatorial cortex	0		1	1.1%	0		0	
100.307	punctate cataract, capsular	0		1	1.1%	0		0	
100.311	incipient cataract, anterior cortex	1	1.7%	0		0		0	
100.312	incipient cataract, posterior cortex	2	3.4%	1	1.1%	0		0	
100.313	incipient cataract, equatorial cortex	3	5.2%	2	2.3%	0		0	
100.316	incipient cataract, nucleus	0		3	3.4%	0		0	
100.326	incomplete cataract, nucleus	0		0		0		1	5.9%
100.330	generalized/complete cataract	1	1.7%	6	6.8%	1	3.6%	0	
VITREOUS									
110.120	persistant hyaloid artery/remnant	2	3.4%	0		0		0	
110.135	PHPV/PTVL	0		1	1.1%	0		0	
RETINA									
120.170	retinal dysplasia, folds	2	3.4%	0		3	10.7%	0	
OPTIC NERVE									
130.110	micropapilla	0		0		2	7.1%	0	
130.120	optic nerve hypoplasia	1	1.7%	0		0		0	
OTHER									
900.000	other, unspecified	0		1	1.1%	2	7.1%	0	
900.100	other, not inherited	0		5	5.7%	0		0	
900.110	other, suspected as inherited	4	6.9%	4	4.5%	0		1	5.9%
NORMAL									
0.000	normal globe	19	32.8%	40	45.5%	14	50.0%	7	41.2%

OCULAR DISORDERS REPORT

SALUKI - 1

SALUKI

	DISORDER	INHERITANCE	REFERENCE	BREEDING ADVICE
A.	Persistent pupillary membranes			
	- iris to iris	Not defined	1, 2	Breeder option
	- all other forms	Not defined	2	NO
B.	Cataract	Not defined	1	NO

Description and Comments

A. Persistent pupillary membranes (PPM)

Persistent blood vessel remnants in the anterior chamber of the eye which fail to regress normally by 3 months of age. These strands may bridge from iris to iris, iris to cornea, iris to lens, or form sheets of tissue in the anterior chamber. The last three forms pose the greatest threat to vision and when severe, vision impairment or blindness may occur.

B. Cataract

A partial or complete opacity of the lens and/or its capsule. In cases where cataracts are complete and affect both eyes, blindness results. The prudent approach is to assume cataracts to be hereditary except in cases known to be associated with trauma, other causes of ocular inflammation, specific metabolic diseases, persistent pupillary membrane, persistent hyaloid or nutritional deficiencies. Cataracts may involve the lens completely (diffuse) or in a localized region.

References

There are no references providing detailed descriptions of hereditary ocular conditions of the Saluki breed. The conditions listed above are generally recognized to exist in this breed, as evidenced by identification on breed eye screening examinations and/or clinical experience of veterinary ophthalmologists.

1. ACVO Genetics Committee, 2002-2003 and/or Data from CERF All-Breeds Report, 2002-2003.
2. ACVO Genetics Committee, 2005 and/or Data from CERF All-Breeds Report 2003-2004.

OCULAR DISORDERS REPORT SALUKI

Diagnostic Name	TOTAL DOGS EXAMINED	1991-1999		2000-2009		2010-2013		2014	
		#	%	#	%	#	%	#	%
CORNEA									
70.700	corneal dystrophy	1	1.0%	0		0		0	
UVEA									
93.710	persistent pupillary membranes, iris to iris	2	2.0%	3	2.7%	2	3.9%	0	
93.730	persistent pupillary membranes, iris to cornea	0		2	1.8%	1	2.0%	0	
93.740	persistent pupillary membranes, iris sheets	0		2	1.8%	0		0	
93.760	persistent pupillary membranes, endothelial opacity/no strands	0		0		1	2.0%	0	
LENS									
100.210	cataract, significance unknown	9	8.8%	4	3.6%	2	3.9%	1	9.1%
100.301	punctate cataract, anterior cortex	1	1.0%	0		0		0	
100.302	punctate cataract, posterior cortex	1	1.0%	1	0.9%	2	3.9%	0	
100.305	punctate cataract, posterior sutures	1	1.0%	0		0		0	
100.307	punctate cataract, capsular	0		0		0		2	18.2%
100.312	incipient cataract, posterior cortex	0		1	0.9%	0		0	
100.313	incipient cataract, equatorial cortex	0		2	1.8%	0		0	
100.316	incipient cataract, nucleus	0		0		1	2.0%	0	
100.330	generalized/complete cataract	0		2	1.8%	0		0	
VITREOUS									
110.200	vitritis	0		0		2	3.9%	0	
110.320	vitreous degeneration syneresis	0		2	1.8%	0		0	
110.330	vitreous degeneration anterior chamber	0		2	1.8%	2	3.9%	0	
RETINA									
120.310	generalized progressive retinal atrophy (PRA)	2	2.0%	0		0		0	
OPTIC NERVE									
130.150	optic disc coloboma	1	1.0%	0		0		0	
OTHER									
900.000	other, unspecified	0		1	0.9%	0		0	
900.100	other, not inherited	2	2.0%	3	2.7%	0		0	
NORMAL									
0.000	normal globe	86	84.3%	94	85.5%	50	98.0%	10	90.9%

OCULAR DISORDERS REPORT

SAMOYED - 1

SAMOYED

	DISORDER	INHERITANCE	REFERENCE	BREEDING ADVICE
A.	Distichiasis	Not defined	1	Breeder option
B.	Corneal dystrophy - epithelial/stromal	Not defined	1, 2	Breeder option
C.	Uveodermatologic syndrome	Not defined	1, 3, 4	NO
D.	Glaucoma	Not defined	1, 5-10	NO
E.	Persistent pupillary membranes			
	- iris to iris	Not defined	1, 11	Breeder option
	- all other forms	Not defined	11	NO
F.	Cataract	Not defined	1	NO
G.	Retinal atrophy - generalized * a DNA test is available	X-linked	1, 12, 13	NO
H.	Retinal dysplasia - folds	Presumed autosomal recessive	1, 14-17	NO (Breeder option with "Normal" DNA test)
I.	Retinal dysplasia - geographic/ detached	Presumed autosomal recessive	1, 14-17	NO
J.	Retinal dysplasia - folds/geographic/ detached (with skeletal defects) * a DNA test is available	Presumed incomplete dominant	1, 14-18	NO

OCULAR DISORDERS REPORT

SAMOYED - 2

Description and Comments

A. Distichiasis

Eyelashes abnormally located on the eyelid margin which may cause ocular irritation. Distichiasis may occur at any time in the life of a dog. It is difficult to make a strong recommendation with regard to breeding dogs with this entity. The hereditary basis has not been established, although it seems probable due to the high incidence in some breeds. Reducing the incidence is a logical goal. When diagnosed, distichiasis should be recorded; breeding discretion is advised.

B. Corneal dystrophy - epithelial/stromal

A non-inflammatory corneal opacity (white to gray) present in one or more of the corneal layers; usually inherited and bilateral.

C. Uveodermatologic syndrome

Uveodermatologic syndrome in the Samoyed bears many similarities to a condition in people called Vogt-Koyanagi-Harada (or VKH) syndrome. Thus, the condition in dogs is often referred to as VKH or VKH-like syndrome. It is an immune-mediated disease in which pigmented cells (melanocytes) in the eye and in the skin are destroyed by white blood cells (lymphocytes). The first clinical signs are usually inflammation of the intraocular structures (or uveitis) in both eyes. Adhesions between the iris and lens (posterior synechiae) and the peripheral iris and cornea (peripheral anterior synechiae) develop rapidly. Other complications include cataract development, retinal degeneration, retinal separation or detachment, optic disc atrophy and secondary glaucoma. The uveitis is very difficult to control medically and ultimately results in blindness in most affected dogs. Whitening of the hair (poliosis) and skin (vitiligo) may also be noted in advanced cases. Some veterinary ophthalmologists feel there is a prevalence of this entity in the Samoyed. Additional studies are needed to validate this experience and explore the possibility of a genetic basis.

D. Glaucoma

An elevation of intraocular pressure (IOP) which, when sustained, causes intraocular damage resulting in blindness. The elevated IOP occurs because the fluid cannot leave through the iridocorneal angle. Diagnosis and classification of glaucoma requires measurement of IOP (tonometry) and examination of the iridocorneal angle (gonioscopy). Neither of these tests is part of a routine breed eye screening exam.

E. Persistent pupillary membranes (PPM)

Persistent blood vessel remnants in the anterior chamber of the eye which fail to regress normally by 3 months of age. These strands may bridge from iris to iris, iris to cornea, iris to lens, or form sheets of tissue in the anterior chamber. The last three forms pose the greatest threat to vision and when severe, vision impairment or blindness may occur.

In the Samoyed, many of the PPM identified on routine screening examinations bridge from

OCULAR DISORDERS REPORT

SAMOYED - 3

the iris to the cornea where they may be associated with corneal opacity and vision impairment.

F. Cataract

A partial or complete opacity of the lens and/or its capsule. In cases where cataracts are complete and affect both eyes, blindness results. The prudent approach is to assume cataracts to be hereditary except in cases known to be associated with trauma, other causes of ocular inflammation, specific metabolic diseases, persistent pupillary membrane, persistent hyaloid or nutritional deficiencies. Cataracts may involve the lens completely (diffuse) or in a localized region.

G. Retinal atrophy - generalized

A degenerative disease of the retinal visual cells which progresses to blindness. This abnormality, also known as progressive retinal atrophy or PRA, may be detected by electroretinogram (not part of a routine eye screening examination) before it is apparent clinically. In the Samoyed, one form of PRA is inherited as a sex-linked trait. A DNA test is available.

H. Retinal dysplasia - folds

Linear, triangular, curved or curvilinear foci of retinal folding that may be single or multiple. When seen in puppies, this condition may partially or completely resolve with maturity. Its significance to vision is unknown. There are two other forms of retinal dysplasia (geographic, detached) which are known to be inherited in other breeds and, in their most severe form, cause blindness.

In the Samoyed, the presence of retinal folds may be seen in the heterozygous state described in "J" below thus the recommendation against breeding.

I. Retinal dysplasia – geographic / detached

Abnormal development of the retina present at birth.

Retinal dysplasia - geographic: Any irregularly shaped area of abnormal retinal development containing both areas of thinning and areas of elevation representing folds and retinal disorganization.

Retinal dysplasia - detached: Severe retinal disorganization associated with separation (detachment) of the retina.

These two forms are associated with vision impairment or blindness. Retinal dysplasia is known to be inherited in many breeds. The genetic relationship between the three forms of retinal dysplasia is not known for all breeds.

J. Retinal dysplasia - folds or detachment with skeletal defects

OCULAR DISORDERS REPORT

SAMOYED - 4

Based on studies of the Samoyed and a recent report of a limited family of dogs, one form of retinal dysplasia in the Samoyed is an inherited defect similar to that reported in the Labrador Retriever affecting the forelimb and the eye. The gene has recessive effects on the skeleton and incomplete dominant effects on the eye. Affected dogs are of small stature with valgus deformity of the carpi. Ocular abnormalities include cataract and retinal folds/multifocal retinal dysplasia and detachment. The genes for dwarfism and retinal dysplasia exhibit pleiotropy. When homozygous for dwarfism, skeletal and ocular defects will be seen. In the heterozygous state multiple retinal folds/multifocal retinal dysplasia are seen. Dogs without the gene for dwarfism may have focal/multifocal retinal dysplasia but no skeletal defects. A DNA test is available

References

1. ACVO Genetics Committee, 1999 and/or Data from CERF All-Breeds Report, 1991-1998.
2. Crispin SM and Barnett KC. Dystrophy, degeneration and infiltration of the canine cornea. *J Small Anim Pract.* 1983;24:63.
3. Bussanich MN, et al. Granulomatous panuveitis and dermal depigmentation in dogs. *J Am Anim Hosp Assoc.* 1982;13:131.
4. Halliwell RE. Autoimmune diseases in domestic animals. *J Am Vet Med Assoc.* 1982 Nov 15;181:1088-1096.
5. Ekesten B and Narfstrom K. Correlation of morphologic features of the iridocorneal angle to intraocular pressure in Samoyeds. *Am J Vet Res.* 1991 Nov;52:1875-1878.
6. Ekesten B and Narfstrom K. Age-related changes in intraocular pressure and iridocorneal angle in Samoyeds. *Prog Vet Comp Ophthalmol.* 1992;2:37.
7. Ekesten B. Correlation of intraocular distances to the iridocorneal angle in samoyeds with special reference to angle-closure glaucoma. *Prog Vet Comp Ophthalmol.* 1993;3:67.
8. Ekesten B and Torrang I. Heritability of the depth of the opening of the ciliary cleft in Samoyeds. *Am J Vet Res.* 1995 Sep;56:1138-1143.
9. Ekesten B. Biological variability and measurement error variability in ocular biometry in samoyed dogs. *Acta Vet Scand.* 1994;35:427-433.
10. Gelatt KN and MacKay EO. Prevalence of the breed-related glaucomas in pure-bred dogs in North America. *Vet Ophthalmol.* 2004 Mar-Apr;7:97-111.
11. ACVO Genetics Committee, 2005 and/or Data from CERF All-Breeds Report 2003-2004.
12. Dice PF, 2nd. Progressive retinal atrophy in the Samoyed. *Mod Vet Pract.* 1980 Jan;61:59-60.
13. Zhang Q, Acland GM, Wu WX, et al. Different RPGR exon ORF15 mutations in Canids

OCULAR DISORDERS REPORT

SAMOYED - 5

- provide insights into photoreceptor cell degeneration. *Hum Mol Genet.* 2002 May 1;11:993-1003.
14. Meyers VN, Jezyk PF, Aguirre GD, et al. Short-limbed dwarfism and ocular defects in the Samoyed dog. *J Am Vet Med Assoc.* 1983 Nov 1;183:975-979.
 15. Acland GM and Aguirre GD. Retinal dysplasia in the Samoyed dog is the heterozygous phenotype of the gene (*drd^s*) for short-limbed dwarfism and ocular defects. *Trans Am Coll Vet Ophthalmol.* 1991;22:44.
 16. Acland GM and Aguirre GD. Oculoskeletal dysplasia in the Samoyed and Labrador Retriever dogs: 2 nonallelic disorders akin to Stickler-like syndrome affecting humans. *Presented at the 2nd international DOGMAP Meeting, Cambridge, Great Britain.* 1995.
 17. Aroch I, Ofri R and Aizenberg I. Haematological, ocular and skeletal abnormalities in a samoyed family. *J Small Anim Pract.* 1996 Jul;37:333-339.
 18. Goldstein O, Guyon R, Kukekova A, et al. COL9A2 and COL9A3 mutations in canine autosomal recessive oculoskeletal dysplasia. *Mamm Genome.* 2010 Aug;21:398-408.

OCULAR DISORDERS REPORT SAMOYED

Diagnostic Name	TOTAL DOGS EXAMINED	1991-1999 7518		2000-2009 10138		2010-2013 3908		2014 1030	
		#	%	#	%	#	%	#	%
GLOBE									
0.110	microphthalmia	13	0.2%	7	0.1%	0		0	
10.000	glaucoma	8	0.1%	2	0.0%	0		0	
EYELIDS									
20.140	ectopic cilia	5	0.1%	1	0.0%	1	0.0%	0	
20.160	macropalpebral fissure	1	0.0%	0		0		0	
21.000	entropion, unspecified	2	0.0%	3	0.0%	1	0.0%	0	
22.000	ectropion, unspecified	0		3	0.0%	0		0	
25.110	distichiasis	464	6.2%	540	5.3%	252	6.4%	54	5.2%
NASOLACRIMAL									
32.110	imperforate lower nasolacrimal punctum	3	0.0%	0		1	0.0%	5	0.5%
40.910	keratoconjunctivitis sicca	2	0.0%	6	0.1%	5	0.1%	0	
NICTITANS									
51.100	third eyelid cartilage anomaly	0		0		4	0.1%	0	
CORNEA									
70.210	corneal pannus	3	0.0%	1	0.0%	0		0	
70.220	pigmentary keratitis	1	0.0%	0		0		0	
70.700	corneal dystrophy	245	3.3%	332	3.3%	137	3.5%	41	4.0%
70.730	corneal endothelial degeneration	7	0.1%	5	0.0%	2	0.1%	0	
UVEA									
93.120	iris cyst	0		7	0.1%	1	0.0%	0	
93.140	corneal endothelial pigment without PPM	0		1	0.0%	0		0	
93.150	iris coloboma	1	0.0%	0		0		0	
93.710	persistent pupillary membranes, iris to iris	79	1.1%	227	2.2%	79	2.0%	41	4.0%
93.720	persistent pupillary membranes, iris to lens	6	0.1%	14	0.1%	2	0.1%	0	
93.730	persistent pupillary membranes, iris to cornea	14	0.2%	17	0.2%	1	0.0%	3	0.3%
93.740	persistent pupillary membranes, iris sheets	4	0.1%	11	0.1%	1	0.0%	0	
93.750	persistent pupillary membranes, lens pigment foci/no strands	0		1	0.0%	6	0.2%	2	0.2%
93.760	persistent pupillary membranes, endothelial opacity/no strands	0		1	0.0%	6	0.2%	2	0.2%
93.810	uveal melanoma	0		1	0.0%	0		0	
95.120	ciliary body cyst	0		0		0		1	0.1%
LENS									
100.200	cataract, unspecified	100	1.3%	0		0		0	
100.210	cataract, significance unknown	190	2.5%	368	3.6%	145	3.7%	39	3.8%
100.301	punctate cataract, anterior cortex	18	0.2%	28	0.3%	21	0.5%	2	0.2%
100.302	punctate cataract, posterior cortex	62	0.8%	55	0.5%	24	0.6%	6	0.6%
100.303	punctate cataract, equatorial cortex	4	0.1%	8	0.1%	3	0.1%	0	
100.304	punctate cataract, anterior sutures	2	0.0%	4	0.0%	2	0.1%	1	0.1%
100.305	punctate cataract, posterior sutures	24	0.3%	25	0.2%	9	0.2%	1	0.1%
100.306	punctate cataract, nucleus	4	0.1%	12	0.1%	4	0.1%	0	
100.307	punctate cataract, capsular	1	0.0%	12	0.1%	7	0.2%	1	0.1%
100.311	incipient cataract, anterior cortex	29	0.4%	32	0.3%	12	0.3%	0	
100.312	incipient cataract, posterior cortex	78	1.0%	116	1.1%	33	0.8%	10	1.0%
100.313	incipient cataract, equatorial cortex	8	0.1%	11	0.1%	6	0.2%	0	

OCULAR DISORDERS REPORT SAMOYED

LENS CONTINUED	1991-1999		2000-2009		2010-2013		2014	
100.314 incipient cataract, anterior sutures	1	0.0%	4	0.0%	2	0.1%	0	
100.315 incipient cataract, posterior sutures	14	0.2%	27	0.3%	6	0.2%	1	0.1%
100.316 incipient cataract, nucleus	10	0.1%	15	0.1%	7	0.2%	0	
100.317 incipient cataract, capsular	0		14	0.1%	10	0.3%	0	
100.322 incomplete cataract, posterior cortex	0		0		4	0.1%	2	0.2%
100.327 incomplete cataract, capsular	0		0		0		1	0.1%
100.330 generalized/complete cataract	39	0.5%	20	0.2%	7	0.2%	0	
100.375 subluxation/luxation, unspecified	2	0.0%	1	0.0%	0		0	
VITREOUS								
110.120 persistent hyaloid artery/remnant	10	0.1%	9	0.1%	1	0.0%	0	
110.135 PHPV/PTVL	6	0.1%	4	0.0%	1	0.0%	0	
110.320 vitreous degeneration syneresis	37	0.5%	39	0.4%	13	0.3%	2	0.2%
110.330 vitreous degeneration anterior chamber	0		1	0.0%	0		0	
FUNDUS								
97.110 choroidal hypoplasia	1	0.0%	3	0.0%	0		0	
97.120 coloboma	3	0.0%	3	0.0%	1	0.0%	0	
RETINA								
120.170 retinal dysplasia, folds	168	2.2%	246	2.4%	46	1.2%	13	1.3%
120.180 retinal dysplasia, geographic	50	0.7%	72	0.7%	30	0.8%	10	1.0%
120.190 retinal dysplasia, detached	7	0.1%	12	0.1%	4	0.1%	0	
120.310 generalized progressive retinal atrophy (PRA)	36	0.5%	14	0.1%	6	0.2%	0	
120.400 retinal hemorrhage	2	0.0%	0		0		0	
120.910 retinal detachment without dialysis	8	0.1%	2	0.0%	0		0	
120.960 retinopathy	0		0		1	0.0%	0	
OPTIC NERVE								
130.110 micropapilla	0		12	0.1%	6	0.2%	1	0.1%
130.120 optic nerve hypoplasia	12	0.2%	1	0.0%	0		0	
130.150 optic disc coloboma	32	0.4%	33	0.3%	5	0.1%	0	
OTHER								
900.000 other, unspecified	0		57	0.6%	119	3.0%	0	
900.100 other, not inherited	61	0.8%	375	3.7%	30	0.8%	36	3.5%
900.110 other, suspected as inherited	75	1.0%	51	0.5%	12	0.3%	5	0.5%
NORMAL								
0.000 normal globe	5981	79.6%	8587	84.7%	3455	88.4%	894	86.8%

OCULAR DISORDERS REPORT

SCHAPENDOES - 1

SCHAPENDOES

	DISORDER	INHERITANCE	REFERENCE	BREEDING ADVICE
A.	Retinal atrophy - generalized * a DNA test is available	Not defined	1, 2	NO

Description and Comments

A. Retinal atrophy - generalized

A degenerative disease of the retinal visual cells which progresses to blindness. This abnormality, also known as progressive retinal atrophy or PRA, may be detected by electroretinogram (not part of a routine eye screening examination) before it is apparent clinically. Except for X-linked PRA in the Siberian Husky, in all breeds studied to date, PRA is inherited as an autosomal recessive trait. A DNA test is available.

References

1. Dekomien G, Vollrath C, Petrasch-Parwez E, et al. Progressive retinal atrophy in Schapendoes dogs: mutation of the newly identified CCDC66 gene. *Neurogenetics*. 2010 May;11:163-174.
2. Lippmann T, Jonkisz A, Dobosz T, et al. Haplotype-defined linkage region for gPRA in Schapendoes dogs. *Mol Vis*. 2007;13:174-180.

OCULAR DISORDERS REPORT SCHAPENDOES

Diagnostic Name	TOTAL DOGS EXAMINED	1991-1999		2000-2009		2010-2013		2014	
		#	%	#	%	#	%	#	%
EYELIDS									
25.110	distichiasis	0		0		2	7.4%	0	
LENS									
100.210	cataract, significance unknown	0		2	5.1%	2	7.4%	0	
100.301	punctate cataract, anterior cortex	0		0		2	7.4%	0	
100.315	incipient cataract, posterior sutures	0		1	2.6%	0		0	
VITREOUS									
110.120	persistant hyaloid artery/remnant	0		2	5.1%	0		0	
110.320	vitreous degeneration syneresis	0		1	2.6%	0		0	
RETINA									
120.180	retinal dysplasia, geographic	0		1	2.6%	0		0	
OTHER									
900.100	other, not inherited	0		5	12.8%	1	3.7%	0	
900.110	other, suspected as inherited	0		0		1	3.7%	0	
NORMAL									
0.000	normal globe	0		34	87.2%	25	92.6%	2	100.0%

OCULAR DISORDERS REPORT

SCHIPPERKE - 1

SCHIPPERKE

	DISORDER	INHERITANCE	REFERENCE	BREEDING ADVICE
A.	Distichiasis	Not defined	1, 2	Breeder option
B.	Persistent pupillary membranes			
	- iris to iris	Not defined	2, 3	Breeder option
	- iris sheets	Not defined	4	NO
	- all other forms	Not defined	2	NO
C.	Cataract	Not defined	3	NO
D.	Vitreous degeneration	Not defined	4, 5	Breeder option
E.	Retinal atrophy - generalized	Presumed autosomal recessive	3	NO
F.	Retinal dysplasia - folds	Not defined	6	Breeder option

Description and Comments

A. Distichiasis

Eyelashes abnormally located on the eyelid margin which may cause ocular irritation. Distichiasis may occur at any time in the life of a dog. It is difficult to make a strong recommendation with regard to breeding dogs with this entity. The hereditary basis has not been established although it seems probable due to the high incidence in some breeds. Reducing the incidence is a logical goal. When diagnosed, distichiasis should be recorded; breeding discretion is advised.

B. Persistent pupillary membranes (PPM)

Persistent blood vessel remnants in the anterior chamber of the eye which fail to regress normally by 3 months of age. These strands may bridge from iris to iris, iris to cornea, iris to lens, or form sheets of tissue in the anterior chamber. The last three forms pose the greatest threat to vision and when severe, vision impairment or blindness may occur.

OCULAR DISORDERS REPORT

SCHIPPERKE - 2

C. Cataract

A partial or complete opacity of the lens and/or its capsule. In cases where cataracts are complete and affect both eyes, blindness results. The prudent approach is to assume cataracts to be hereditary except in cases known to be associated with trauma, other causes of ocular inflammation, specific metabolic diseases, persistent pupillary membrane, persistent hyaloid or nutritional deficiencies. Cataracts may involve the lens completely (diffuse) or in a localized region.

D. Vitreous degeneration

Liquefaction of the vitreous gel which may predispose to retinal detachment.

E. Retinal atrophy - generalized

A degenerative disease of the retinal visual cells which progresses to blindness. This abnormality, also known as progressive retinal atrophy or PRA, may be detected by electroretinogram (not part of a routine eye screening examination) before it is apparent clinically. Except for X-linked PRA in the Siberian Husky, in all breeds studied to date, PRA is inherited as an autosomal recessive trait.

F. Retinal dysplasia - folds

Linear, triangular, curved or curvilinear foci of retinal folding that may be single or multiple. When seen in puppies, this condition may partially or completely resolve with maturity. Its significance to vision is unknown. There are two other forms of retinal dysplasia (geographic, detached) which are known to be inherited in other breeds and, in their most severe form, cause blindness. The genetic relationship between folds and more severe forms of retinal dysplasia is undetermined.

References

There are no references providing detailed descriptions of hereditary ocular conditions of the Schipperke breed. The conditions listed above are generally recognized to exist in this breed, as evidenced by identification on breed eye screening examinations and/or clinical experience of veterinary ophthalmologists.

1. ACVO Genetics Committee, 2002-2003 and/or Data from CERF All-Breeds Report, 2002-2003.
2. ACVO Genetics Committee, 2005 and/or Data from CERF All-Breeds Report 2003-2004.
3. ACVO Genetics Committee, 1999 and/or Data from CERF All-Breeds Report, 1991-1998.
4. ACVO Genetics Committee, 2008 and/or Data from CERF All-Breeds Report, 2003-2007.
5. ACVO Genetics Committee, 2007 and/or Data from CERF All-Breeds Report 2002-2006.

OCULAR DISORDERS REPORT

SCHIPPERKE - 3

6. ACVO Genetics Committee, 2006 and/or Data from CERF All-Breeds Report, 2001-2005.

OCULAR DISORDERS REPORT SCHIPPERKE

Diagnostic Name	TOTAL DOGS EXAMINED	1991-1999		2000-2009		2010-2013		2014	
		#	%	#	%	#	%	#	%
GLOBE									
0.110 microphthalmia		0		1	0.1%	0		0	
EYELIDS									
25.110 distichiasis		7	1.6%	15	2.2%	12	6.6%	7	7.7%
CORNEA									
70.210 corneal pannus		1	0.2%	0		0		0	
70.700 corneal dystrophy		0		1	0.1%	1	0.6%	0	
70.730 corneal endothelial degeneration		1	0.2%	1	0.1%	0		0	
UVEA									
93.710 persistent pupillary membranes, iris to iris		24	5.5%	43	6.4%	24	13.3%	9	9.9%
93.720 persistent pupillary membranes, iris to lens		1	0.2%	5	0.7%	0		0	
93.730 persistent pupillary membranes, iris to cornea		0		2	0.3%	0		0	
93.740 persistent pupillary membranes, iris sheets		1	0.2%	9	1.3%	0		0	
93.750 persistent pupillary membranes, lens pigment foci/no strands		0		2	0.3%	2	1.1%	2	2.2%
LENS									
100.200 cataract, unspecified		4	0.9%	0		0		0	
100.210 cataract, significance unknown		13	3.0%	33	4.9%	9	5.0%	1	1.1%
100.301 punctate cataract, anterior cortex		2	0.5%	6	0.9%	1	0.6%	1	1.1%
100.302 punctate cataract, posterior cortex		0		1	0.1%	0		0	
100.303 punctate cataract, equatorial cortex		1	0.2%	1	0.1%	3	1.7%	1	1.1%
100.304 punctate cataract, anterior sutures		1	0.2%	0		0		0	
100.305 punctate cataract, posterior sutures		1	0.2%	0		0		0	
100.306 punctate cataract, nucleus		3	0.7%	1	0.1%	1	0.6%	1	1.1%
100.311 incipient cataract, anterior cortex		3	0.7%	12	1.8%	3	1.7%	1	1.1%
100.312 incipient cataract, posterior cortex		1	0.2%	8	1.2%	1	0.6%	0	
100.313 incipient cataract, equatorial cortex		4	0.9%	3	0.4%	0		1	1.1%
100.315 incipient cataract, posterior sutures		0		1	0.1%	0		0	
100.316 incipient cataract, nucleus		0		2	0.3%	1	0.6%	0	
100.317 incipient cataract, capsular		0		1	0.1%	0		0	
100.321 incomplete cataract, anterior cortex		0		0		1	0.6%	0	
100.330 generalized/complete cataract		2	0.5%	6	0.9%	0		0	
VITREOUS									
110.135 PHPV/PTVL		0		1	0.1%	0		0	
110.200 vitritis		0		0		1	0.6%	0	
110.320 vitreous degeneration syneresis		3	0.7%	11	1.6%	3	1.7%	0	
110.330 vitreous degeneration anterior chamber		0		0		1	0.6%	0	
RETINA									
120.170 retinal dysplasia, folds		0		5	0.7%	3	1.7%	1	1.1%
120.180 retinal dysplasia, geographic		0		3	0.4%	1	0.6%	0	
120.200 retinitis		0		0		0		1	1.1%
120.310 generalized progressive retinal atrophy (PRA)		6	1.4%	8	1.2%	2	1.1%	0	
120.960 retinopathy		0		0		1	0.6%	0	

OCULAR DISORDERS REPORT SCHIPPERKE

	1991-1999	2000-2009	2010-2013	2014
OTHER				
900.000 other, unspecified	0	5 0.7%	11 6.1%	0
900.100 other, not inherited	6 1.4%	45 6.7%	4 2.2%	3 3.3%
900.110 other, suspected as inherited	3 0.7%	1 0.1%	2 1.1%	0
NORMAL				
0.000 normal globe	362 82.8%	571 84.6%	140 77.3%	81 89.0%

OCULAR DISORDERS REPORT

SCOTTISH TERRIER - 1

SCOTTISH TERRIER

	DISORDER	INHERITANCE	REFERENCE	BREEDING ADVICE
A.	Persistent pupillary membranes			
	- iris to iris	Not defined	1, 2	Breeder option
	- iris to lens	Not defined	3	NO
	- all other forms	Not defined	2	NO
B.	Cataract	Not defined	1	NO
C.	Vitreous degeneration	Not defined	4	Breeder option
D.	Ligneous conjunctivitis	Not defined	5, 6	NO

Description and Comments

A. Persistent pupillary membranes (PPM)

Persistent blood vessel remnants in the anterior chamber of the eye which fail to regress normally by 3 months of age. These strands may bridge from iris to iris, iris to cornea, iris to lens, or form sheets of tissue in the anterior chamber. The last three forms pose the greatest threat to vision and when severe, vision impairment or blindness may occur.

Iris to lens strands are seen in the Scottish terrier. These may be associated with focal cataract and vision impairment.

B. Cataract

A partial or complete opacity of the lens and/or its capsule. In cases where cataracts are complete and affect both eyes, blindness results. The prudent approach is to assume cataracts to be hereditary except in cases known to be associated with trauma, other causes of ocular inflammation, specific metabolic diseases, persistent pupillary membrane, persistent hyaloid or nutritional deficiencies. Cataracts may involve the lens completely (diffuse) or in a localized region.

C. Vitreous degeneration

Liquefaction of the vitreous gel which may predispose to retinal detachment.

D. Ligneous conjunctivitis

©2014, American College of Veterinary Ophthalmologists

OCULAR DISORDERS REPORT

SCOTTISH TERRIER - 2

A rare type of conjunctivitis characterized by the formation of thick membranes covering conjunctiva of the nictitans and eyelids of affected dogs. This condition has been diagnosed in four unrelated Doberman Pinschers, three of which had life-threatening systemic disease. Ligneous conjunctivitis has also been reported in one Yorkshire terrier.

References

There are no references providing detailed descriptions of hereditary ocular conditions of the Scottish Terrier breed. The conditions listed above are generally recognized to exist in this breed, as evidenced by identification on breed eye screening examinations and/or clinical experience of veterinary ophthalmologists.

1. ACVO Genetics Committee, 1999 and/or Data from CERF All-Breeds Report, 1991-1998.
2. ACVO Genetics Committee, 2005 and/or Data from CERF All-Breeds Report 2003-2004.
3. ACVO Genetics Committee, 2002-2003 and/or Data from CERF All-Breeds Report, 2002-2003.
4. ACVO Genetics Committee, 2006 and/or Data from CERF All-Breeds Report, 2001-2005.
5. Ramsey DT, Ketring K, Glaze MB, et al. Ligneous conjunctivitis in four Doberman pinschers. *J Am Anim Hosp Assoc.* 1996; 32: 439-447.
6. Mason SL, McElroy P, Nuttall T. Ligneous membranitis in Scottish terriers. *Vet Rec.* 2012; 171: 160.

OCULAR DISORDERS REPORT SCOTTISH TERRIER

Diagnostic Name	TOTAL DOGS EXAMINED		1991-1999		2000-2009		2010-2013		2014	
	#	%	#	%	#	%	#	%	#	%
EYELIDS										
25.110 distichiasis	1	0.6%	2	0.5%	0		0		0	
NASOLACRIMAL										
40.910 keratoconjunctivitis sicca	0		0		1	0.8%	0		0	
NICTITANS										
52.110 prolapsed gland of the third eyelid	0		0		2	1.6%	0		0	
CORNEA										
70.210 corneal pannus	1	0.6%	0		0		0		0	
70.220 pigmentary keratitis	0		1	0.2%	1	0.8%	0		0	
70.700 corneal dystrophy	1	0.6%	4	0.9%	0		0		0	
70.730 corneal endothelial degeneration	1	0.6%	1	0.2%	0		0		0	
UVEA										
93.140 corneal endothelial pigment without PPM	0		0		3	2.4%	0		0	
93.710 persistent pupillary membranes, iris to iris	43	26.9%	120	28.0%	50	39.7%	9	29.0%		
93.720 persistent pupillary membranes, iris to lens	16	10.0%	18	4.2%	3	2.4%	0		0	
93.730 persistent pupillary membranes, iris to cornea	5	3.1%	4	0.9%	0		0		0	
93.740 persistent pupillary membranes, iris sheets	1	0.6%	2	0.5%	0		0		0	
93.750 persistent pupillary membranes, lens pigment foci/no strands	0		8	1.9%	30	23.8%	9	29.0%		
93.760 persistent pupillary membranes, endothelial opacity/no strands	0		0		4	3.2%	0		0	
LENS										
100.210 cataract, significance unknown	15	9.4%	56	13.1%	0		2	6.5%		
100.301 punctate cataract, anterior cortex	3	1.9%	4	0.9%	0		0		0	
100.302 punctate cataract, posterior cortex	1	0.6%	1	0.2%	0		0		0	
100.303 punctate cataract, equatorial cortex	0		2	0.5%	0		0		0	
100.304 punctate cataract, anterior sutures	0		2	0.5%	0		0		0	
100.305 punctate cataract, posterior sutures	0		1	0.2%	0		0		0	
100.306 punctate cataract, nucleus	2	1.2%	1	0.2%	0		0		0	
100.307 punctate cataract, capsular	0		2	0.5%	0		0		0	
100.311 incipient cataract, anterior cortex	1	0.6%	4	0.9%	1	0.8%	0		0	
100.312 incipient cataract, posterior cortex	1	0.6%	4	0.9%	0		0		0	
100.313 incipient cataract, equatorial cortex	0		3	0.7%	0		0		0	
100.314 incipient cataract, anterior sutures	1	0.6%	0		0		0		0	
100.315 incipient cataract, posterior sutures	1	0.6%	0		0		0		0	
100.316 incipient cataract, nucleus	4	2.5%	5	1.2%	0		0		0	
100.317 incipient cataract, capsular	0		2	0.5%	0		0		0	
100.330 generalized/complete cataract	1	0.6%	1	0.2%	2	1.6%	0		0	
100.375 subluxation/luxation, unspecified	0		1	0.2%	0		0		0	
VITREOUS										
110.120 persistent hyaloid artery/remnant	1	0.6%	0		0		0		0	
110.320 vitreous degeneration syneresis	0		4	0.9%	0		0		0	
110.330 vitreous degeneration anterior chamber	0		1	0.2%	0		0		0	

OCULAR DISORDERS REPORT SCOTTISH TERRIER

	1991-1999	2000-2009	2010-2013	2014
RETINA				
120.170 retinal dysplasia, folds	0	4 0.9%	1 0.8%	0
120.310 generalized progressive retinal atrophy (PRA)	2 1.2%	6 1.4%	0	0
OPTIC NERVE				
130.150 optic disc coloboma	0	1 0.2%	0	1 3.2%
OTHER				
900.000 other, unspecified	0	8 1.9%	5 4.0%	0
900.100 other, not inherited	0	60 14.0%	2 1.6%	1 3.2%
900.110 other, suspected as inherited	5 3.1%	11 2.6%	1 0.8%	0
NORMAL				
0.000 normal globe	85 53.1%	240 56.1%	62 49.2%	15 48.4%

OCULAR DISORDERS REPORT

SEALYHAM TERRIER - 1

SEALYHAM TERRIER

	DISORDER	INHERITANCE	REFERENCE	BREEDING ADVICE
A.	Distichiasis	Not defined	1	Breeder option
B.	Persistent pupillary membranes			
	- iris to iris	Not defined	1-3	Breeder option
	- all other forms	Not defined	3	NO
C.	Cataract	Not defined	3	NO
D.	Lens luxation * a DNA test is available	Not defined	4-8	NO
E.	Retinal dysplasia - folds	Presumed autosomal recessive	4,9	Breeder option
F.	Retinal dysplasia - geographic/ detached	Presumed autosomal recessive	4,9	NO

Description and Comments

A. Distichiasis

Eyelashes abnormally located on the eyelid margin which may cause ocular irritation. Distichiasis may occur at any time in the life of a dog. It is difficult to make a strong recommendation with regard to breeding dogs with this entity. The hereditary basis has not been established although it seems probable due to the high incidence in some breeds. Reducing the incidence is a logical goal. When diagnosed, distichiasis should be recorded; breeding discretion is advised.

B. Persistent pupillary membranes (PPM)

Persistent blood vessel remnants in the anterior chamber of the eye which fail to regress normally by 3 months of age. These strands may bridge from iris to iris, iris to cornea, iris to lens, or form sheets of tissue in the anterior chamber. The last three forms pose the greatest threat to vision and when severe, vision impairment or blindness may occur.

OCULAR DISORDERS REPORT

SEALYHAM TERRIER - 2

C. Cataract

A partial or complete opacity of the lens and/or its capsule. In cases where cataracts are complete and affect both eyes, blindness results. The prudent approach is to assume cataracts to be hereditary except in cases known to be associated with trauma, other causes of ocular inflammation, specific metabolic diseases, persistent pupillary membrane, persistent hyaloid or nutritional deficiencies. Cataracts may involve the lens completely (diffuse) or in a localized region.

D. Lens luxation

Partial (subluxation) or complete displacement of the lens from the normal anatomic site behind the pupil. Lens luxation not associated with trauma or inflammation is presumed to be inherited. Lens luxation may result in elevated intraocular pressure (glaucoma) causing vision impairment or blindness. A DNA test is available.

E. Retinal dysplasia - folds

Linear, triangular, curved or curvilinear foci of retinal folding that may be single or multiple. When seen in puppies, this condition may partially or completely resolve with maturity. Its significance to vision is unknown. There are two other forms of retinal dysplasia (geographic, detached) which are known to be inherited in other breeds and, in their most severe form, cause blindness. The genetic relationship between folds and more severe forms of retinal dysplasia is undetermined.

F. Retinal dysplasia - geographic / detached

Abnormal development of the retina present at birth.

Retinal dysplasia - geographic: Any irregularly shaped area of abnormal retinal development containing both areas of thinning and areas of elevation representing folds and retinal disorganization.

Retinal dysplasia - detached: Severe retinal disorganization associated with separation (detachment) of the retina.

These two forms are associated with vision impairment or blindness. Retinal dysplasia is known to be inherited in many breeds. The genetic relationship between the three forms of retinal dysplasia is not known for all breeds.

References

1. ACVO Genetics Committee, 2002-2003 and/or Data from CERF All-Breeds Report, 2002-2003.
2. ACVO Genetics Committee, 2000-2002 and/or Data from CERF All-Breeds Report, 2000-2002.

OCULAR DISORDERS REPORT

SEALYHAM TERRIER - 3

3. ACVO Genetics Committee, 2005 and/or Data from CERF All-Breeds Report 2003-2004.
4. ACVO Genetics Committee, 1999 and/or Data from CERF All-Breeds Report, 1991-1998.
5. Formston C. Observations on subluxation and luxation of the crystalline lens in the dog. *Journal of comparative pathology*. 1945;55:168.
6. Hodgman SFJ. Abnormalities and defects in pedigree dogs: I. An investigation into the existence of abnormalities in pedigree dogs in British Isles. *J Small Anim Pract*. 1963;4:447.
7. Curtis R and Barnett KC. Primary lens luxation in the dog. *J Small Anim Pract*. 1980 Dec;21:657-668.
8. Gould D, Pettitt L, McLaughlin B, et al. ADAMTS17 mutation associated with primary lens luxation is widespread among breeds. *Vet Ophthalmol*. 2011 Nov;14:378-384.
9. Ashton N, Barnett KC and Sachs DD. Retinal dysplasia in the Sealyham terrier. *The Journal of pathology and bacteriology*. 1968 Oct;96:269-272.

OCULAR DISORDERS REPORT SEALYHAM TERRIER

Diagnostic Name	TOTAL DOGS EXAMINED		1991-1999		2000-2009		2010-2013		2014	
	#	%	#	%	#	%	#	%	#	%
EYELIDS										
25.110 distichiasis	2	2.4%	17	4.9%	7	15.6%	2	20.0%		
NICTITANS										
52.110 prolapsed gland of the third eyelid	0		1	0.3%	0		0			
UVEA										
93.710 persistent pupillary membranes, iris to iris	3	3.7%	26	7.5%	3	6.7%	0			
93.720 persistent pupillary membranes, iris to lens	0		2	0.6%	0		0			
93.730 persistent pupillary membranes, iris to cornea	0		1	0.3%	0		0			
93.740 persistent pupillary membranes, iris sheets	0		2	0.6%	0		0			
93.750 persistent pupillary membranes, lens pigment foci/no strands	0		0		1	2.2%	0			
93.760 persistent pupillary membranes, endothelial opacity/no strands	0		0		1	2.2%	0			
LENS										
100.200 cataract, unspecified	2	2.4%	0		0		0		0	
100.210 cataract, significance unknown	4	4.9%	15	4.3%	1	2.2%	0		0	
100.301 punctate cataract, anterior cortex	2	2.4%	2	0.6%	0		0		0	
100.302 punctate cataract, posterior cortex	0		2	0.6%	0		0		0	
100.303 punctate cataract, equatorial cortex	0		1	0.3%	0		0		0	
100.305 punctate cataract, posterior sutures	0		2	0.6%	0		0		0	
100.307 punctate cataract, capsular	0		1	0.3%	0		0		1	10.0%
100.311 incipient cataract, anterior cortex	1	1.2%	2	0.6%	0		0		0	
100.312 incipient cataract, posterior cortex	4	4.9%	4	1.2%	0		0		0	
100.313 incipient cataract, equatorial cortex	0		1	0.3%	0		0		0	
100.315 incipient cataract, posterior sutures	1	1.2%	0		0		0		0	
100.316 incipient cataract, nucleus	0		1	0.3%	1	2.2%	0		0	
100.317 incipient cataract, capsular	0		2	0.6%	0		0		0	
100.330 generalized/complete cataract	3	3.7%	3	0.9%	0		0		0	
100.375 subluxation/luxation, unspecified	0		5	1.4%	0		0		0	
VITREOUS										
110.135 PHPV/PTVL	0		2	0.6%	0		0		0	
110.320 vitreous degeneration syneresis	1	1.2%	4	1.2%	0		0		0	
110.330 vitreous degeneration anterior chamber	0		1	0.3%	0		0		0	
FUNDUS										
97.120 coloboma	1	1.2%	0		0		0		0	
RETINA										
120.170 retinal dysplasia, folds	1	1.2%	7	2.0%	1	2.2%	0		0	
120.180 retinal dysplasia, geographic	0		1	0.3%	0		0		0	
120.190 retinal dysplasia, detached	1	1.2%	0		0		0		0	
120.310 generalized progressive retinal atrophy (PRA)	0		11	3.2%	0		0		0	
120.910 retinal detachment without dialysis	1	1.2%	0		0		0		0	
OPTIC NERVE										
130.120 optic nerve hypoplasia	0		1	0.3%	0		0		0	

OCULAR DISORDERS REPORT SEALYHAM TERRIER

	1991-1999	2000-2009	2010-2013	2014
OTHER				
900.000 other, unspecified	0	3 0.9%	1 2.2%	0
900.100 other, not inherited	0	10 2.9%	0	1 10.0%
900.110 other, suspected as inherited	0	1 0.3%	0	0
NORMAL				
0.000 normal globe	65 79.3%	297 85.6%	38 84.4%	7 70.0%

OCULAR DISORDERS REPORT

SHETLAND SHEEPDOG - 1

SHETLAND SHEEPDOG (Sheltie)

	DISORDER	INHERITANCE	REFERENCE	BREEDING ADVICE
A.	Distichiasis	Not defined	1	Breeder option
B.	1. Corneal dystrophy 2. Sheltie –like corneal dystrophy	Not defined Not defined	1-3	Breeder option NO
C.	Persistent pupillary membranes - iris to iris - iris to cornea - all other forms	Not defined Not defined Not defined	1, 4 5 4	Breeder option NO NO
D.	Cataract	Not defined	1	NO
E.	Choroidal hypoplasia (Collie Eye Anomaly) - Optic nerve coloboma - Retinal detachment - Retinal hemorrhage - Staphyloma/coloboma * a DNA test is available	Autosomal recessive	1, 6, 7	NO
F.	Retinal atrophy - generalized	Not defined	1	NO
G.	Slowly progressive retinopathy	Not defined	8	NO
H.	Optic nerve coloboma	Not defined	1	NO
I.	Uveodermatologic syndrome	Not defined	1	NO

OCULAR DISORDERS REPORT

SHETLAND SHEEPDOG - 2

Description and Comments

A. Distichiasis

Eyelashes abnormally located on the eyelid margin which may cause ocular irritation. Distichiasis may occur at any time in the life of a dog. It is difficult to make a strong recommendation with regard to breeding dogs with this entity. The hereditary basis has not been established although it seems probable due to the high incidence in some breeds. Reducing the incidence is a logical goal. When diagnosed, distichiasis should be recorded. Breeding discretion is advised.

Distichiasis in the Shetland Sheepdog usually involves stiff lashes which require permanent epilation.

B. 1. Corneal dystrophy

Corneal dystrophy: non-inflammatory corneal opacity (white to gray) present in one or more of the corneal layers (epithelium, stroma, endothelium). The term dystrophy implies an inherited condition. It is usually bilateral although not necessarily symmetrical and the onset in one eye may precede the other.

Corneal dystrophy - epithelial, stromal: breed-related, non-inflammatory, white to silver-colored opacification of the corneal epithelium and/or stroma frequently resulting from deposition of lipid

2. Sheltie-like corneal dystrophy

The corneal changes in the Shetland Sheepdog are characterized grossly by multifocal, central, subepithelial and superficial stromal, grey-white, circular or irregular rings. Some affected animals develop corneal erosions. The precorneal tear film in the majority of dogs is unstable and requires symptomatic therapy to keep the patients comfortable. Further studies are necessary to define this disorder.

C. Persistent pupillary membranes (PPM)

Persistent blood vessel remnants in the anterior chamber of the eye which fail to regress normally by 3 months of age. These strands may bridge from iris to iris, iris to cornea, iris to lens, or form sheets of tissue in the anterior chamber. The last three forms are seen in the Shetland sheepdog and pose the greatest threat to vision and when severe, vision impairment or blindness may occur.

D. Cataract

A partial or complete opacity of the lens and/or its capsule. In cases where cataracts are complete and affect both eyes, blindness results. The prudent approach is to assume cataracts to be hereditary except in cases known to be associated with trauma, other causes of ocular inflammation, specific metabolic diseases, persistent pupillary membrane, persistent hyaloid or nutritional deficiencies. Cataracts may involve the lens completely

OCULAR DISORDERS REPORT

SHETLAND SHEEPDOG - 3

(diffuse) or in a localized region.

- E. Choroidal hypoplasia
(Collie Eye Anomaly)
 - Optic nerve coloboma
 - Retinal detachment
 - Retinal hemorrhage
 - Staphyloma/coloboma

A spectrum of malformations present at birth and ranging from inadequate development of the choroid (choroidal hypoplasia) to defects of the choroid, retina, or optic nerve (coloboma/staphyloma) to complete retinal detachment (with or without hemorrhage). Mildly affected animals will have no detectable vision deficit.

This disorder is collectively referred to as "Collie Eye Anomaly". Although there is a lack of scientific evidence, it is believed that the incidence and severity of this entity in collies was decreased by breeding only "mildly affected" animals. At this time, the Genetics Committee of the ACVO recommends against breeding dogs with any form of the Collie Eye anomaly.

- F. Retinal atrophy - generalized

A degenerative disease of the retinal visual cells which progresses to blindness. This abnormality, also known as progressive retinal atrophy or PRA, may be detected by electroretinogram (not part of a routine eye screening examination) before it is apparent clinically. PRA is inherited as an autosomal recessive trait in most breeds.

- G. Slowly progressive retinopathy:

A syndrome as yet not well defined. May be a variant of PRA.

- H. Optic nerve coloboma (without choroidal hypoplasia)

A congenital cavity in the optic nerve which, if large, may cause blindness or vision impairment.

- I. Uveodermatologic syndrome

Uveodermatologic syndrome in the Sheltie bears many similarities to a condition in people called Vogt-Koyanagi-Harada (or VKH) syndrome. Thus, the condition in dogs is often referred to as VKH or VKH-like syndrome. It is an immune-mediated disease in which pigmented cells (melanocytes) in the eye and in the skin are destroyed by white blood cells (lymphocytes). The first clinical signs are usually inflammation of the intraocular structures (or uveitis) in both eyes. Adhesions between the iris and lens (posterior synechia) and the peripheral iris and cornea (peripheral anterior synechia) develop rapidly. Other complications include cataract development, retinal degeneration, retinal separation or detachment, optic disc atrophy and secondary glaucoma. The uveitis is very difficult to control medically and ultimately results in blindness in most affected dogs. Whitening of the hair (poliosis) and skin (vitiligo) may also be noted in advanced cases. The genetics of this

OCULAR DISORDERS REPORT

SHETLAND SHEEPDOG - 4

condition are unclear, but some genetic predisposition is indicated by the higher prevalence of this disorder in Shelties compared with other dog breeds. Affected dogs are generally young, ranging in age between 1 ½ to 4 years. Uveodermatologic syndrome

References

1. ACVO Genetics Committee, 1999 and/or Data from CERF All-Breeds Report, 1991-1998.
2. Dice P. Corneal dystrophy in the Shetland Sheepdog. *Trans Am Coll Vet Ophthalmol.* 1984;15:241.
3. Crispin SM and Barnett KC. Dystrophy, degeneration and infiltration of the canine cornea. *J Small Anim Pract.* 1983;24:63.
4. ACVO Genetics Committee, 2005 and/or Data from CERF All-Breeds Report 2003-2004.
5. ACVO Genetics Committee, 2009 and/or Data from CERF All-Breeds Report, 2008.
6. Barnett KC and Stades FC. Collie eye anomaly in the Shetland sheepdog in the Netherlands. *J Small Anim Pract.* 1979 Jun;20:321-329.
7. Parker HG, Kukekova AV, Akey DT, et al. Breed relationships facilitate fine-mapping studies: a 7.8-kb deletion cosegregates with Collie eye anomaly across multiple dog breeds. *Genome Res.* 2007 Nov;17:1562-1571.
8. Karlstam L, Hertel E, Zeiss C, et al. A slowly progressive retinopathy in the Shetland Sheepdog. *Vet Ophthalmol.* 2011 Jul;14:227-238.

OCULAR DISORDERS REPORT SHETLAND SHEEPDOG

Diagnostic Name	TOTAL DOGS EXAMINED		1991-1999 14863		2000-2009 16694		2010-2013 4921		2014 1154	
	#	%	#	%	#	%	#	%	#	%
GLOBE										
0.110 microphthalmia	25	0.2%	29	0.2%	7	0.1%	1	0.1%		
10.000 glaucoma	1	0.0%	1	0.0%	0		0			
EYELIDS										
20.140 ectopic cilia	5	0.0%	4	0.0%	0		0		0	
21.000 entropion, unspecified	2	0.0%	4	0.0%	0		0		0	
22.000 ectropion, unspecified	3	0.0%	7	0.0%	0		0		0	
25.110 distichiasis	1172	7.9%	948	5.7%	275	5.6%	57	4.9%		
NASOLACRIMAL										
32.110 imperforate lower nasolacrimal punctum	3	0.0%	0		0		0		0	
40.910 keratoconjunctivitis sicca	1	0.0%	3	0.0%	1	0.0%	0		0	
NICTITANS										
51.100 third eyelid cartilage anomaly	0		3	0.0%	2	0.0%	1	0.1%		
52.110 prolapsed gland of the third eyelid	1	0.0%	2	0.0%	1	0.0%	0			
CORNEA										
70.210 corneal pannus	5	0.0%	4	0.0%	0		0		0	
70.220 pigmentary keratitis	0		3	0.0%	0		0		0	
70.700 corneal dystrophy	416	2.8%	449	2.7%	114	2.3%	37	3.2%		
70.730 corneal endothelial degeneration	11	0.1%	19	0.1%	3	0.1%	1	0.1%		
UVEA										
90.250 pigmentary uveitis	0		0		0		1	0.1%		
93.110 iris hypoplasia	0		1	0.0%	3	0.1%	0			
93.120 iris cyst	1	0.0%	16	0.1%	4	0.1%	0			
93.140 corneal endothelial pigment without PPM	0		5	0.0%	0		0			
93.150 iris coloboma	10	0.1%	11	0.1%	3	0.1%	1	0.1%		
93.710 persistent pupillary membranes, iris to iris	460	3.1%	763	4.6%	252	5.1%	62	5.4%		
93.720 persistent pupillary membranes, iris to lens	55	0.4%	45	0.3%	14	0.3%	3	0.3%		
93.730 persistent pupillary membranes, iris to cornea	64	0.4%	98	0.6%	20	0.4%	5	0.4%		
93.740 persistent pupillary membranes, iris sheets	5	0.0%	24	0.1%	0		0			
93.750 persistent pupillary membranes, lens pigment foci/no strands	0		0		8	0.2%	1	0.1%		
93.760 persistent pupillary membranes, endothelial opacity/no strands	0		2	0.0%	15	0.3%	1	0.1%		
95.120 ciliary body cyst	0		0		4	0.1%	0			
97.150 choriorretinal coloboma, congenital	0		0		0		2	0.2%		
LENS										
100.200 cataract, unspecified	73	0.5%	0		0		0		0	
100.210 cataract, significance unknown	166	1.1%	283	1.7%	107	2.2%	19	1.6%		
100.301 punctate cataract, anterior cortex	34	0.2%	31	0.2%	10	0.2%	0			
100.302 punctate cataract, posterior cortex	31	0.2%	22	0.1%	10	0.2%	0			
100.303 punctate cataract, equatorial cortex	14	0.1%	12	0.1%	2	0.0%	0			
100.304 punctate cataract, anterior sutures	1	0.0%	3	0.0%	0		0			
100.305 punctate cataract, posterior sutures	3	0.0%	3	0.0%	3	0.1%	0			
100.306 punctate cataract, nucleus	6	0.0%	12	0.1%	11	0.2%	0			
100.307 punctate cataract, capsular	1	0.0%	14	0.1%	5	0.1%	2	0.2%		
100.311 incipient cataract, anterior cortex	45	0.3%	72	0.4%	13	0.3%	5	0.4%		

OCULAR DISORDERS REPORT SHETLAND SHEEPDOG

LENS CONTINUED	1991-1999	2000-2009	2010-2013	2014
100.312 incipient cataract, posterior cortex	33 0.2%	49 0.3%	10 0.2%	2 0.2%
100.313 incipient cataract, equatorial cortex	19 0.1%	30 0.2%	5 0.1%	0
100.314 incipient cataract, anterior sutures	3 0.0%	1 0.0%	0	1 0.1%
100.315 incipient cataract, posterior sutures	9 0.1%	4 0.0%	0	0
100.316 incipient cataract, nucleus	15 0.1%	17 0.1%	2 0.0%	1 0.1%
100.317 incipient cataract, capsular	2 0.0%	20 0.1%	8 0.2%	0
100.321 incomplete cataract, anterior cortex	0	0	0	1 0.1%
100.322 incomplete cataract, posterior cortex	0	0	0	2 0.2%
100.323 incomplete cataract, equatorial cortex	0	0	0	1 0.1%
100.330 generalized/complete cataract	19 0.1%	22 0.1%	2 0.0%	1 0.1%
100.340 resorbing/hypermature cataract	0	0	0	1 0.1%
100.375 subluxation/luxation, unspecified	3 0.0%	3 0.0%	0	0
VITREOUS				
110.120 persistent hyaloid artery/remnant	45 0.3%	39 0.2%	1 0.0%	1 0.1%
110.135 PHPV/PTVL	5 0.0%	8 0.0%	4 0.1%	0
110.200 vitritis	0	0	1 0.0%	0
110.320 vitreous degeneration syneresis	33 0.2%	53 0.3%	44 0.9%	2 0.2%
110.330 vitreous degeneration anterior chamber	0	2 0.0%	0	0
FUNDUS				
97.110 choroidal hypoplasia	53 0.4%	50 0.3%	12 0.2%	6 0.5%
97.120 coloboma	53 0.4%	25 0.1%	4 0.1%	0
RETINA				
120.170 retinal dysplasia, folds	29 0.2%	47 0.3%	10 0.2%	0
120.180 retinal dysplasia, geographic	9 0.1%	6 0.0%	1 0.0%	0
120.190 retinal dysplasia, detached	1 0.0%	2 0.0%	2 0.0%	0
120.200 retinitis	0	0	0	9 0.8%
120.310 generalized progressive retinal atrophy (PRA)	89 0.6%	100 0.6%	24 0.5%	0
120.910 retinal detachment without dialysis	8 0.1%	6 0.0%	4 0.1%	0
120.920 retinal detachment with dialysis	0	0	0	1 0.1%
120.960 retinopathy	0	0	8 0.2%	0
OPTIC NERVE				
130.110 micropapilla	2 0.0%	8 0.0%	2 0.0%	2 0.2%
130.120 optic nerve hypoplasia	19 0.1%	6 0.0%	0	0
130.150 optic disc coloboma	104 0.7%	70 0.4%	11 0.2%	1 0.1%
OTHER				
900.000 other, unspecified	0	85 0.5%	158 3.2%	0
900.100 other, not inherited	22 0.1%	536 3.2%	38 0.8%	32 2.8%
900.110 other, suspected as inherited	116 0.8%	43 0.3%	5 0.1%	6 0.5%
NORMAL				
0.000 normal globe	12221 82.2%	14553 87.2%	4379 89.0%	1028 89.1%

OCULAR DISORDERS REPORT

SHIBA INU - 1

SHIBA INU

	DISORDER	INHERITANCE	REFERENCE	BREEDING ADVICE
A.	Glaucoma	Not defined	1,2	NO
B.	Distichiasis	Not defined	3	Breeder option
C.	Persistent pupillary membranes			
	- iris to iris	Not defined	3,4	Breeder option
	- all other forms	Not defined	4	NO
D.	Corneal dystrophy	Not defined	4,5	Breeder option
	- epithelial/stromal			
E.	Pigmentary keratitis	Not defined	6	Breeder option
F.	Cataract	Not defined	3	NO
G.	Vitreous degeneration	Not defined	5	Breeder option

Description and Comments

A. Glaucoma

An elevation of intraocular pressure (IOP) which, when sustained, causes intraocular damage resulting in blindness. The elevated IOP occurs because the fluid cannot leave through the iridocorneal angle. Diagnosis and classification of glaucoma requires measurement of IOP (tonometry) and examination of the iridocorneal angle (gonioscopy). Neither of these tests is part of a routine breed eye screening exam.

B. Distichiasis

Eyelashes abnormally located on the eyelid margin which may cause ocular irritation. Distichiasis may occur at any time in the life of a dog. It is difficult to make a strong recommendation with regard to breeding dogs with this entity. The hereditary basis has not been established, although it seems probable due to the high incidence in some breeds. Reducing the incidence is a logical goal. When diagnosed, distichiasis should be recorded; breeding discretion is advised.

C. Persistent pupillary membrane (PPM)

©2014, American College of Veterinary Ophthalmologists

OCULAR DISORDERS REPORT

SHIBA INU - 2

Persistent blood vessel remnants in the anterior chamber of the eye which fail to regress normally by 3 months of age. These strands may bridge from iris to iris, iris to cornea, iris to lens, or form sheets of tissue in the anterior chamber. The last three forms pose the greatest threat to vision and when severe, vision impairment or blindness may occur.

D. Corneal Dystrophy - epithelial/stromal

A non-inflammatory corneal opacity (white to gray) present in one or more of the corneal layers. Corneal dystrophy implies a probable inherited basis and is usually bilateral.

E. Exposure keratopathy syndrome / Pigmentary keratitis

A corneal disease involving all or part of the cornea, resulting from inadequate blinking. This results from a combination of anatomic features including shallow orbits, exophthalmos, macroblepharon and lagophthalmos

F. Cataract

A partial or complete opacity of the lens and/or its capsule. In cases where cataracts are complete and affect both eyes, blindness results. The prudent approach is to assume cataracts to be hereditary except in cases known to be associated with trauma, other causes of ocular inflammation, specific metabolic diseases, persistent pupillary membrane, persistent hyaloid or nutritional deficiencies. Cataracts may involve the lens completely (diffuse) or in a localized region.

G. Vitreous degeneration

A liquefaction of the vitreous gel which may predispose to retinal detachment resulting in blindness.

References

There are few references providing detailed descriptions of hereditary ocular conditions of the Shiba Inu breed. The conditions listed above are generally recognized to exist in this breed, as evidenced by identification on breed eye screening examinations and/or clinical experience of veterinary ophthalmologists.

1. ACVO Genetics Committee, 2013-2014 and Data from OFA All-Breeds Report, 2013-2014.
2. Kato K, Sasaki N, Matsunaga S, et al. Possible association of glaucoma with pectinate ligament dysplasia and narrowing of the iridocorneal angle in Shiba Inu dogs in Japan. *Vet Ophthalmol.* 2006;9:71-75.
3. ACVO Genetics Committee, 1999 and/or Data from CERF All-Breeds Report, 1991-1998.
4. ACVO Genetics Committee, 2005 and/or Data from CERF All-Breeds Report 2003-2004.

©2014, American College of Veterinary Ophthalmologists

OCULAR DISORDERS REPORT

SHIBA INU - 3

5. ACVO Genetics Committee, 2002-2003 and/or Data from CERF All-Breeds Report, 2002-2003.
6. ACVO Genetics Committee, 2006 and/or Data from CERF All-Breeds Report, 2001-2005.

OCULAR DISORDERS REPORT SHIBA INU

Diagnostic Name	TOTAL DOGS EXAMINED		1991-1999 1221		2000-2009 2043		2010-2013 832		2014 185	
	#	%	#	%	#	%	#	%	#	%
GLOBE										
10.000 glaucoma	0		0		3	0.4%	0			
EYELIDS										
20.140 ectopic cilia	0		2	0.1%	2	0.2%	0		0	
20.160 macropalpebral fissure	2	0.2%	4	0.2%	0		0		0	
21.000 entropion, unspecified	4	0.3%	8	0.4%	0		0		0	
25.110 distichiasis	25	2.0%	45	2.2%	16	1.9%	10	5.4%		
NASOLACRIMAL										
32.110 imperforate lower nasolacrimal punctum	0		0		2	0.2%	0		0	
40.910 keratoconjunctivitis sicca	0		0		1	0.1%	0		0	
NICTITANS										
52.110 prolapsed gland of the third eyelid	0		0		2	0.2%	0		0	
CORNEA										
70.210 corneal pannus	3	0.2%	1	0.0%	0		0		0	
70.220 pigmentary keratitis	1	0.1%	6	0.3%	1	0.1%	2	1.1%		
70.700 corneal dystrophy	14	1.1%	14	0.7%	3	0.4%	1	0.5%		
70.730 corneal endothelial degeneration	8	0.7%	0		2	0.2%	0			
UVEA										
93.710 persistent pupillary membranes, iris to iris	36	2.9%	84	4.1%	34	4.1%	10	5.4%		
93.720 persistent pupillary membranes, iris to lens	6	0.5%	8	0.4%	0		1	0.5%		
93.730 persistent pupillary membranes, iris to cornea	1	0.1%	0		0		0			
93.740 persistent pupillary membranes, iris sheets	1	0.1%	0		0		0			
93.750 persistent pupillary membranes, lens pigment foci/no strands	0		0		13	1.6%	4	2.2%		
93.760 persistent pupillary membranes, endothelial opacity/no strands	0		0		3	0.4%	1	0.5%		
LENS										
100.200 cataract, unspecified	10	0.8%	0		0		0		0	
100.210 cataract, significance unknown	41	3.4%	88	4.3%	34	4.1%	13	7.0%		
100.301 punctate cataract, anterior cortex	1	0.1%	3	0.1%	3	0.4%	0			
100.302 punctate cataract, posterior cortex	8	0.7%	4	0.2%	6	0.7%	0			
100.303 punctate cataract, equatorial cortex	0		3	0.1%	0		0			
100.304 punctate cataract, anterior sutures	0		2	0.1%	1	0.1%	0			
100.305 punctate cataract, posterior sutures	8	0.7%	11	0.5%	2	0.2%	0			
100.306 punctate cataract, nucleus	0		0		2	0.2%	0			
100.307 punctate cataract, capsular	0		1	0.0%	1	0.1%	0			
100.311 incipient cataract, anterior cortex	5	0.4%	16	0.8%	11	1.3%	1	0.5%		
100.312 incipient cataract, posterior cortex	8	0.7%	9	0.4%	7	0.8%	1	0.5%		
100.313 incipient cataract, equatorial cortex	2	0.2%	6	0.3%	2	0.2%	2	1.1%		
100.314 incipient cataract, anterior sutures	0		2	0.1%	0		0			
100.315 incipient cataract, posterior sutures	3	0.2%	5	0.2%	2	0.2%	1	0.5%		
100.316 incipient cataract, nucleus	0		1	0.0%	2	0.2%	0			
100.317 incipient cataract, capsular	0		1	0.0%	1	0.1%	0			
100.330 generalized/complete cataract	9	0.7%	7	0.3%	3	0.4%	0			
100.375 subluxation/luxation, unspecified	0		3	0.1%	0		0			

OCULAR DISORDERS REPORT SHIBA INU

	1991-1999	2000-2009	2010-2013	2014
VITREOUS				
110.120 persistant hyaloid artery/remnant	4 0.3%	10 0.5%	2 0.2%	3 1.6%
110.135 PHPV/PTVL	0	4 0.2%	0	0
110.320 vitreous degeneration syneresis	9 0.7%	16 0.8%	2 0.2%	1 0.5%
110.330 vitreous degeneration anterior chamber	0	2 0.1%	1 0.1%	0
RETINA				
120.170 retinal dysplasia, folds	4 0.3%	2 0.1%	1 0.1%	0
120.180 retinal dysplasia, geographic	2 0.2%	0	0	0
120.190 retinal dysplasia, detached	0	0	2 0.2%	0
120.310 generalized progressive retinal atrophy (PRA)	9 0.7%	15 0.7%	5 0.6%	0
120.400 retinal hemorrhage	0	1 0.0%	0	0
120.910 retinal detachment without dialysis	0	1 0.0%	0	0
120.960 retinopathy	0	0	1 0.1%	0
OPTIC NERVE				
130.120 optic nerve hypoplasia	3 0.2%	4 0.2%	0	0
OTHER				
900.000 other, unspecified	0	4 0.2%	27 3.2%	0
900.100 other, not inherited	7 0.6%	85 4.2%	8 1.0%	7 3.8%
900.110 other, suspected as inherited	11 0.9%	10 0.5%	4 0.5%	0
NORMAL				
0.000 normal globe	1018 83.4%	1759 86.1%	729 87.6%	159 85.9%

OCULAR DISORDERS REPORT

SHIH TZU - 1

SHIH TZU

	DISORDER	INHERITANCE	REFERENCE	BREEDING ADVICE
A.	Distichiasis	Not defined	1	Breeder option
B.	Ectopic cilia	Not defined	1	Breeder option
C.	Entropion	Not defined	1	Breeder option
D.	Eury/Macrolepharon	Not defined	2	Breeder option
E.	Ciliated caruncle	Not defined	1	Breeder option
F.	Keratoconjunctivitis sicca (dry eye)	Not defined	1, 3	NO
G.	Corneal dystrophy - epithelial/stromal	Not defined	4	Breeder option
H.	Chronic superficial keratitis/pannus	Not defined	4	Breeder option
I.	Exposure keratopathy syndrome/ macroblepharon	Not defined	1	Breeder option
J.	Persistent pupillary membranes - iris to iris	Not defined	5	Breeder option
K.	Cataract	Not defined	1	NO
L.	Persistent hyaloid artery	Not defined	11	Breeder option
M.	Vitreous Degeneration -anterior chamber -syneresis	Not defined Not defined	5, 6 5, 6	Breeder option Breeder option
N.	Retinal atrophy - generalized	Not defined	1	NO
O.	Retinal detachment	Not defined	6-8	NO
P.	Retinal degeneration	Not defined	7	NO

©2014, American College of Veterinary Ophthalmologists

OCULAR DISORDERS REPORT

SHIH TZU - 2

Q.	Optic nerve hypoplasia	Not defined	9, 10	NO
R.	Micropapilla	Not defined	3	Breeder option

Description and Comments

A. Distichiasis

Eyelashes abnormally located on the eyelid margin which may cause ocular irritation. Distichiasis may occur at any time in the life of a dog. It is difficult to make a strong recommendation with regard to breeding dogs with this entity. The hereditary basis has not been established although it seems probable due to the high incidence in some breeds. Reducing the incidence is a logical goal. When diagnosed, distichiasis should be recorded. Breeding discretion is advised.

B. Ectopic cilia

Hair emerging through the eyelid conjunctiva. Ectopic cilia occur more frequently in younger dogs and cause discomfort and corneal disease.

C. Entropion

A conformational defect resulting in an "in-rolling" of one or both of the eyelids which may cause ocular irritation. It is likely that entropion is influenced by several genes (polygenic), defining the skin and other structures which make up the eyelids, the amount and weight of the skin covering the head and face, the orbital contents, and the conformation of the skull.

D. Macrolepharon

Defined as an exceptionally large palpebral fissure, macrolepharon in conjunction with laxity of the lateral canthal structures may lead to lower lid ectropion and upper lid entropion. Either of these conditions may lead to severe ocular irritation.

E. Ciliated caruncle

The caruncle is a normal structure (a mass of fleshy conjunctival tissue at the nasal canthus). In abnormal conditions, it may contain hair which, if contacting the cornea, may cause irritation and/or tearing.

F. Keratoconjunctivitis sicca (KCS)/dry eye

An abnormality of the tear film, most commonly a deficiency of the aqueous portion,

OCULAR DISORDERS REPORT

SHIH TZU - 3

although the mucin and/or lipid layers may be affected; results in ocular irritation and/or vision impairment.

G. Corneal dystrophy - epithelial/stromal

A non-inflammatory corneal opacity (white to gray) present in one or more of the corneal layers. Corneal dystrophy implies a probable inherited basis and is usually bilateral.

H. Chronic superficial keratitis/pannus

A bilateral inflammatory disease of the cornea which usually starts as a grayish haze to the ventral or ventrolateral cornea, followed by the formation of a vascularized subepithelial growth that begins to spread toward the central cornea; pigmentation follows the vascularization. If severe, vision impairment occurs. Pannus may be associated with plasma cell infiltration of the nictitans.

I. Exposure keratopathy syndrome/macroblepharon

A corneal disease involving all or part of the cornea, resulting from inadequate blinking. This results from a combination of anatomic features including shallow orbits, exophthalmos, macroblepharon and lagophthalmos. Macroblepharon is defined as an exceptionally large palpebral fissure. When present with laxity of the lateral canthal structures, this condition may lead to lower lid ectropion and upper lid entropion. Either of these conditions may lead to severe ocular irritation.

J. Persistent pupillary membranes (PPM)

Persistent blood vessel remnants in the anterior chamber of the eye which fail to regress normally by 3 months of age. These strands may bridge from iris to iris, iris to cornea, iris to lens, or form sheets of tissue in the anterior chamber. The last three forms pose the greatest threat to vision and when severe, vision impairment or blindness may occur.

K. Cataract

A partial or complete opacity of the lens and/or its capsule. In cases where cataracts are complete and affect both eyes, blindness results. The prudent approach is to assume cataracts to be hereditary except in cases known to be associated with trauma, other causes of ocular inflammation, specific metabolic diseases, persistent pupillary membrane, persistent hyaloid or nutritional deficiencies. Cataracts may involve the lens completely (diffuse) or in a localized region.

L. Persistent hyaloid artery (PHA)

A congenital defect resulting from abnormalities in the development and regression of the hyaloid artery. The blood vessel remnant can be present in the vitreous as a small vascular strand (**PHA**) or as a non-vascular strand that appears gray-white (**persistent hyaloid remnant**).

OCULAR DISORDERS REPORT

SHIH TZU - 4

M. Vitreous degeneration

A liquefaction of the vitreous gel which may predispose to retinal detachment.

N. Retinal atrophy - generalized

A degenerative disease of the retinal visual cells which progresses to blindness. This abnormality, also known as progressive retinal atrophy or PRA, may be detected by electroretinogram (not part of a routine eye screening examination) before it is apparent clinically. Except for X-linked PRA in the Siberian Husky, in all breeds studied to date, PRA is inherited as an autosomal recessive trait.

O. Retinal detachment

A separation of the sensory retina from the underlying tissue. It results in blindness when complete.

P. Retinal degeneration

A unilateral or bilateral retinal disease which can be progressive. When bilateral, the ophthalmoscopic lesions are sometimes asymmetrical, particularly in the early stages of the disease. Fundus examination shows initially single or multiple focal retinal lesions that appear active (local infiltrative inflammation or granulation) or inactive. The lesions can progress resulting in widespread retinal atrophy. The end-stage ophthalmoscopic lesions vary and may appear indistinguishable from PRA, or may be more characteristic of an inflammatory retinopathy. The asymmetry of the fundus abnormalities and the presence of inflammatory lesions in the retina and choroid help to differentiate this disorder from PRA. The mode of inheritance of this disease is not known; however, studies of different families suggest that it is possibly inherited. An intriguing aspect of the disease has been the preponderance of affected males compared to females. This has been confirmed in a recent unpublished survey.

Q. Optic nerve hypoplasia

A congenital defect of the optic nerve which causes blindness and abnormal pupil response in the affected eye. May be unable to differentiate from micropapilla on a routine (dilated) screening ophthalmoscopic exam.

R. Micropapilla

Micropapilla refers to a small optic disc which is not associated with vision impairment. Optic nerve hypoplasia refers to a congenital defect of the optic nerve which causes blindness and abnormal pupil response in the affected eye. It may be difficult to differentiate between micropapilla and optic nerve hypoplasia on a routine (dilated) screening ophthalmoscopic exam.

References

©2014, American College of Veterinary Ophthalmologists

OCULAR DISORDERS REPORT

SHIH TZU - 5

1. ACVO Genetics Committee, 1999 and/or Data from CERF All-Breeds Report, 1991-1998.
2. ACVO Genetics Committee, 2008 and/or Data from CERF All Breeds Report, 2003-2007.
3. Sanchez RF, Innocent G, Mould J, et al. Canine keratoconjunctivitis sicca: disease trends in a review of 229 cases. *J Small Anim Pract.* 2007; 48: 211-217.
4. ACVO Genetics Committee, 2005 and/or Data from CERF All-Breeds Report 2003-2004.
5. ACVO Genetics Committee, 2009 and/or Data from CERF All-Breeds Report, 2008.
6. Hendrix DV, Nasisse MP, Cowen P, et al. Clinical signs, concurrent diseases and risk factors associated with retinal detachment in dogs. *Prog Vet Comp Ophthal.* 1993; 3: 87.
7. Itoh Y, Maehara S, Yamasaki A, et al. Investigation of fellow eye of unilateral retinal detachment in Shih-Tzu. *Vet Ophthalmol.* 2010; 13: 289-293.
8. Fritz KJ, Steele KA, Esson DW, et al. A review of the breed-associated frequency of canine patients presented for retinal re-attachment surgery. *43rd Annual Meeting of the American College of Veterinary Ophthalmologists, Portland 2012 October 17-20, 2012.*
9. ACVO Genetics Committee, 2000-2002 and/or Data from CERF All-Breeds Report, 2000-2002.
10. da Silva EG, Dubielzig R, Zarfoss MK, et al. Distinctive histopathologic features of canine optic nerve hypoplasia and aplasia: a retrospective review of 13 cases. *Vet Ophthalmol.* 2008; 11: 23-29.
11. ACVO Genetics Committee, 2014 and/or Data from OFA All-Breeds Report, 2013-2014.

OCULAR DISORDERS REPORT SHIH TZU

Diagnostic Name	TOTAL DOGS EXAMINED		1991-1999 1038		2000-2009 926		2010-2013 315		2014 88	
	#	%	#	%	#	%	#	%	#	%
GLOBE										
0.110 microphthalmia	1	0.1%	4	0.4%	1	0.3%	0			
EYELIDS										
20.140 ectopic cilia	11	1.1%	25	2.7%	1	0.3%	0			
20.160 macropalpebral fissure	18	1.7%	37	4.0%	2	0.6%	0			
21.000 entropion, unspecified	48	4.6%	70	7.6%	37	11.7%	0			
22.000 ectropion, unspecified	3	0.3%	1	0.1%	0		0			
25.110 distichiasis	219	21.1%	179	19.3%	51	16.2%	7	8.0%		
NASOLACRIMAL										
32.110 imperforate lower nasolacrimal punctum	3	0.3%	0		2	0.6%	0			
40.910 keratoconjunctivitis sicca	2	0.2%	3	0.3%	8	2.5%	2	2.3%		
NICTITANS										
51.100 third eyelid cartilage anomaly	1	0.1%	0		0		0			
CORNEA										
70.210 corneal pannus	16	1.5%	9	1.0%	0		0			
70.220 pigmentary keratitis	53	5.1%	38	4.1%	26	8.3%	6	6.8%		
70.700 corneal dystrophy	9	0.9%	15	1.6%	6	1.9%	1	1.1%		
70.730 corneal endothelial degeneration	0		2	0.2%	1	0.3%	0			
UVEA										
93.120 iris cyst	0		5	0.5%	0		0			
93.140 corneal endothelial pigment without PPM	0		1	0.1%	0		0			
93.150 iris coloboma	1	0.1%	2	0.2%	1	0.3%	0			
93.710 persistent pupillary membranes, iris to iris	4	0.4%	16	1.7%	10	3.2%	2	2.3%		
93.720 persistent pupillary membranes, iris to lens	1	0.1%	1	0.1%	1	0.3%	1	1.1%		
93.730 persistent pupillary membranes, iris to cornea	1	0.1%	0		0		2	2.3%		
LENS										
100.200 cataract, unspecified	16	1.5%	0		0		0			
100.210 cataract, significance unknown	17	1.6%	21	2.3%	7	2.2%	1	1.1%		
100.301 punctate cataract, anterior cortex	7	0.7%	6	0.6%	1	0.3%	0			
100.302 punctate cataract, posterior cortex	1	0.1%	4	0.4%	2	0.6%	0			
100.303 punctate cataract, equatorial cortex	0		1	0.1%	0		0			
100.304 punctate cataract, anterior sutures	0		0		1	0.3%	0			
100.305 punctate cataract, posterior sutures	2	0.2%	7	0.8%	1	0.3%	0			
100.306 punctate cataract, nucleus	1	0.1%	0		0		0			
100.307 punctate cataract, capsular	0		2	0.2%	0		0			
100.311 incipient cataract, anterior cortex	8	0.8%	12	1.3%	1	0.3%	0			
100.312 incipient cataract, posterior cortex	7	0.7%	10	1.1%	2	0.6%	1	1.1%		
100.313 incipient cataract, equatorial cortex	4	0.4%	7	0.8%	1	0.3%	0			
100.314 incipient cataract, anterior sutures	0		1	0.1%	0		0			
100.315 incipient cataract, posterior sutures	1	0.1%	4	0.4%	1	0.3%	0			
100.316 incipient cataract, nucleus	3	0.3%	3	0.3%	1	0.3%	0			
100.317 incipient cataract, capsular	0		2	0.2%	0		0			
100.321 incomplete cataract, anterior cortex	0		0		0		1	1.1%		
100.322 incomplete cataract, posterior cortex	0		0		0		1	1.1%		
100.330 generalized/complete cataract	14	1.3%	9	1.0%	0		0			

OCULAR DISORDERS REPORT SHIH TZU

LENS CONTINUED	1991-1999	2000-2009	2010-2013	2014
100.375 subluxation/luxation, unspecified	2 0.2%	2 0.2%	0	0
VITREOUS				
110.120 persistant hyaloid artery/remnant	3 0.3%	1 0.1%	5 1.6%	3 3.4%
110.200 vitritis	0	0	3 1.0%	2 2.3%
110.320 vitreous degeneration syneresis	34 3.3%	66 7.1%	16 5.1%	9 10.2%
110.330 vitreous degeneration anterior chamber	0	14 1.5%	6 1.9%	0
FUNDUS				
97.110 choroidal hypoplasia	0	1 0.1%	0	0
97.120 coloboma	1 0.1%	1 0.1%	0	0
RETINA				
120.170 retinal dysplasia, folds	5 0.5%	4 0.4%	1 0.3%	0
120.180 retinal dysplasia, geographic	0	4 0.4%	0	0
120.200 retinitis	0	0	1 0.3%	1 1.1%
120.310 generalized progressive retinal atrophy (PRA)	25 2.4%	13 1.4%	3 1.0%	0
120.910 retinal detachment without dialysis	4 0.4%	5 0.5%	0	0
120.960 retinopathy	0	0	1 0.3%	0
OPTIC NERVE				
130.120 optic nerve hypoplasia	8 0.8%	2 0.2%	0	0
130.150 optic disc coloboma	2 0.2%	2 0.2%	0	0
OTHER				
900.000 other, unspecified	0	20 2.2%	23 7.3%	0
900.100 other, not inherited	9 0.9%	81 8.7%	11 3.5%	6 6.8%
900.110 other, suspected as inherited	26 2.5%	21 2.3%	7 2.2%	0
NORMAL				
0.000 normal globe	630 60.7%	543 58.6%	209 66.3%	65 73.9%

OCULAR DISORDERS REPORT

SHILOH SHEPHERD - 1

SHILOH SHEPHERD

	DISORDER	INHERITANCE	REFERENCE	BREEDING ADVICE
A.	Corneal dystrophy - epithelial/stromal	Not defined	1	Breeder option
B.	Pannus/Chronic superficial keratitis	Not defined	2	No

Description and Comments

A. Corneal Dystrophy - epithelial/stromal

A non-inflammatory corneal opacity (white to gray) present in one or more of the corneal layers. Corneal dystrophy implies a probable inherited basis and is usually bilateral.

B. Pannus/Chronic superficial keratitis

Bilateral inflammatory disease of the cornea which usually starts as a grayish haze to the inferior or inferiotemporal cornea, followed by the formation of a vascularized subepithelial opacity that begins to spread toward the central cornea; pigmentation follows the vascularization. If severe, vision impairment occurs. Pannus may be associated with plasma cell infiltration of the nictitans. (Also called "atypical pannus or plasmoma")

References

There are no references providing detailed descriptions of hereditary ocular conditions of the Shiloh Shepherd breed. The conditions listed above are generally recognized to exist in this breed, as evidenced by identification on breed eye screening examinations and/or clinical experience of veterinary ophthalmologists.

1. ACVO Genetics Committee, 2000-2002 and/or Data from CERF All-Breeds Report, 2000-2002.
2. ACVO Genetics Committee, 2011 and/or Data from CERF All-Breeds Report, 2010.

OCULAR DISORDERS REPORT SHILOH SHEPHERD

Diagnostic Name	TOTAL DOGS EXAMINED		1991-1999		2000-2009		2010-2013		2014	
	#	%	#	%	#	%	#	%	#	%
EYELIDS										
25.110 distichiasis	0		0		3	5.8%	0			
CORNEA										
70.700 corneal dystrophy	4	44.4%	15	10.0%	7	13.5%	0			
70.730 corneal endothelial degeneration	0		0		1	1.9%	0			
UVEA										
93.120 iris cyst	0		1	0.7%	0		0		0	
93.710 persistent pupillary membranes, iris to iris	0		2	1.3%	0		0		0	
LENS										
100.210 cataract, significance unknown	0		6	4.0%	3	5.8%	2	12.5%		
100.302 punctate cataract, posterior cortex	0		1	0.7%	0		0			
100.307 punctate cataract, capsular	0		1	0.7%	0		0			
100.312 incipient cataract, posterior cortex	0		1	0.7%	0		0			
100.314 incipient cataract, anterior sutures	0		0		0		1	6.2%		
100.330 generalized/complete cataract	0		1	0.7%	0		0			
RETINA										
120.180 retinal dysplasia, geographic	0		1	0.7%	1	1.9%	0			
OTHER										
900.000 other, unspecified	0		1	0.7%	0		0		0	
900.100 other, not inherited	0		4	2.7%	0		0		0	
NORMAL										
0.000 normal globe	5	55.6%	134	89.3%	46	88.5%	15	93.8%		

OCULAR DISORDERS REPORT

SIBERIAN HUSKY - 1

SIBERIAN HUSKY

	DISORDER	INHERITANCE	REFERENCE	BREEDING ADVICE
A.	Glaucoma	Not defined	1-4	NO
B.	Distichiasis	Not defined	1	Breeder option
C.	Entropion	Not defined	1	Breeder option
D.	Corneal dystrophy - epithelial/stromal	Presumed autosomal recessive	1,5-8	NO
E.	Persistent pupillary membranes - iris to iris - endothelial opacity/ no strands	Not defined	9,10 11	Breeder option NO
F.	Uveodermatologic syndrome	Not defined	1,12-14	NO
G.	Cataract	Not defined	1,4	NO
H.	Persistent hyperplastic primary vitreous	Not defined	15	NO
I.	Vitreous degeneration	Not defined	11	Breeder option
J.	Retinal atrophy - generalized * a DNA test is available	X-linked	1,16-20	NO
K.	Retinal dysplasia - folds	Not defined	11	Breeder option
I.	Retinal dysplasia - geographic/ detached	Presumed autosomal recessive	1, 14-17	NO

OCULAR DISORDERS REPORT

SIBERIAN HUSKY - 2

Description and Comments

A. Glaucoma

An elevation of intraocular pressure (IOP) which, when sustained, causes intraocular damage resulting in blindness. The elevated IOP occurs because the fluid cannot leave through the iridocorneal angle. Diagnosis and classification of glaucoma requires measurement of IOP (tonometry) and examination of the iridocorneal angle (gonioscopy). Neither of these tests is part of a routine breed eye screening exam.

B. Distichiasis

Eyelashes abnormally located on the eyelid margin which may cause ocular irritation. Distichiasis may occur at any time in the life of a dog. It is difficult to make a strong recommendation with regard to breeding dogs with this entity. The hereditary basis has not been established although it seems probable due to the high incidence in some breeds. Reducing the incidence is a logical goal. When diagnosed, distichiasis should be recorded. Breeding discretion is advised.

C. Entropion

A conformational defect resulting in an "in-rolling" of one or both of the eyelids which may cause ocular irritation. It is likely that entropion is influenced by several genes (polygenic), defining the skin and other structures which make up the eyelids, the amount and weight of the skin covering the head and face, the orbital contents, and the conformation of the skull.

D. Corneal dystrophy - epithelial/stromal

A non-inflammatory corneal opacity (white to gray) present in one or more of the corneal layers; usually inherited and bilateral.

In the Siberian Husky, the opacities are bilaterally symmetrical, round to oval and ring shaped. They occur early in life (0.5-2 years) and may progress to cause significant vision loss.

E. Persistent pupillary membranes (PPM)

Persistent blood vessel remnants in the anterior chamber of the eye which fail to regress normally by 3 months of age. These strands may bridge from iris to iris, iris to cornea, iris to lens, or form sheets of tissue in the anterior chamber. The last three forms pose the greatest threat to vision and when severe, vision impairment or blindness may occur.

F. Uveodermatologic syndrome

Uveodermatologic syndrome in the Siberian Husky bears many similarities to a condition in people called Vogt-Koyanagi-Harada (or VKH) syndrome. Thus, the condition in dogs is often referred to as VKH or VKH-like syndrome. It is an immune-mediated disease in which

OCULAR DISORDERS REPORT

SIBERIAN HUSKY - 3

pigmented cells (melanocytes) in the eye and in the skin are destroyed by white blood cells (lymphocytes). The first clinical signs are usually inflammation of the intraocular structures (or uveitis) in both eyes. Adhesions between the iris and lens (posterior synechia) and the peripheral iris and cornea (peripheral anterior synechia) develop rapidly. Other complications include cataract development, retinal degeneration, retinal separation or detachment, optic disc atrophy and secondary glaucoma. The uveitis is very difficult to control medically and ultimately results in blindness in most affected dogs. Whitening of the hair (poliosis) and skin (vitiligo) may also be noted in advanced cases. The genetics of this condition are unclear, but some genetic predisposition is indicated by the higher prevalence of this disorder in Siberian Huskies compared with other dog breeds. Affected dogs are generally young, ranging in age between 1 ½ to 4 years.

G. Cataract

A partial or complete opacity of the lens and/or its capsule. In cases where cataracts are complete and affect both eyes, blindness results. The prudent approach is to assume cataracts to be hereditary except in cases known to be associated with trauma, other causes of ocular inflammation, specific metabolic diseases, persistent pupillary membrane, persistent hyaloid or nutritional deficiencies. Cataracts may involve the lens completely (diffuse) or in a localized region.

In the Siberian Husky, cataracts begin in the axial posterior cortex at approximately one year of age. Progression is variable and vision impairment may occur. In cases with rapid progression, secondary lens-induced uveitis and glaucoma may be associated with partial cataract resorption.

H. Persistent hyperplastic primary vitreous (PHPV)

Persistent hyperplastic primary vitreous is a congenital defect resulting from abnormalities in the development and regression of the hyaloid artery (the primary vitreous) and the interaction of this blood vessel with the posterior lens capsule/cortex during embryogenesis. This condition is often associated with persistent hyperplastic tunica vasculosa lentis which results from failure of regression of the embryologic vascular network which surrounds the developing lens.

I. Vitreous degeneration

A liquefaction of the vitreous gel which may predispose to retinal detachment.

J. Retinal atrophy - generalized

A degenerative disease of the retinal visual cells which progresses to blindness. This abnormality, also known as progressive retinal atrophy or PRA, may be detected by electroretinogram (not part of a routine eye screening examination) before it is apparent clinically. In the Siberian Husky, one form of PRA is inherited as a sex-linked trait.

OCULAR DISORDERS REPORT

SIBERIAN HUSKY - 4

K. Retinal dysplasia - folds

Linear, triangular, curved or curvilinear foci of retinal folding that may be single or multiple. When seen in puppies, this condition may partially or completely resolve with maturity. Its significance to vision is unknown. There are two other forms of retinal dysplasia (geographic, detached) which are known to be inherited in other breeds and, in their most severe form, cause blindness. The genetic relationship between folds and more severe forms of retinal dysplasia is undetermined.

I. Retinal dysplasia - geographic / detached

Abnormal development of the retina present at birth.

Retinal dysplasia - geographic: Any irregularly shaped area of abnormal retinal development containing both areas of thinning and areas of elevation representing folds and retinal disorganization.

Retinal dysplasia - detached: Severe retinal disorganization associated with separation (detachment) of the retina.

These two forms are associated with vision impairment or blindness. Retinal dysplasia is known to be inherited in many breeds. The genetic relationship between the three forms of retinal dysplasia is not known for all breeds.

References

1. ACVO Genetics Committee, 1999 and/or Data from CERF All-Breeds Report, 1991-1998.
2. Slater MR, Erb HN. Effects of risk factors and prophylactic treatment on primary glaucoma in the dog. *J Am Vet Med Assoc.* 1986;188:1028-1030.
3. Gelatt KN, MacKay EO. Prevalence of the breed-related glaucomas in pure-bred dogs in North America. *Vet Ophthalmol.* 2004;7:97-111.
4. Stanley RG, Blogg JR. Eye diseases in Siberian husky dogs. *Aust Vet J.* 1991;68:161-162.
5. Cooley PL, Dice PF, 2nd. Corneal dystrophy in the dog and cat. *Vet Clin North Am Small Anim Pract.* 1990;20:681-692.
6. MacMillan AD, Waring GO, 3rd, Spangler WL, et al. Crystalline corneal opacities in the Siberian Husky. *J Am Vet Med Assoc.* 1979;175:829-832.
7. Waring GO, 3rd. Oval lipid corneal opacities in beagles and crystalline lipid corneal opacities in Siberian Huskies. *Metab Pediatr Ophthalmol.* 1979;3:203.
8. Waring GO, 3rd. Inheritance of crystalline corneal dystrophy in Siberian Huskies. *J Am Anim Hosp Assoc.* 1986;22:655.

OCULAR DISORDERS REPORT

SIBERIAN HUSKY - 5

9. ACVO Genetics Committee, 2000-2002 and/or Data from CERF All-Breeds Report, 2000-2002.
10. ACVO Genetics Committee, 2005 and/or Data from CERF All-Breeds Report 2003-2004.
11. ACVO Genetics Committee, 2013-2014 and Data from OFA All-Breeds Report, 2013-2014.
12. Halliwell RE. Autoimmune diseases in domestic animals. *J Am Vet Med Assoc.* 1982;181:1088-1096.
13. Bussanich M, Rootman J, Dolman C. Granulomatous panuveitis and dermal depigmentation in dogs. *J Am Anim Hosp Assoc.* 1982;18:131-138.
14. Kern TJ, Walton DK, Riis RC, et al. Uveitis associated with poliosis and vitiligo in six dogs. *J Am Vet Med Assoc.* 1985;187:408-414.
15. Ori J, Yoshika T, Yoshimura S. Persistent hyperplastic primary vitreous (PHPV) in two Siberian Husky dogs. *J Vet Med Sci.* 1998;60:263.
16. Acland GM, Blanton SH, Hershfield B, et al. XLPRA: a canine retinal degeneration inherited as an X-linked trait. *Am J Med Genet.* 1994;52:27-33.
17. Acland GM, Blanton SH, Hershfield B. XLPRA: An X-linked form of progressive retinal atrophy in Siberian Husky dogs. *Proc Am Coll Vet Ophthalmol.* 1993;24:37.
18. Aguirre GD, Acland GM. Electroretinographic studies in XLPRA: A canine model of x-linked retinitis pigmentosa. *Invest Ophthalmol Vis Sci (Supp).* 1994;35:1611.
19. Hershfield B, Micklethwaite C, Mullings SJ. RLFP mapping of x-linked progressive retinal atrophy (XLPRA) in the Siberian husky. *Invest Ophthalmol Vis Sci (Supp).* 1994;35:1612.
20. Zhang Q, Acland GM, Wu WX, et al. Different RPGR exon ORF15 mutations in Canids provide insights into photoreceptor cell degeneration. *Hum Mol Genet.* 2002;11:993-1003.

OCULAR DISORDERS REPORT SIBERIAN HUSKY

Diagnostic Name	TOTAL DOGS EXAMINED		1991-1999 16961		2000-2009 13659		2010-2013 5203		2014 1133	
	#	%	#	%	#	%	#	%	#	%
GLOBE										
0.110	microphthalmia	5	0.0%	2	0.0%	0		0		0
10.000	glaucoma	10	0.1%	2	0.0%	0		0		0
EYELIDS										
20.110	eyelid dermoid	4	0.0%	0		0		0		0
20.140	ectopic cilia	2	0.0%	0		1	0.0%	0		0
20.160	macropalpebral fissure	1	0.0%	0		0		0		0
21.000	entropion, unspecified	12	0.1%	5	0.0%	2	0.0%	0		0
22.000	ectropion, unspecified	4	0.0%	0		0		0		0
25.110	distichiasis	162	1.0%	133	1.0%	62	1.2%	16	1.4%	
NASOLACRIMAL										
32.110	imperforate lower nasolacrimal punctum	1	0.0%	0		0		0		0
40.910	keratoconjunctivitis sicca	1	0.0%	0		3	0.1%	0		0
NICTITANS										
51.100	third eyelid cartilage anomaly	0		0		2	0.0%	0		0
52.110	prolapsed gland of the third eyelid	1	0.0%	0		1	0.0%	0		0
CORNEA										
70.210	corneal pannus	11	0.1%	8	0.1%	1	0.0%	0		0
70.220	pigmentary keratitis	0		0		1	0.0%	0		0
70.700	corneal dystrophy	502	3.0%	371	2.7%	85	1.6%	20	1.8%	
70.730	corneal endothelial degeneration	21	0.1%	13	0.1%	2	0.0%	1	0.1%	
UVEA										
93.110	iris hypoplasia	0		1	0.0%	1	0.0%	1	0.1%	
93.120	iris cyst	3	0.0%	11	0.1%	1	0.0%	1	0.1%	
93.140	corneal endothelial pigment without PPM	0		0		1	0.0%	0		0
93.150	iris coloboma	4	0.0%	1	0.0%	0		1	0.1%	
93.170	anterior chamber cyst	0		0		1	0.0%	0		0
93.710	persistent pupillary membranes, iris to iris	284	1.7%	392	2.9%	166	3.2%	35	3.1%	
93.720	persistent pupillary membranes, iris to lens	10	0.1%	13	0.1%	2	0.0%	0		0
93.730	persistent pupillary membranes, iris to cornea	26	0.2%	13	0.1%	6	0.1%	0		0
93.740	persistent pupillary membranes, iris sheets	2	0.0%	3	0.0%	0		0		0
93.750	persistent pupillary membranes, lens pigment foci/no strands	0		0		8	0.2%	3	0.3%	
93.760	persistent pupillary membranes, endothelial opacity/no strands	0		0		12	0.2%	1	0.1%	
93.810	uveal melanoma	0		1	0.0%	0		0		0
95.120	ciliary body cyst	0		0		0		1	0.1%	
97.150	chorioretinal coloboma, congenital	0		0		0		1	0.1%	
LENS										
100.200	cataract, unspecified	576	3.4%	0		0		0		0
100.210	cataract, significance unknown	271	1.6%	244	1.8%	112	2.2%	26	2.3%	
100.301	punctate cataract, anterior cortex	27	0.2%	22	0.2%	16	0.3%	5	0.4%	
100.302	punctate cataract, posterior cortex	106	0.6%	63	0.5%	26	0.5%	4	0.4%	
100.303	punctate cataract, equatorial cortex	18	0.1%	9	0.1%	7	0.1%	4	0.4%	
100.304	punctate cataract, anterior sutures	7	0.0%	3	0.0%	0		0		0
100.305	punctate cataract, posterior sutures	64	0.4%	29	0.2%	8	0.2%	2	0.2%	

OCULAR DISORDERS REPORT SIBERIAN HUSKY

LENS CONTINUED	1991-1999		2000-2009		2010-2013		2014	
100.306 punctate cataract, nucleus	6	0.0%	11	0.1%	10	0.2%	0	
100.307 punctate cataract, capsular	5	0.0%	13	0.1%	10	0.2%	1	0.1%
100.311 incipient cataract, anterior cortex	50	0.3%	55	0.4%	16	0.3%	4	0.4%
100.312 incipient cataract, posterior cortex	584	3.4%	513	3.8%	142	2.7%	23	2.0%
100.313 incipient cataract, equatorial cortex	28	0.2%	27	0.2%	6	0.1%	3	0.3%
100.314 incipient cataract, anterior sutures	7	0.0%	8	0.1%	3	0.1%	0	
100.315 incipient cataract, posterior sutures	137	0.8%	95	0.7%	21	0.4%	4	0.4%
100.316 incipient cataract, nucleus	38	0.2%	38	0.3%	9	0.2%	3	0.3%
100.317 incipient cataract, capsular	8	0.0%	47	0.3%	27	0.5%	2	0.2%
100.321 incomplete cataract, anterior cortex	0		0		0		3	0.3%
100.322 incomplete cataract, posterior cortex	0		0		23	0.4%	19	1.7%
100.325 incomplete cataract, posterior sutures	0		0		0		2	0.2%
100.326 incomplete cataract, nucleus	0		0		4	0.1%	4	0.4%
100.327 incomplete cataract, capsular	0		0		2	0.0%	5	0.4%
100.330 generalized/complete cataract	290	1.7%	143	1.0%	24	0.5%	2	0.2%
100.375 subluxation/luxation, unspecified	11	0.1%	0		2	0.0%	0	
VITREOUS								
110.120 persistant hyaloid artery/remnant	25	0.1%	15	0.1%	2	0.0%	1	0.1%
110.130 PHPV/PTVL	0		0		1	0.0%	0	
110.135 PHPV/PTVL	1	0.0%	3	0.0%	1	0.0%	0	
110.320 vitreous degeneration syneresis	14	0.1%	13	0.1%	7	0.1%	3	0.3%
FUNDUS								
97.110 choroidal hypoplasia	21	0.1%	18	0.1%	7	0.1%	1	0.1%
97.120 coloboma	8	0.0%	7	0.1%	2	0.0%	0	
RETINA								
120.170 retinal dysplasia, folds	41	0.2%	34	0.2%	13	0.2%	1	0.1%
120.180 retinal dysplasia, geographic	17	0.1%	19	0.1%	12	0.2%	2	0.2%
120.190 retinal dysplasia, detached	4	0.0%	3	0.0%	4	0.1%	1	0.1%
120.200 retinitis	0		0		2	0.0%	3	0.3%
120.310 generalized progressive retinal atrophy (PRA)	58	0.3%	82	0.6%	21	0.4%	1	0.1%
120.400 retinal hemorrhage	6	0.0%	1	0.0%	0		0	
120.910 retinal detachment without dialysis	12	0.1%	12	0.1%	3	0.1%	0	
120.920 retinal detachment with dialysis	0		0		1	0.0%	1	0.1%
120.960 retinopathy	0		0		7	0.1%	0	
OPTIC NERVE								
130.110 micropapilla	0		2	0.0%	1	0.0%	0	
130.120 optic nerve hypoplasia	6	0.0%	1	0.0%	0		0	
130.150 optic disc coloboma	1	0.0%	2	0.0%	0		0	
OTHER								
900.000 other, unspecified	0		103	0.8%	251	4.8%	0	
900.100 other, not inherited	57	0.3%	688	5.0%	72	1.4%	97	8.6%
900.110 other, suspected as inherited	175	1.0%	51	0.4%	20	0.4%	3	0.3%
NORMAL								
0.000 normal globe	14127	83.3%	11787	86.3%	4681	90.0%	981	86.6%

OCULAR DISORDERS REPORT

SILKY TERRIER - 1

SILKY TERRIER

	DISORDER	INHERITANCE	REFERENCE	BREEDING ADVICE
A.	Corneal dystrophy - epithelial/stromal	Not defined	1, 2	Breeder option
B.	Persistent pupillary membranes - iris to iris	Not defined	1, 2	Breeder option
C.	Cataract	Not defined	1-4	NO
D.	Vitreous degeneration	Not defined	2, 3, 5	Breeder option
E.	Retinal atrophy - generalized (<i>prcd</i>)	Presumed autosomal recessive	6	NO

Description and Comments

A. Corneal Dystrophy - epithelial/stromal

A non-inflammatory corneal opacity (white to gray) present in one or more of the corneal layers. Corneal dystrophy implies a probable inherited basis and is usually bilateral.

B. Persistent pupillary membranes (PPM)

Persistent blood vessel remnants in the anterior chamber of the eye which fail to regress normally in the neonatal period. These strands may bridge from iris to iris, iris to cornea, iris to lens, or from sheets of tissue in the anterior chamber. The last three forms pose the greatest threat to vision and when severe, vision impairment or blindness may occur.

C. Cataract

A partial or complete opacity of the lens and/or its capsule. In cases where cataracts are complete and affect both eyes, blindness results. The prudent approach is to assume cataracts to be hereditary except in cases known to be associated with trauma, other causes of ocular inflammation, specific metabolic diseases, persistent pupillary membranes, persistent hyaloid or nutritional deficiencies. Cataracts may involve the lens completely (diffuse) or in a localized region.

OCULAR DISORDERS REPORT

SILKY TERRIER - 2

D. Vitreous degeneration

Liquefaction of the vitreous gel which may predispose to retinal detachment.

E. Retinal atrophy - generalized (*prcd*)

A degenerative disease of the retinal visual cells which progresses to blindness. This abnormality, also known as progressive retinal atrophy or PRA, may be detected by electroretinogram (not part of a routine eye screening examination) before it is apparent clinically. PRA is inherited as an autosomal recessive trait in most breeds.

This photoreceptor degeneration is characterized by slow death of visual cells following their normal development. The disease begins clinically with signs of night blindness followed by day blindness.

References

1. ACVO Genetics Committee, 2000-2002 and/or Data from CERF All-Breeds Report, 2000-2002.
2. ACVO Genetics Committee, 2005 and/or Data from CERF All-Breeds Report 2003-2004.
3. ACVO Genetics Committee, 2002-2003 and/or Data from CERF All-Breeds Report, 2002-2003.
4. Gelatt KN and Mackay EO. Prevalence of primary breed-related cataracts in the dog in North America. *Vet Ophthalmol.* 2005 Mar-Apr;8:101-111.
5. ACVO Genetics Committee, 2009 and/or Data from CERF All-Breeds Report, 2008.
6. Zangerl B, Goldstein O, Philp AR, et al. Identical mutation in a novel retinal gene causes progressive rod-cone degeneration in dogs and retinitis pigmentosa in humans. *Genomics.* 2006 Nov;88:551-563.

OCULAR DISORDERS REPORT

SILKY TERRIER

Diagnostic Name	TOTAL DOGS EXAMINED	1991-1999		2000-2009		2010-2013		2014	
		#	%	#	%	#	%	#	%
EYELIDS									
21.000	entropion, unspecified	0		1	0.3%	0		0	
25.110	distichiasis	1	0.7%	1	0.3%	0		0	
NICTITANS									
52.110	prolapsed gland of the third eyelid	0		0		1	0.6%	0	
CORNEA									
70.700	corneal dystrophy	7	4.6%	0		0		1	2.7%
UVEA									
93.140	corneal endothelial pigment without PPM	0		0		1	0.6%	0	
93.710	persistent pupillary membranes, iris to iris	10	6.6%	25	8.1%	5	3.1%	2	5.4%
93.720	persistent pupillary membranes, iris to lens	1	0.7%	0		0		0	
93.730	persistent pupillary membranes, iris to cornea	2	1.3%	1	0.3%	0		0	
93.750	persistent pupillary membranes, lens pigment foci/no strands	0		0		0		1	2.7%
93.760	persistent pupillary membranes, endothelial opacity/no strands	0		1	0.3%	0		0	
LENS									
100.200	cataract, unspecified	4	2.6%	0		0		0	
100.210	cataract, significance unknown	5	3.3%	20	6.5%	5	3.1%	4	10.8%
100.301	punctate cataract, anterior cortex	0		6	1.9%	3	1.8%	1	2.7%
100.302	punctate cataract, posterior cortex	1	0.7%	2	0.6%	0		0	
100.303	punctate cataract, equatorial cortex	2	1.3%	2	0.6%	2	1.2%	0	
100.304	punctate cataract, anterior sutures	0		0		1	0.6%	0	
100.306	punctate cataract, nucleus	0		1	0.3%	0		0	
100.311	incipient cataract, anterior cortex	3	2.0%	7	2.3%	2	1.2%	0	
100.312	incipient cataract, posterior cortex	4	2.6%	8	2.6%	4	2.5%	0	
100.313	incipient cataract, equatorial cortex	0		3	1.0%	4	2.5%	1	2.7%
100.314	incipient cataract, anterior sutures	0		1	0.3%	0		0	
100.315	incipient cataract, posterior sutures	1	0.7%	1	0.3%	0		0	
100.317	incipient cataract, capsular	0		1	0.3%	0		0	
100.321	incomplete cataract, anterior cortex	0		0		0		1	2.7%
100.322	incomplete cataract, posterior cortex	0		0		0		1	2.7%
100.330	generalized/complete cataract	17	11.3%	5	1.6%	0		0	
VITREOUS									
110.320	vitreous degeneration syneresis	5	3.3%	9	2.9%	11	6.7%	2	5.4%
110.330	vitreous degeneration anterior chamber	0		2	0.6%	0		0	
FUNDUS									
97.110	choroidal hypoplasia	0		1	0.3%	2	1.2%	0	
RETINA									
120.170	retinal dysplasia, folds	1	0.7%	2	0.6%	0		1	2.7%
120.180	retinal dysplasia, geographic	0		1	0.3%	0		0	
120.310	generalized progressive retinal atrophy (PRA)	2	1.3%	3	1.0%	2	1.2%	1	2.7%
120.910	retinal detachment without dialysis	1	0.7%	0		0		0	

OCULAR DISORDERS REPORT SILKY TERRIER

	1991-1999	2000-2009	2010-2013	2014
OPTIC NERVE				
130.110 micropapilla	0	1 0.3%	0	0
OTHER				
900.000 other, unspecified	0	1 0.3%	11 6.7%	0
900.100 other, not inherited	0	23 7.4%	5 3.1%	1 2.7%
900.110 other, suspected as inherited	1 0.7%	0	0	0
NORMAL				
0.000 normal globe	111 73.5%	236 76.1%	131 80.4%	33 89.2%

OCULAR DISORDERS REPORT

SLOUGHY - 1

SLOUGHY

	DISORDER	INHERITANCE	REFERENCE	BREEDING ADVICE
A	Progressive retinal atrophy (rcd1a) / Generalized retinal degeneration * a DNA test is available	Autosomal recessive	1, 2	NO

Description and Comments

A. Progressive Retinal Atrophy/Generalized retinal degeneration

A late onset degenerative disease of the retinal visual cells with visual deficits detectable at 2 to 3 years of age and which progresses to blindness. This abnormality may be detected by electroretinogram (not part of a routine eye screening examination) before it is apparent clinically. It is inherited as an autosomal recessive trait. The disease is due to an 8-bp insertion in exon 21 of the PDE6B gene referred to as rcd1a, as occurs in the Irish Setter. A DNA test is available.

References

1. Brahm R, editor Retinal degeneration in the Sloughy dog and diagnosed by direct DNA Test. *ECVO Proceedings*; 2001.
2. Dekomien G, Runte M, Godde R, et al. Generalized progressive retinal atrophy of Sloughy dogs is due to an 8-bp insertion in exon 21 of the PDE6B gene. *Cytogenetics and cell genetics*. 2000;90:261-267.

OCULAR DISORDERS REPORT SLOUGHI

Diagnostic Name	TOTAL DOGS EXAMINED	1991-1999		2000-2009		2010-2013		2014	
		#	%	#	%	#	%	#	%
NICTITANS									
51.100 third eyelid cartilage anomaly		0		0		1	4.5%	0	
UVEA									
93.750 persistent pupillary membranes, lens pigment foci/no strands		0		0		2	9.1%	0	
LENS									
100.210 cataract, significance unknown		0		0		1	4.5%	0	
VITREOUS									
110.330 vitreous degeneration anterior chamber		0		1	10.0%	0		0	
OTHER									
900.000 other, unspecified		0		0		1	4.5%	0	
NORMAL									
0.000 normal globe		0		10	100.0%	21	95.5%	0	

OCULAR DISORDERS REPORT

SMOOTH FOX TERRIER - 1

SMOOTH FOX TERRIER*

*The Smooth Fox Terrier and the Wire Fox Terrier were originally considered two varieties of the same breed. They became separate breeds in 1985. It is likely that the same genetic diseases exist in both breeds

	DISORDER	INHERITANCE	REFERENCE	BREEDING ADVICE
A.	Glaucoma	Not defined	1, 2	NO
B.	Persistent pupillary membranes - iris to iris	Not defined	3	Breeder option
C.	Cataract	Not defined	1	NO
D.	Lens luxation * a DNA test is available	Not defined	1, 4-7	NO

Description and Comments

A. Glaucoma

Glaucoma is characterized by an elevation of intraocular pressure (IOP) which, when sustained, causes intraocular damage resulting in blindness. The elevated IOP occurs because the fluid cannot leave through the iridocorneal angle. Diagnosis and classification of glaucoma requires measurement of the intraocular pressure (tonometry) and examination of the iridocorneal angle (gonioscopy). Neither of these tests is part of a routine breed eye screening exam.

B. Persistent pupillary membranes (PPM)

Persistent blood vessel remnants in the anterior chamber of the eye which fail to regress normally by 3 months of age. These strands may bridge from iris to iris, iris to cornea, iris to lens, or form sheets of tissue in the anterior chamber. The last three forms pose the greatest threat to vision and when severe, vision impairment or blindness may occur.

OCULAR DISORDERS REPORT

SMOOTH FOX TERRIER - 2

C. Cataract

A partial or complete opacity of the lens and/or its capsule. In cases where cataracts are complete and affect both eyes, blindness results. The prudent approach is to assume cataracts to be hereditary except in cases known to be associated with trauma, other causes of ocular inflammation, specific metabolic diseases, persistent pupillary membrane, persistent hyaloid or nutritional deficiencies. Cataracts may involve the lens completely (diffuse) or in a localized region.

The cataracts observed in the Smooth Fox Terrier begin in the posterior subcapsular region and are progressive.

D. Lens luxation

Partial (subluxation) or complete displacement of the lens from the normal anatomic site behind the pupil. Lens luxation not associated with trauma or inflammation is presumed to be inherited. Lens luxation may result in elevated intraocular pressure (glaucoma) causing vision impairment or blindness. A DNA test is available.

References

1. ACVO Genetics Committee, 1999 and/or Data from CERF All-Breeds Report, 1991-1998.
2. Martin CL and Wyman M. Primary glaucoma in the dog. *Vet Clin North Am.* 1978 May;8:257-286.
3. ACVO Genetics Committee, 2005 and/or Data from CERF All-Breeds Report 2003-2004.
4. Lawson DD. Luxation of the crystalline lens in the dog. *J Small Anim Pract.* 1969;10:461.
5. Curtis R and Barnett KC. Primary lens luxation in the dog. *J Small Anim Pract.* 1980 Dec;21:657-668.
6. Hodgman SFJ. Abnormalities and defects in pedigree dogs: I. An investigation into the existence of abnormalities in pedigree dogs in British Isles. *J Small Anim Pract.* 1963;4:447.
7. Formston C. Observations on subluxation and luxation of the crystalline lens in the dog. *Journal of comparative pathology.* 1945;55:168.

OCULAR DISORDERS REPORT SMOOTH FOX TERRIER

Diagnostic Name	TOTAL DOGS EXAMINED		1991-1999		2000-2009		2010-2013		2014	
	#	%	#	%	#	%	#	%	#	%
UVEA										
93.710 persistent pupillary membranes, iris to iris	2	2.6%	8	5.2%	2	6.9%	1	14.3%		
93.750 persistent pupillary membranes, lens pigment foci/no strands	0		0		0		1	14.3%		
93.760 persistent pupillary membranes, endothelial opacity/no strands	0		0		0		1	14.3%		
LENS										
100.210 cataract, significance unknown	0		3	2.0%	0		0		0	
100.311 incipient cataract, anterior cortex	1	1.3%	0		0		0		0	
100.312 incipient cataract, posterior cortex	1	1.3%	0		1	3.4%	0		0	
100.330 generalized/complete cataract	0		2	1.3%	0		0		0	
VITREOUS										
110.320 vitreous degeneration syneresis	0		3	2.0%	0		0		0	
RETINA										
120.170 retinal dysplasia, folds	0		1	0.7%	0		0		0	
120.310 generalized progressive retinal atrophy (PRA)	0		2	1.3%	0		0		0	
OTHER										
900.000 other, unspecified	0		0		1	3.4%	0		0	
900.100 other, not inherited	0		6	3.9%	1	3.4%	1	14.3%		
NORMAL										
0.000 normal globe	72	94.7%	135	88.2%	26	89.7%	6	85.7%		

OCULAR DISORDERS REPORT

SOFT-COATED WHEATEN TERRIER - 1

SOFT-COATED WHEATEN TERRIER

	DISORDER	INHERITANCE	REFERENCE	BREEDING ADVICE
A.	Microphthalmia with multiple ocular defects	Not defined	1	NO
B.	Distichiasis	Not defined	2	Breeder option
C.	Corneal dystrophy - epithelial/stromal	Not defined	3	Breeder option
D.	Persistent pupillary membranes - iris to iris - all other forms	Not defined Not defined	1-3 3	Breeder option NO
E.	Cataract	Not defined	1, 2	NO
F.	Persistent hyaloid artery	Not defined	1, 2	Breeder option
G.	Retinal dysplasia - folds	Not defined	2	Breeder option
H.	Choroidal hypoplasia	Not defined	4	NO

Description and Comments

A. Microphthalmia with multiple ocular defects

Microphthalmia is a congenital defect characterized by a small eye often associated with defects of the cornea, iris (coloboma), anterior chamber, lens (cataract) and/or retina (retinal dysplasia).

B. Distichiasis

Eyelashes abnormally located on the eyelid margin which may cause ocular irritation. Distichiasis may occur at any time in the life of a dog. It is difficult to make a strong recommendation with regard to breeding dogs with this entity. The hereditary basis has not been established although it seems probable due to the high incidence in some breeds. Reducing the incidence is a logical goal. When diagnosed, distichiasis should be recorded; breeding discretion is advised.

OCULAR DISORDERS REPORT

SOFT-COATED WHEATEN TERRIER - 2

C. Corneal dystrophy - epithelial/stromal

A non-inflammatory corneal opacity (white to gray) present in one or more of the corneal layers; usually inherited and bilateral.

D. Persistent pupillary membranes (PPM)

Persistent blood vessel remnants in the anterior chamber of the eye which fail to regress normally by 3 months of age. These strands may bridge from iris to iris, iris to cornea, iris to lens, or form sheets of tissue in the anterior chamber. The last three forms pose the greatest threat to vision and when severe, vision impairment or blindness may occur.

E. Cataract

A partial or complete opacity of the lens and/or its capsule. In cases where cataracts are complete and affect both eyes, blindness results. The prudent approach is to assume cataracts to be hereditary except in cases known to be associated with trauma, other causes of ocular inflammation, specific metabolic diseases, persistent pupillary membrane, persistent hyaloid or nutritional deficiencies. Cataracts may involve the lens completely (diffuse) or in a localized region.

F. Persistent hyaloid artery (PHA)

A congenital defect resulting from abnormalities in the development and regression of the hyaloid artery. The blood vessel remnant can be present in the vitreous as a small vascular strand (**PHA**) or as a non-vascular strand that appears gray-white (**persistent hyaloid remnant**).

G. Retinal dysplasia - folds

Linear, triangular, curved or curvilinear foci of retinal folding that may be single or multiple. When seen in puppies, this condition may partially or completely resolve with maturity. Its significance to vision is unknown. There are two other forms of retinal dysplasia (geographic, detached) which are known to be inherited in other breeds and, in their most severe form, cause blindness. The genetic relationship between folds and more severe forms of retinal dysplasia is undetermined.

H. Choroidal hypoplasia

Inadequate development of the choroid present at birth and non-progressive. This condition is most commonly identified in the Collie breed where it is a manifestation of "Collie Eye Anomaly".

OCULAR DISORDERS REPORT

SOFT-COATED WHEATEN TERRIER - 3

References

1. Van der Woerd A. Multiple ocular anomalies in two related litters of soft-coated Wheaten terriers. *Prog Vet Comp Ophthalmol.* 1995;5:78.
2. ACVO Genetics Committee, 1999 and/or Data from CERF All-Breeds Report, 1991-1998.
3. ACVO Genetics Committee, 2005 and/or Data from CERF All-Breeds Report 2003-2004.
4. ACVO Genetics Committee, 2009 and/or Data from CERF All-Breeds Report, 2008.

OCULAR DISORDERS REPORT SOFT-COATED WHEATEN TERRIER

Diagnostic Name	TOTAL DOGS EXAMINED	1991-1999		2000-2009		2010-2013		2014	
		#	%	#	%	#	%	#	%
GLOBE									
10.000 glaucoma		2	0.1%	0		0		0	
EYELIDS									
20.160 macropalpebral fissure		1	0.0%	0		0		0	
21.000 entropion, unspecified		1	0.0%	0		0		0	
25.110 distichiasis		46	1.5%	43	1.4%	19	2.4%	14	7.0%
NASOLACRIMAL									
32.110 imperforate lower nasolacrimal punctum		6	0.2%	0		0		0	
NICTITANS									
52.110 prolapsed gland of the third eyelid		0		0		3	0.4%	0	
CORNEA									
70.700 corneal dystrophy		21	0.7%	27	0.9%	6	0.8%	2	1.0%
UVEA									
93.120 iris cyst		0		12	0.4%	1	0.1%	0	
93.140 corneal endothelial pigment without PPM		0		1	0.0%	2	0.3%	0	
93.150 iris coloboma		1	0.0%	0		0		0	
93.710 persistent pupillary membranes, iris to iris		62	2.0%	128	4.2%	36	4.5%	13	6.5%
93.720 persistent pupillary membranes, iris to lens		4	0.1%	13	0.4%	0		1	0.5%
93.740 persistent pupillary membranes, iris sheets		1	0.0%	2	0.1%	0		0	
93.750 persistent pupillary membranes, lens pigment foci/no strands		0		1	0.0%	27	3.4%	8	4.0%
93.760 persistent pupillary membranes, endothelial opacity/no strands		0		0		4	0.5%	0	
95.120 ciliary body cyst		0		0		1	0.1%	0	
LENS									
100.200 cataract, unspecified		24	0.8%	0		0		0	
100.210 cataract, significance unknown		82	2.6%	184	6.0%	49	6.1%	15	7.5%
100.301 punctate cataract, anterior cortex		9	0.3%	14	0.5%	5	0.6%	1	0.5%
100.302 punctate cataract, posterior cortex		3	0.1%	5	0.2%	1	0.1%	0	
100.303 punctate cataract, equatorial cortex		3	0.1%	7	0.2%	2	0.3%	0	
100.304 punctate cataract, anterior sutures		3	0.1%	1	0.0%	0		0	
100.305 punctate cataract, posterior sutures		1	0.0%	1	0.0%	2	0.3%	0	
100.306 punctate cataract, nucleus		1	0.0%	2	0.1%	1	0.1%	0	
100.307 punctate cataract, capsular		1	0.0%	10	0.3%	2	0.3%	0	
100.311 incipient cataract, anterior cortex		8	0.3%	12	0.4%	8	1.0%	0	
100.312 incipient cataract, posterior cortex		10	0.3%	14	0.5%	4	0.5%	1	0.5%
100.313 incipient cataract, equatorial cortex		11	0.4%	6	0.2%	0		0	
100.314 incipient cataract, anterior sutures		1	0.0%	0		1	0.1%	0	
100.315 incipient cataract, posterior sutures		8	0.3%	0		2	0.3%	0	
100.316 incipient cataract, nucleus		5	0.2%	10	0.3%	1	0.1%	0	
100.317 incipient cataract, capsular		0		11	0.4%	0		1	0.5%
100.330 generalized/complete cataract		14	0.5%	20	0.7%	1	0.1%	0	
100.375 subluxation/luxation, unspecified		0		3	0.1%	0		1	0.5%

OCULAR DISORDERS REPORT SOFT-COATED WHEATEN TERRIER

	1991-1999	2000-2009	2010-2013	2014
VITREOUS				
110.120 persistant hyaloid artery/remnant	41 1.3%	24 0.8%	0	1 0.5%
110.130 PHPV/PTVL	0	0	1 0.1%	0
110.135 PHPV/PTVL	4 0.1%	1 0.0%	1 0.1%	0
110.320 vitreous degeneration syneresis	2 0.1%	5 0.2%	2 0.3%	1 0.5%
110.330 vitreous degeneration anterior chamber	0	2 0.1%	1 0.1%	0
FUNDUS				
97.110 choroidal hypoplasia	0	17 0.6%	0	0
97.120 coloboma	1 0.0%	0	0	0
RETINA				
120.170 retinal dysplasia, folds	43 1.4%	19 0.6%	5 0.6%	1 0.5%
120.180 retinal dysplasia, geographic	1 0.0%	1 0.0%	1 0.1%	0
120.190 retinal dysplasia, detached	2 0.1%	0	0	0
120.200 retinitis	0	0	0	1 0.5%
120.310 generalized progressive retinal atrophy (PRA)	8 0.3%	6 0.2%	0	0
120.910 retinal detachment without dialysis	1 0.0%	0	0	0
120.960 retinopathy	0	0	1 0.1%	0
OPTIC NERVE				
130.110 micropapilla	3 0.1%	10 0.3%	0	1 0.5%
130.120 optic nerve hypoplasia	5 0.2%	0	0	0
130.150 optic disc coloboma	3 0.1%	6 0.2%	0	0
OTHER				
900.000 other, unspecified	0	12 0.4%	37 4.6%	0
900.100 other, not inherited	14 0.5%	169 5.5%	10 1.3%	12 6.0%
900.110 other, suspected as inherited	11 0.4%	18 0.6%	3 0.4%	0
NORMAL				
0.000 normal globe	2735 88.2%	2656 86.6%	730 91.4%	170 85.4%

OCULAR DISORDERS REPORT

SPANISH WATER DOG - 1

SPANISH WATER DOG

	DISORDER	INHERITANCE	REFERENCE	BREEDING ADVICE
A.	Lens luxation	Not defined	1	NO
B.	Retinal atrophy - generalized (<i>prcd</i>) * a DNA test is available	Autosomal recessive	2	NO

Description and Comments

A. Lens luxation

Partial (subluxation) or complete displacement of the lens from the normal anatomic site behind the pupil. Lens luxation not associated with trauma or inflammation is presumed to be inherited. Lens luxation may result in elevated intraocular pressure (glaucoma) causing vision impairment or blindness.

B. Retinal atrophy - generalized (PRA)

A degenerative disease of the retinal visual cells which progresses to blindness. This abnormality, also known as progressive retinal atrophy or PRA, may be detected by electroretinogram (not part of a routine eye screening examination) before it is apparent clinically. Except for X-linked PRA in the Siberian Husky, in all breeds studied to date, PRA is inherited as an autosomal recessive trait. A DNA test is available.

References

1. Gould D, Pettitt L, McLaughlin B, et al. ADAMTS17 mutation associated with primary lens luxation is widespread among breeds. *Vet Ophthalmol.* 2011; 14: 378-384.
2. ACVO Genetics Committee, 2013-2014 and Data from OFA All-Breeds Report, 2013-2014.

OCULAR DISORDERS REPORT SPANISH WATER DOG

Diagnostic Name	TOTAL DOGS EXAMINED	1991-1999		2000-2009		2010-2013		2014	
		#	%	#	%	#	%	#	%
EYELIDS									
25.110 distichiasis		0		2	1.8%	0		0	
NICTITANS									
52.110 prolapsed gland of the third eyelid		0		1	0.9%	0		0	
CORNEA									
70.700 corneal dystrophy		0		2	1.8%	0		0	
UVEA									
93.710 persistent pupillary membranes, iris to iris		0		1	0.9%	4	6.2%	1	5.3%
LENS									
100.210 cataract, significance unknown		0		7	6.4%	4	6.2%	1	5.3%
100.302 punctate cataract, posterior cortex		0		0		1	1.6%	0	
100.306 punctate cataract, nucleus		0		1	0.9%	0		0	
100.307 punctate cataract, capsular		0		0		1	1.6%	0	
100.313 incipient cataract, equatorial cortex		0		0		1	1.6%	0	
100.317 incipient cataract, capsular		0		1	0.9%	0		0	
VITREOUS									
110.120 persistent hyaloid artery/remnant		0		1	0.9%	0		0	
RETINA									
120.170 retinal dysplasia, folds		0		2	1.8%	1	1.6%	0	
120.180 retinal dysplasia, geographic		0		0		1	1.6%	0	
120.310 generalized progressive retinal atrophy (PRA)		0		4	3.6%	0		0	
OTHER									
900.000 other, unspecified		0		0		4	6.2%	0	
900.100 other, not inherited		0		7	6.4%	0		0	
900.110 other, suspected as inherited		0		1	0.9%	0		0	
NORMAL									
0.000 normal globe		0		99	90.0%	56	87.5%	18	94.7%

OCULAR DISORDERS REPORT

SPINONE ITALIANO - 1

SPINONE ITALIANO

	DISORDER	INHERITANCE	REFERENCE	BREEDING ADVICE
A.	Distichiasis	Not defined	1, 2	Breeder option
B.	Entropion	Not defined	3	Breeder option
C.	Persistent pupillary membranes - iris to iris	Not defined	3, 4	Breeder option
D.	Cataract	Not defined	5	NO

Description and Comments

A. Distichiasis

Eyelashes abnormally located on the eyelid margin which may cause ocular irritation. Distichiasis may occur at any time in the life of a dog. It is difficult to make a strong recommendation with regard to breeding dogs with this entity. The hereditary basis has not been established although it seems probable due to the high incidence in some breeds. Reducing the incidence is a logical goal. When diagnosed, distichiasis should be recorded. Breeding discretion is advised.

B. Entropion

A conformational defect resulting in an "in-rolling" of one or both of the eyelids which may cause ocular irritation. It is likely that entropion is influenced by several genes (polygenic), defining the skin and other structures which make up the eyelids, the amount and weight of the skin covering the head and face, the orbital contents, and the conformation of the skull.

C. Persistent pupillary membranes (PPM)

Persistent blood vessel remnants in the anterior chamber of the eye which fail to regress normally by 3 months of age. These strands may bridge from iris to iris, iris to cornea, iris to lens, or form sheets of tissue in the anterior chamber. The last three forms pose the greatest threat to vision and when severe, vision impairment or blindness may occur.

D. Cataract

A partial or complete opacity of the lens and/or its capsule. In cases where cataracts are complete and affect both eyes, blindness results. The prudent approach is to assume

OCULAR DISORDERS REPORT

SPINONE ITALIANO –2

cataracts to be hereditary except in cases known to be associated with trauma, other causes of ocular inflammation, specific metabolic diseases, persistent pupillary membrane, persistent hyaloid or nutritional deficiencies. Cataracts may involve the lens completely (diffuse) or in a localized region.

References

There are no references providing detailed descriptions of hereditary ocular conditions of the Spinone Italiano breed. The conditions listed above are generally recognized to exist in the breed, as evidenced by identification on breed eye screening examinations and/or clinical experience of veterinary ophthalmologists.

1. ACVO Genetics Committee, 2007 and/or Data from CERF All-Breeds Report 2002-2006.
2. ACVO Genetics Committee, 2008 and/or Data from CERF All-Breeds Report, 2003-2007.
3. ACVO Genetics Committee, 2005 and/or Data from CERF All-Breeds Report 2003-2004.
4. ACVO Genetics Committee, 2000-2002 and/or Data from CERF All-Breeds Report, 2000-2002.
5. ACVO Genetics Committee, 1999 and/or Data from CERF All-Breeds Report, 1991-1998.

OCULAR DISORDERS REPORT SPINONE ITALIANO

Diagnostic Name	TOTAL DOGS EXAMINED	1991-1999		2000-2009		2010-2013		2014	
		#	%	#	%	#	%	#	%
GLOBE									
0.110 microphthalmia		0		1	0.1%	0		0	
EYELIDS									
20.160 macropalpebral fissure		0		3	0.2%	0		0	
21.000 entropion, unspecified		2	1.7%	23	1.8%	4	0.8%	2	1.8%
22.000 ectropion, unspecified		2	1.7%	5	0.4%	2	0.4%	3	2.7%
25.110 distichiasis		2	1.7%	11	0.9%	4	0.8%	5	4.5%
NASOLACRIMAL									
40.910 keratoconjunctivitis sicca		0		1	0.1%	0		0	
NICTITANS									
51.100 third eyelid cartilage anomaly		0		2	0.2%	0		1	0.9%
52.110 prolapsed gland of the third eyelid		0		3	0.2%	0		0	
UVEA									
90.200 uveitis		0		0		1	0.2%	0	
90.250 pigmentary uveitis		0		0		1	0.2%	0	
93.120 iris cyst		0		1	0.1%	1	0.2%	0	
93.150 iris coloboma		0		1	0.1%	0		0	
93.170 anterior chamber cyst		0		0		1	0.2%	0	
93.710 persistent pupillary membranes, iris to iris		0		49	3.8%	23	4.6%	6	5.4%
93.720 persistent pupillary membranes, iris to lens		0		1	0.1%	0		0	
93.730 persistent pupillary membranes, iris to cornea		0		1	0.1%	0		0	
93.740 persistent pupillary membranes, iris sheets		0		2	0.2%	0		0	
93.750 persistent pupillary membranes, lens pigment foci/no strands		0		0		1	0.2%	1	0.9%
95.120 ciliary body cyst		0		0		1	0.2%	0	
LENS									
100.200 cataract, unspecified		2	1.7%	0		0		0	
100.210 cataract, significance unknown		8	6.8%	65	5.1%	24	4.8%	8	7.2%
100.301 punctate cataract, anterior cortex		0		5	0.4%	2	0.4%	0	
100.302 punctate cataract, posterior cortex		0		2	0.2%	1	0.2%	0	
100.303 punctate cataract, equatorial cortex		0		1	0.1%	0		0	
100.304 punctate cataract, anterior sutures		0		2	0.2%	0		0	
100.305 punctate cataract, posterior sutures		0		1	0.1%	1	0.2%	0	
100.306 punctate cataract, nucleus		3	2.6%	9	0.7%	4	0.8%	0	
100.307 punctate cataract, capsular		0		3	0.2%	0		0	
100.311 incipient cataract, anterior cortex		1	0.9%	9	0.7%	2	0.4%	0	
100.312 incipient cataract, posterior cortex		3	2.6%	3	0.2%	0		0	
100.313 incipient cataract, equatorial cortex		0		5	0.4%	0		0	
100.314 incipient cataract, anterior sutures		0		1	0.1%	0		0	
100.315 incipient cataract, posterior sutures		0		4	0.3%	0		0	
100.316 incipient cataract, nucleus		0		5	0.4%	0		0	
100.317 incipient cataract, capsular		0		0		1	0.2%	0	
100.326 incomplete cataract, nucleus		0		0		1	0.2%	0	
100.330 generalized/complete cataract		0		5	0.4%	0		0	
100.375 subluxation/luxation, unspecified		0		3	0.2%	0		0	

OCULAR DISORDERS REPORT SPINONE ITALIANO

	1991-1999	2000-2009	2010-2013	2014
VITREOUS				
110.120 persistant hyaloid artery/remnant	0	2 0.2%	0	0
110.200 vitritis	0	0	2 0.4%	0
110.320 vitreous degeneration syneresis	2 1.7%	8 0.6%	2 0.4%	1 0.9%
110.330 vitreous degeneration anterior chamber	0	2 0.2%	3 0.6%	0
RETINA				
120.170 retinal dysplasia, folds	0	6 0.5%	2 0.4%	0
120.310 generalized progressive retinal atrophy (PRA)	0	1 0.1%	0	0
OTHER				
900.000 other, unspecified	0	7 0.5%	15 3.0%	0
900.100 other, not inherited	0	62 4.8%	3 0.6%	3 2.7%
900.110 other, suspected as inherited	0	3 0.2%	0	0
NORMAL				
0.000 normal globe	103 88.0%	1134 88.7%	464 92.2%	94 84.7%

OCULAR DISORDERS REPORT

STAFFORDSHIRE BULL TERRIER - 1

STAFFORDSHIRE BULL TERRIER*

* Please note that since 1972 the AKC considers the Staffordshire Bull Terrier a different breed from the American Staffordshire Terrier.

	DISORDER	INHERITANCE	REFERENCE	BREEDING ADVICE
A.	Distichiasis	Not defined	1	Breeder option
B.	Entropion	Not defined	2	Breeder option
C.	Persistent pupillary membranes			
	- iris to iris	Not defined	3, 4	Breeder option
	- all other forms	Not defined	4	NO
D.	Cataract	Autosomal	2, 3, 5-7	NO
	* a DNA test is available	recessive		
E.	Persistent hyperplastic primary vitreous	Not defined	2, 8, 9	NO
F.	Persistent hyaloid artery	Not defined	1	Breeder option

Description and Comments

A. Distichiasis

Eyelashes abnormally located on the eyelid margin which may cause ocular irritation. Distichiasis may occur at any time in the life of a dog. It is difficult to make a strong recommendation with regard to breeding dogs with this entity. The hereditary basis has not been established although it seems probable due to the high incidence in some breeds. Reducing the incidence is a logical goal. When diagnosed, distichiasis should be recorded; breeding discretion is advised.

B. Entropion

A conformational defect resulting in "in-rolling" of one or both of the eyelids which may cause ocular irritation. It is likely that entropion is influenced by several genes (polygenic), defining the skin and other structures which make up the eyelids, the amount and weight of the skin covering the head and face, the orbital contents and the conformation of the skull. Selection should be directed against entropion and toward a head conformation that minimizes or

OCULAR DISORDERS REPORT

STAFFORDSHIRE BULL TERRIER - 2

eliminates the likelihood of the defect.

C. Persistent pupillary membranes (PPM)

Persistent blood vessel remnants in the anterior chamber of the eye which fail to regress normally by 3 months of age. These strands may bridge from iris to iris, iris to cornea, iris to lens, or form sheets of tissue in the anterior chamber. The last three forms pose the greatest threat to vision and when severe, vision impairment or blindness may occur.

D. Cataract

A partial or complete opacity of the lens and/or its capsule. In cases where cataracts are complete and affect both eyes, blindness results. The prudent approach is to assume cataracts to be hereditary except in cases known to be associated with trauma, other causes of ocular inflammation, specific metabolic diseases, persistent pupillary membrane, persistent hyaloid or nutritional deficiencies. Cataracts may involve the lens completely (diffuse) or in a localized region.

In this breed, cataracts usually develop by one year of age. There is initial opacification of the suture lines progressing to nuclear and cortical cataract formation; complete cataracts and blindness develop by three years of age. The Animal Health Trust (UK) identified autosomal recessive gene mutation in the HSF4 gene (HSF4-1) causing hereditary cataract in this breed. A genetic test is available.

E. Persistent hyperplastic primary vitreous (PHPV)

A congenital defect resulting from abnormalities in the development and regression of the hyaloid artery (the primary vitreous) and the interaction of this blood vessel with the posterior lens capsule/cortex during embryogenesis. This condition is often associated with **persistent tunica vasculosa lentis (PTVL)** which results from failure of regression of the embryologic vascular network which surrounds the developing lens.

The majority of affected dogs have a retrolental fibrovascular plaque and variable lenticular defects which include posterior lenticonus/globus, colobomata, intralenticular hemorrhage and/or secondary cataracts. Vision impairment may result. The disease is an inherited disorder in the breed, but the mode of inheritance has not been defined. The results of current studies cannot rule out autosomal recessive or a dominant trait with incomplete penetrance.

F. Persistent hyaloid artery (PHA)

A congenital defect resulting from abnormalities in the development and regression of the hyaloid artery. The blood vessel remnant can be present in the vitreous as a small patent vascular strand (PHA) or as a non-vascular strand that appears gray-white (persistent hyaloid remnant).

References

©2014, American College of Veterinary Ophthalmologists

OCULAR DISORDERS REPORT

STAFFORDSHIRE BULL TERRIER - 3

1. ACVO Genetics Committee, 2000-2002 and/or Data from CERF All-Breeds Report, 2000-2002.
2. ACVO Genetics Committee, 1999 and/or Data from CERF All-Breeds Report, 1991-1998.
3. ACVO Genetics Committee, 2002-2003 and/or Data from CERF All-Breeds Report, 2002-2003.
4. ACVO Genetics Committee, 2005 and/or Data from CERF All-Breeds Report 2003-2004.
5. Barnett KC. Hereditary cataract in the dog. *J Small Anim Pract.* 1978 Feb;19:109-120.
6. Barnett KC. The diagnosis and differential diagnosis of cataract in the dog. *J Small Anim Pract.* 1985;26:305.
7. Mellersh CS, Pettitt L, Forman OP, et al. Identification of mutations in HSF4 in dogs of three different breeds with hereditary cataracts. *Vet Ophthalmol.* 2006 Sep-Oct;9:369-378.
8. Curtis R, Barnett KC and Leon A. Persistent hyperplastic primary vitreous in the Staffordshire bull terrier. *Vet Rec.* 1984 Oct 13;115:385.
9. Leon A, Curtis R and Barnett K. Hereditary persistent hyperplastic primary vitreous in the Staffordshire Bull Terrier. *J Am Anim Hosp Assoc.* 1986;22:765-774.

OCULAR DISORDERS REPORT STAFFORDSHIRE BULL TERRIER

Diagnostic Name	TOTAL DOGS EXAMINED	1991-1999		2000-2009		2010-2013		2014	
		#	%	#	%	#	%	#	%
EYELIDS									
25.110	distichiasis	10	6.8%	45	11.8%	14	4.9%	4	7.8%
CORNEA									
70.700	corneal dystrophy	0		1	0.3%	0		0	
UVEA									
93.120	iris cyst	0		2	0.5%	3	1.1%	1	2.0%
93.710	persistent pupillary membranes, iris to iris	7	4.8%	6	1.6%	6	2.1%	1	2.0%
93.720	persistent pupillary membranes, iris to lens	1	0.7%	1	0.3%	0		0	
93.750	persistent pupillary membranes, lens pigment foci/no strands	0		0		3	1.1%	0	
93.760	persistent pupillary membranes, endothelial opacity/no strands	0		0		0		1	2.0%
LENS									
100.210	cataract, significance unknown	3	2.0%	19	5.0%	10	3.5%	2	3.9%
100.301	punctate cataract, anterior cortex	0		3	0.8%	1	0.4%	0	
100.302	punctate cataract, posterior cortex	0		0		1	0.4%	0	
100.303	punctate cataract, equatorial cortex	0		1	0.3%	0		0	
100.304	punctate cataract, anterior sutures	0		1	0.3%	0		0	
100.307	punctate cataract, capsular	0		1	0.3%	2	0.7%	0	
100.311	incipient cataract, anterior cortex	0		0		0		1	2.0%
100.312	incipient cataract, posterior cortex	2	1.4%	1	0.3%	1	0.4%	1	2.0%
100.313	incipient cataract, equatorial cortex	1	0.7%	2	0.5%	1	0.4%	0	
100.315	incipient cataract, posterior sutures	0		1	0.3%	0		0	
100.317	incipient cataract, capsular	0		1	0.3%	2	0.7%	0	
VITREOUS									
110.120	persistant hyaloid artery/remnant	0		1	0.3%	6	2.1%	0	
110.320	vitreous degeneration syneresis	2	1.4%	7	1.8%	3	1.1%	4	7.8%
RETINA									
120.170	retinal dysplasia, folds	1	0.7%	3	0.8%	0		1	2.0%
120.180	retinal dysplasia, geographic	0		3	0.8%	1	0.4%	0	
120.310	generalized progressive retinal atrophy (PRA)	0		1	0.3%	0		0	
OTHER									
900.000	other, unspecified	0		3	0.8%	6	2.1%	0	
900.100	other, not inherited	0		20	5.2%	13	4.6%	1	2.0%
900.110	other, suspected as inherited	0		0		4	1.4%	0	
NORMAL									
0.000	normal globe	123	83.7%	316	82.9%	254	89.4%	45	88.2%

OCULAR DISORDERS REPORT

STANDARD SCHNAUZER - 1

STANDARD SCHNAUZER

	DISORDER	INHERITANCE	REFERENCE	BREEDING ADVICE
A.	Distichiasis	Not defined	1	Breeder option
B.	Corneal dystrophy - epithelial/stromal	Not defined	1	Breeder option
C.	Persistent pupillary membranes -iris to iris	Not defined	2	Breeder option
D.	Cataract	Not defined	1	NO
E.	Vitreous degeneration	Not defined	3	Breeder option
F.	Retinal atrophy - generalized	Presumed autosomal recessive	1	NO
G.	Retinal dysplasia - folds	Not defined	1	Breeder option

Description and Comments

A. Distichiasis

Eyelashes abnormally located on the eyelid margin which may cause ocular irritation. Distichiasis may occur at any time in the life of a dog. It is difficult to make a strong recommendation with regard to breeding dogs with this entity. The hereditary basis has not been established although it seems probable due to the high incidence in some breeds. Reducing the incidence is a logical goal. When diagnosed, distichiasis should be recorded; breeding discretion is advised.

B. Corneal dystrophy - epithelial/stromal

A non-inflammatory corneal opacity (white to gray) present in one or more of the corneal layers; usually inherited and bilateral.

C. Persistent pupillary membranes (PPM)

OCULAR DISORDERS REPORT

STANDARD SCHNAUZER - 2

Persistent blood vessel remnants in the anterior chamber of the eye which fail to regress normally by 3 months of age. These strands may bridge from iris to iris, iris to cornea, iris to lens, or form sheets of tissue in the anterior chamber. The last three forms pose the greatest potential threat to vision.

D. Cataract

A partial or complete opacity of the lens and/or its capsule. In cases where cataracts are complete and affect both eyes, blindness results. The prudent approach is to assume cataracts to be hereditary except in cases known to be associated with trauma, other causes of ocular inflammation, specific metabolic diseases, persistent pupillary membranes, persistent hyaloid or nutritional deficiencies. Cataracts may involve the lens completely (diffuse) or in a localized region.

There are apparently several forms of cataracts in the breed: 1) posterior cortex and posterior/total nucleus involvement, with slow progression; 2) dense posterior polar opacity near the subcapsular region which progresses rapidly to very dense posterior polar plaques in young animals; 3) dense posterior polar opacity like that reported in young animals but found in older animals with variable progression.

E. Vitreous degeneration

Liquefaction of the vitreous gel which may predispose to retinal detachment.

F. Retinal atrophy - generalized

A degenerative disease of the retinal visual cells which progresses to blindness. This abnormality, also known as progressive retinal atrophy or PRA, may be detected by electroretinogram (not part of a routine eye screening examination) before it is apparent clinically. Except for X-linked PRA in the Siberian Husky, in all breeds studied to date, PRA is inherited as an autosomal recessive trait.

G. Retinal dysplasia - folds

Linear, triangular, curved or curvilinear foci of retinal folding that may be single or multiple. When seen in puppies, this condition may partially or completely resolve with maturity. Its significance to vision is unknown. There are two other forms of retinal dysplasia (geographic, detached) which are known to be inherited in other breeds and, in their most severe form, cause blindness. The genetic relationship between folds and more severe forms of retinal dysplasia is undetermined.

References

There are no references providing detailed descriptions of hereditary ocular conditions of the Standard Schnauzer breed. The conditions listed are generally recognized to exist in the breed, as evidenced by identification on breed eye screening examinations and/or clinical experience of veterinary ophthalmologists.

©2014, American College of Veterinary Ophthalmologists

OCULAR DISORDERS REPORT

STANDARD SCHNAUZER - 3

1. ACVO Genetics Committee, 1999 and/or Data from CERF All-Breeds Report, 1991-1998.
2. ACVO Genetics Committee, 2009 and/or Data from CERF All-Breeds Report, 2008.
3. ACVO Genetics Committee, 2014 and/or Data from OFA All-Breeds Reports, 2013-2014.

OCULAR DISORDERS REPORT STANDARD SCHNAUZER

Diagnostic Name	TOTAL DOGS EXAMINED		1991-1999		2000-2009		2010-2013		2014	
	#	%	#	%	#	%	#	%	#	%
GLOBE										
0.110 microphthalmia	0		1	0.1%	0		0		0	
10.000 glaucoma	2	0.3%	0		0		0		0	
EYELIDS										
25.110 distichiasis	16	2.2%	30	2.1%	18	2.5%	2	1.4%		
NICTITANS										
51.100 third eyelid cartilage anomaly	0		1	0.1%	1	0.1%	0		0	
52.110 prolapsed gland of the third eyelid	0		0		2	0.3%	0		0	
CORNEA										
70.700 corneal dystrophy	8	1.1%	10	0.7%	4	0.6%	0			
UVEA										
93.120 iris cyst	0		1	0.1%	1	0.1%	0		0	
93.710 persistent pupillary membranes, iris to iris	2	0.3%	10	0.7%	3	0.4%	0		0	
93.720 persistent pupillary membranes, iris to lens	2	0.3%	1	0.1%	0		0		0	
93.730 persistent pupillary membranes, iris to cornea	1	0.1%	2	0.1%	0		0		0	
93.740 persistent pupillary membranes, iris sheets	1	0.1%	1	0.1%	0		0		0	
93.750 persistent pupillary membranes, lens pigment foci/no strands	0		0		7	1.0%	2	1.4%		
93.760 persistent pupillary membranes, endothelial opacity/no strands	0		0		1	0.1%	0		0	
LENS										
100.200 cataract, unspecified	2	0.3%	0		0		0		0	
100.210 cataract, significance unknown	26	3.5%	48	3.3%	38	5.4%	4	2.8%		
100.301 punctate cataract, anterior cortex	1	0.1%	4	0.3%	5	0.7%	1	0.7%		
100.302 punctate cataract, posterior cortex	1	0.1%	2	0.1%	2	0.3%	0		0	
100.303 punctate cataract, equatorial cortex	3	0.4%	1	0.1%	0		0		0	
100.304 punctate cataract, anterior sutures	1	0.1%	0		2	0.3%	0		0	
100.305 punctate cataract, posterior sutures	3	0.4%	1	0.1%	4	0.6%	1	0.7%		
100.306 punctate cataract, nucleus	1	0.1%	2	0.1%	1	0.1%	0		0	
100.307 punctate cataract, capsular	0		6	0.4%	8	1.1%	1	0.7%		
100.311 incipient cataract, anterior cortex	3	0.4%	6	0.4%	3	0.4%	0		0	
100.312 incipient cataract, posterior cortex	3	0.4%	7	0.5%	1	0.1%	0		0	
100.313 incipient cataract, equatorial cortex	6	0.8%	5	0.3%	3	0.4%	2	1.4%		
100.314 incipient cataract, anterior sutures	1	0.1%	1	0.1%	0		0		0	
100.315 incipient cataract, posterior sutures	0		1	0.1%	0		0		0	
100.316 incipient cataract, nucleus	3	0.4%	4	0.3%	2	0.3%	0		0	
100.317 incipient cataract, capsular	0		4	0.3%	0		0		0	
100.330 generalized/complete cataract	8	1.1%	5	0.3%	0		0		0	
100.375 subluxation/luxation, unspecified	1	0.1%	0		0		0		0	
VITREOUS										
110.120 persistent hyaloid artery/remnant	0		3	0.2%	0		0		0	
110.320 vitreous degeneration syneresis	3	0.4%	3	0.2%	5	0.7%	2	1.4%		
110.330 vitreous degeneration anterior chamber	0		2	0.1%	3	0.4%	0		0	

OCULAR DISORDERS REPORT STANDARD SCHNAUZER

	1991-1999	2000-2009	2010-2013	2014
RETINA				
120.170 retinal dysplasia, folds	4 0.5%	21 1.5%	4 0.6%	1 0.7%
120.180 retinal dysplasia, geographic	1 0.1%	2 0.1%	1 0.1%	0
120.310 generalized progressive retinal atrophy (PRA)	12 1.6%	10 0.7%	1 0.1%	0
120.910 retinal detachment without dialysis	1 0.1%	0	0	0
OPTIC NERVE				
130.110 micropapilla	0	4 0.3%	0	1 0.7%
130.120 optic nerve hypoplasia	2 0.3%	0	1 0.1%	0
OTHER				
900.000 other, unspecified	0	7 0.5%	24 3.4%	0
900.100 other, not inherited	3 0.4%	66 4.6%	5 0.7%	3 2.1%
900.110 other, suspected as inherited	5 0.7%	3 0.2%	2 0.3%	1 0.7%
NORMAL				
0.000 normal globe	636 86.5%	1297 90.1%	654 92.6%	135 94.4%

OCULAR DISORDERS REPORT

SUSSEX SPANIEL - 1

SUSSEX SPANIEL

	DISORDER	INHERITANCE	REFERENCE	BREEDING ADVICE
A.	Ectropion	Not defined	1	Breeder option
B.	Distichiasis	Not defined	2	Breeder option
C.	Macroblepharon	Not defined	2	Breeder option
D.	Iris coloboma	Not defined	2	NO
E.	Persistent hyaloid artery	Not defined	1	Breeder option
F.	Retinal dysplasia - folds	Not defined	1	Breeder option

Description and Comments

A. Ectropion

A conformational defect resulting in eversion of the eyelid(s), which may cause ocular irritation due to exposure. It is likely that ectropion is influenced by several genes (polygenic) defining the skin and other structures which make up the eyelids, the amount and weight of the skin covering the head and face, the orbital contents and the conformation of the skull.

B. Distichiasis

Eyelashes abnormally located on the eyelid margin which may cause ocular irritation. Distichiasis may occur at any time in the life of a dog. It is difficult to make a strong recommendation with regard to breeding dogs with this entity. The hereditary basis has not been established although it seems probable due to the high incidence in some breeds. Reducing the incidence is a logical goal. When diagnosed, distichiasis should be recorded; breeding discretion is advised.

C. Macroblepharon

Defined as an exceptionally large palpebral fissure, macroblepharon in conjunction with laxity of the lateral canthal structures may lead to lower lid ectropion and upper lid entropion. Either of these conditions may lead to severe ocular irritation

D. Iris coloboma

©2014, American College of Veterinary Ophthalmologists

OCULAR DISORDERS REPORT

SUSSEX SPANIEL - 2

A coloboma is a congenital defect which may affect the iris, choroid or optic disc. Iris colobomas are seen as notches in the pupillary margin. Scleral ectasia is defined as a congenital thinning and secondary distention of the sclera; when lined by uveal tissue it is called a staphyloma. These may be anteriorly located, apparent as a bulge beneath the upper eyelid or posteriorly located, requiring visualization with an ophthalmoscope. These conditions may or may not be genetically related to the same anomalies seen associated with microphthalmia.

E. Persistent hyaloid artery (PHA)

Congenital defect resulting from abnormalities in the development and regression of the hyaloid artery. The blood vessel remnant can be present in the vitreous as a small patent vascular strand (PHA) or as a non-vascular strand that appears gray-white (persistent hyaloid remnant).

F. Retinal dysplasia - folds

Linear, triangular, curved or curvilinear foci of retinal folding that may be single or multiple. When seen in puppies, this condition may partially or completely resolve with maturity. Its significance to vision is unknown. There are two other forms of retinal dysplasia (geographic, detached) which are known to be inherited in other breeds and, in their most severe form, cause blindness. The genetic relationship between folds and more severe forms of retinal dysplasia is undetermined.

References

There are no references providing detailed descriptions of hereditary ocular conditions of the Sussex Spaniel breed. The conditions listed are generally recognized to exist in the breed, as evidenced by identification on breed eye screening examinations and/or clinical experience of veterinary ophthalmologists.

1. ACVO Genetics Committee, 2000-2002 and/or Data from CERF All-Breeds Report, 2000-2002.
2. ACVO Genetics Committee, 2002-2003 and/or Data from CERF All-Breeds Report, 2002-2003.

OCULAR DISORDERS REPORT SUSSEX SPANIEL

Diagnostic Name	TOTAL DOGS EXAMINED		1991-1999		2000-2009		2010-2013		2014	
	#	%	#	%	#	%	#	%	#	%
EYELIDS										
20.160	macropalpebral fissure	7	3.5%	16	9.6%	0		0		0
21.000	entropion, unspecified	1	0.5%	0		0		0		0
22.000	ectropion, unspecified	13	6.6%	6	3.6%	6	16.2%	2	22.2%	0
25.110	distichiasis	15	7.6%	6	3.6%	3	8.1%	0		0
CORNEA										
70.700	corneal dystrophy	0		2	1.2%	0		0		0
UVEA										
93.110	iris hypoplasia	0		1	0.6%	0		0		0
93.150	iris coloboma	5	2.5%	2	1.2%	0		0		0
93.710	persistent pupillary membranes, iris to iris	1	0.5%	1	0.6%	0		0		0
93.720	persistent pupillary membranes, iris to lens	3	1.5%	3	1.8%	0		0		0
93.740	persistent pupillary membranes, iris sheets	0		1	0.6%	0		0		0
93.750	persistent pupillary membranes, lens pigment foci/no strands	0		0		0		1	11.1%	0
LENS										
100.210	cataract, significance unknown	4	2.0%	6	3.6%	3	8.1%	0		0
100.302	punctate cataract, posterior cortex	0		1	0.6%	0		0		0
100.307	punctate cataract, capsular	0		1	0.6%	0		0		0
100.312	incipient cataract, posterior cortex	0		2	1.2%	0		0		0
100.315	incipient cataract, posterior sutures	1	0.5%	0		0		0		0
100.317	incipient cataract, capsular	0		3	1.8%	1	2.7%	0		0
100.330	generalized/complete cataract	0		2	1.2%	0		0		0
VITREOUS										
110.120	persistant hyaloid artery/remnant	23	11.6%	10	6.0%	0		0		0
110.135	PHPV/PTVL	1	0.5%	3	1.8%	0		0		0
110.320	vitreous degeneration syneresis	1	0.5%	0		0		0		0
RETINA										
120.170	retinal dysplasia, folds	13	6.6%	22	13.2%	6	16.2%	0		0
120.180	retinal dysplasia, geographic	0		2	1.2%	0		0		0
OPTIC NERVE										
130.110	micropapilla	0		1	0.6%	0		0		0
130.120	optic nerve hypoplasia	1	0.5%	0		0		0		0
130.150	optic disc coloboma	3	1.5%	0		0		0		0
OTHER										
900.000	other, unspecified	0		5	3.0%	5	13.5%	0		0
900.100	other, not inherited	3	1.5%	15	9.0%	1	2.7%	0		0
900.110	other, suspected as inherited	1	0.5%	1	0.6%	1	2.7%	0		0
NORMAL										
0.000	normal globe	120	60.6%	110	65.9%	25	67.6%	7	77.8%	0

OCULAR DISORDERS REPORT

SWEDISH VALLHUND - 1

SWEDISH VALLHUND

	DISORDER	INHERITANCE	REFERENCE	BREEDING ADVICE
A.	Distichiasis	Not defined	1, 2	Breeder option
B.	Corneal dystrophy - epithelial/stromal	Not defined	2	Breeder option
C.	Persistent pupillary membranes - iris to iris	Not defined	3, 4	Breeder option
D.	Cataract	Not defined	5	NO
E.	Vitreous degeneration	Not defined	5,6	Breeder option
F.	Retinopathy	Presumed Autosomal Recessive	7-9	Breeder option
G.	Retinal dysplasia - folds	Not defined	2	Breeder option

Description and Comments

A. Distichiasis

Eyelashes abnormally located on the eyelid margin which may cause ocular irritation. Distichiasis may occur at any time in the life of a dog. It is difficult to make a strong recommendation with regard to breeding dogs with this entity. The hereditary basis has not been established although it seems probable due to the high incidence in some breeds. Reducing the incidence is a logical goal. When diagnosed, distichiasis should be recorded; breeding discretion is advised.

B. Corneal dystrophy - epithelial/stromal

A non-inflammatory corneal opacity (white to gray) present in one or more of the corneal layers; usually inherited and bilateral. In these dogs, lesions are circular or semicircular central crystalline deposits in the anterior corneal stroma that appear between 2 and 5 years of age. It may be associated with exophthalmos and lagophthalmos common in these dogs.

©2014, American College of Veterinary Ophthalmologists

OCULAR DISORDERS REPORT

SWEDISH VALLHUND - 2

C. Persistent pupillary membranes (PPM)

Persistent blood vessel remnants in the anterior chamber of the eye which fail to regress normally by 3 months of age. These strands may bridge from iris to iris, iris to cornea, iris to lens, or form sheets of tissue in the anterior chamber. The last three forms pose the greatest threat to vision and when severe, vision impairment or blindness may occur.

D. Cataract

A partial or complete opacity of the lens and/or its capsule. In cases where cataracts are complete and affect both eyes, blindness results. The prudent approach is to assume cataracts to be hereditary except in cases known to be associated with trauma, other causes of ocular inflammation, specific metabolic diseases, persistent pupillary membrane, persistent hyaloid or nutritional deficiencies. Cataracts may involve the lens completely (diffuse) or in a localized region.

E. Vitreous degeneration

Liquefaction of the vitreous gel which may predispose to retinal detachment.

F. Retinopathy

Several forms of fundus abnormalities have been seen in the Swedish Vallhund. Some of the changes resemble multifocal acquired chorioretinopathy seen in some herding breeds. Progressive retinal atrophy (PRA) has been diagnosed in Scandinavia.

Inherited retinopathy in the Swedish Vallhund may be a form of progressive retinal atrophy (PRA), however, several aspects of the disease do not resemble known forms of PRA. Vallhund retinopathy has three stages. Stage one usually occurs between 2-3 years of age and is characterized by mottling or multifocal brown discoloration of the tapetal fundus – this should be marked as retinopathy. In stage two, geographic thinning of the retina can be seen and subtle night vision deficits are observed. In stage three, the retinal thinning becomes more generalized with small islands of retinal sparing and deficits are noted in both photopic and scotopic vision. These later stages should be marked as retinal atrophy – suspicious or generalized as indicated and determined by the examining diplomate.

G. Retinal dysplasia - folds

Linear, triangular, curved or curvilinear foci of retinal folding that may be single or multiple. When seen in puppies, this condition may partially or completely resolve with maturity. Its significance to vision is unknown. There are two other forms of retinal dysplasia (geographic, detached) which are known to be inherited in other breeds and, in their most severe form, cause blindness. The genetic relationship between folds and more severe forms of retinal dysplasia is undetermined.

OCULAR DISORDERS REPORT

SWEDISH VALLHUND - 3

References

1. ACVO Genetics Committee, 2007 and/or Data from CERF All-Breeds Report 2002-2006.
2. ACVO Genetics Committee, 2008 and/or Data from CERF All-Breeds Report, 2003-2007.
3. ACVO Genetics Committee, 2002-2003 and/or Data from CERF All-Breeds Report, 2002-2003.
4. ACVO Genetics Committee, 2005 and/or Data from CERF All-Breeds Report 2003-2004.
5. ACVO Genetics Committee, 2006 and/or Data from CERF All-Breeds Report, 2001-2005.
6. ACVO Genetics Committee, 2009 and/or Data from CERF All-Breeds Report, 2008.
7. Breed club request February 1, 2005 to CERF.
8. Komaromy AM, Ahonene S, Cooper EE, et al. Inherited retinopathy in the Swedish Valhund (Vastgotaspets) Abstract #49. *Abstract from the Meeting of the European College of Veterinary Ophthalmologists & European Society of Veterinary Ophthalmology*, 2008 14-18 May 2008.
9. ACVO Genetics Committee, 2011 and/or Data from CERF All-Breeds Report, 2010.

OCULAR DISORDERS REPORT SWEDISH VALLHUND

Diagnostic Name	TOTAL DOGS EXAMINED		1991-1999		2000-2009		2010-2013		2014	
	#	%	#	%	#	%	#	%	#	%
EYELIDS										
20.140 ectopic cilia	0		1	0.1%	0		0		0	
25.110 distichiasis	0		27	4.0%	6	1.3%	2	1.5%		
NASOLACRIMAL										
40.910 keratoconjunctivitis sicca	0		0		1	0.2%	0			
CORNEA										
70.700 corneal dystrophy	0		12	1.8%	2	0.4%	2	1.5%		
UVEA										
93.120 iris cyst	0		4	0.6%	2	0.4%	0			
93.140 corneal endothelial pigment without PPM	0		1	0.1%	0		0			
93.710 persistent pupillary membranes, iris to iris	0		120	17.8%	81	18.2%	14	10.7%		
93.720 persistent pupillary membranes, iris to lens	0		0		2	0.4%	1	0.8%		
93.730 persistent pupillary membranes, iris to cornea	0		0		1	0.2%	1	0.8%		
93.740 persistent pupillary membranes, iris sheets	0		1	0.1%	0		0			
93.750 persistent pupillary membranes, lens pigment foci/no strands	0		2	0.3%	0		1	0.8%		
93.760 persistent pupillary membranes, endothelial opacity/no strands	0		0		1	0.2%	0			
93.810 uveal melanoma	0		0		3	0.7%	0			
LENS										
100.210 cataract, significance unknown	2	4.7%	117	17.4%	57	12.8%	17	13.0%		
100.301 punctate cataract, anterior cortex	0		4	0.6%	5	1.1%	0			
100.302 punctate cataract, posterior cortex	0		1	0.1%	2	0.4%	0			
100.303 punctate cataract, equatorial cortex	0		2	0.3%	1	0.2%	0			
100.305 punctate cataract, posterior sutures	0		5	0.7%	4	0.9%	0			
100.306 punctate cataract, nucleus	0		6	0.9%	4	0.9%	1	0.8%		
100.311 incipient cataract, anterior cortex	1	2.3%	4	0.6%	9	2.0%	0			
100.312 incipient cataract, posterior cortex	0		2	0.3%	0		0			
100.313 incipient cataract, equatorial cortex	0		2	0.3%	3	0.7%	1	0.8%		
100.314 incipient cataract, anterior sutures	0		1	0.1%	0		0			
100.315 incipient cataract, posterior sutures	0		4	0.6%	1	0.2%	1	0.8%		
100.316 incipient cataract, nucleus	0		6	0.9%	6	1.3%	0			
100.330 generalized/complete cataract	0		2	0.3%	5	1.1%	0			
VITREOUS										
110.135 PHPV/PTVL	0		1	0.1%	0		0			
110.320 vitreous degeneration syneresis	0		20	3.0%	12	2.7%	2	1.5%		
110.330 vitreous degeneration anterior chamber	0		5	0.7%	4	0.9%	0			
RETINA										
120.170 retinal dysplasia, folds	0		10	1.5%	8	1.8%	2	1.5%		
120.180 retinal dysplasia, geographic	0		4	0.6%	0		0			
120.190 retinal dysplasia, detached	0		1	0.1%	0		0			
120.200 retinitis	0		0		0		8	6.1%		
120.310 generalized progressive retinal atrophy (PRA)	0		29	4.3%	14	3.1%	0			
120.960 retinopathy	0		0		24	5.4%	0			

OCULAR DISORDERS REPORT SWEDISH VALLHUND

	1991-1999	2000-2009	2010-2013	2014
OPTIC NERVE				
130.150 optic disc coloboma	1 2.3%	0	0	0
OTHER				
900.000 other, unspecified	0	19 2.8%	28 6.3%	0
900.100 other, not inherited	0	69 10.3%	10 2.2%	11 8.4%
900.110 other, suspected as inherited	0	16 2.4%	2 0.4%	0
NORMAL				
0.000 normal globe	40 93.0%	435 64.6%	305 68.5%	91 69.5%

OCULAR DISORDERS REPORT

TIBETAN SPANIEL - 1

TIBETAN SPANIEL

	DISORDER	INHERITANCE	REFERENCE	BREEDING ADVICE
A.	Entropion	Not defined	1	Breeder option
B.	Distichiasis	Not defined	1	Breeder option
C.	Chronic superficial keratitis/pannus	Not defined	2	Breeder option
D.	Exposure/pigmentary keratitis	Not defined	3	Breeder option
E.	Persistent pupillary membranes			
	- iris to iris	Not defined	2,4	Breeder option
	- all other forms	Not defined	4	NO
F.	Cataract	Not defined	1	NO
G.	Retinal atrophy - generalized	Not defined	1,5,6	NO
H.	Ceroid lipofuscinosis	Not defined	7	NO

Descriptions and Comments

A. Entropion

A conformational defect resulting in an "in rolling" of one or more of the eyelids which may cause ocular irritation. It is likely that entropion is influenced by several genes (polygenic), defining the skin and other structures which make up the eyelids, the amount and weight of the skin covering the head and face, the orbital contents, and the conformation of the skull.

B. Distichiasis

Eyelashes abnormally located on the eyelid margin which may cause ocular irritation. Distichiasis may occur at any time. It is difficult to make a strong recommendation with regards to breeding dogs with this entity. The hereditary basis has not been established although it seems probable due to the high incidence in some breeds. Reducing the incidence is a logical goal. When diagnosed, distichiasis should be recorded and breeding discretion is advised.

©2014, American College of Veterinary Ophthalmologists

OCULAR DISORDERS REPORT

TIBETAN SPANIEL - 2

C. Chronic superficial keratitis / Pannus

A bilateral disease of the cornea which usually starts as a grayish haze to the ventral or ventrolateral cornea, followed by the formation of a vascularized subepithelial growth that begins to spread toward the central cornea; pigmentation follows the vascularization. If severe, vision impairment occurs. Pannus may be associated with plasma cell infiltration of the nictitans.

D. Exposure/pigmentary keratitis

A condition characterized by variable degrees of superficial vascularization, fibrosis and/or pigmentation of the cornea. May be associated with excessive exposure/irritation of the globe due to shallow orbits, lower eyelid medial entropion, lagophthalmos and macropalpebral fissure.

E. Persistent pupillary membranes (PPM)

Persistent blood vessel remnants in the anterior chamber of the eye which fail to regress normally by 3 months of age. These strands may bridge from iris to iris, iris to cornea, iris to lens, or form sheets of tissue in the anterior chamber. The last three forms pose the greatest threat to vision and when severe, vision impairment or blindness may occur.

F. Cataract

A partial or complete opacity of the lens and/or its capsule. In cases where cataracts are complete and affect both eyes, blindness results. The prudent approach is to assume cataracts to be hereditary except in cases known to be associated with trauma, other causes of ocular inflammation, specific metabolic diseases, persistent pupillary membrane, persistent hyaloid or nutritional deficiencies. Cataracts may involve the lens completely (diffuse) or in a localized region.

G. Retinal atrophy - generalized

A degenerative disease of the retinal visual cells which progresses to blindness. This abnormality, also known as progressive retinal atrophy or PRA, may be detected by electroretinogram (not part of a routine eye screening examination) before it is apparent clinically. Except for X-linked PRA in the Siberian Husky, in all breeds studied to date, PRA is inherited as an autosomal recessive trait.

H. Ceroid Lipofuscinosis

An inherited disease of man and animal characterized by the accumulation of lipopigment in various tissues of the body including the eye. It results in progressive neurologic disease including blindness. (Also called Batten's disease).

OCULAR DISORDERS REPORT

TIBETAN SPANIEL - 3

References

1. ACVO Genetics Committee, 1999 and/or Data from CERF All-Breeds Report, 1991-1998.
2. ACVO Genetics Committee, 2000-2002 and/or Data from CERF All-Breeds Report, 2000-2002.
3. ACVO Genetics Committee, 2013-2014 and Data from OFA All-Breeds Report, 2013-2014.
4. ACVO Genetics Committee, 2005 and/or Data from CERF All-Breeds Report 2003-2004.
5. Bjerkas E, Peiffer RL, Jr., Ekesten B. Primary glaucoma in the Norwegian elkhound. *Proc Am Coll Vet Ophthalmol.* 1994;25:74.
6. Bjerkas E. Progressive retinal atrophy in dogs in Norway. *Norsk Veterinaertidsskrift.* 1991;103:601-610.
7. Katz ML, Narfstrom K, Johnson GS, et al. Assessment of retinal function and characterization of lysosomal storage body accumulation in the retinas and brains of Tibetan Terriers with ceroid-lipofuscinosis. *Am J Vet Res.* 2005;66:67-76.

OCULAR DISORDERS REPORT TIBETAN SPANIEL

Diagnostic Name	TOTAL DOGS EXAMINED		1991-1999		2000-2009		2010-2013		2014	
	#	%	#	%	#	%	#	%	#	%
GLOBE										
0.110 microphthalmia	1	0.1%	0		1	0.2%	0			
EYELIDS										
20.140 ectopic cilia	1	0.1%	2	0.1%	0		1	1.0%		
20.160 macropalpebral fissure	2	0.2%	3	0.2%	0		0			
21.000 entropion, unspecified	21	2.3%	55	3.4%	10	1.9%	1	1.0%		
22.000 ectropion, unspecified	0		2	0.1%	0		0			
25.110 distichiasis	82	8.8%	120	7.4%	70	13.3%	10	10.4%		
NASOLACRIMAL										
32.110 imperforate lower nasolacrimal punctum	0		0		1	0.2%	0			
40.910 keratoconjunctivitis sicca	2	0.2%	0		0		0			
NICTITANS										
51.100 third eyelid cartilage anomaly	0		2	0.1%	0		0			
52.110 prolapsed gland of the third eyelid	3	0.3%	3	0.2%	0		0			
CORNEA										
70.210 corneal pannus	7	0.8%	1	0.1%	0		0			
70.220 pigmentary keratitis	3	0.3%	9	0.6%	5	1.0%	0			
70.700 corneal dystrophy	1	0.1%	6	0.4%	3	0.6%	0			
70.730 corneal endothelial degeneration	0		1	0.1%	0		0			
UVEA										
93.110 iris hypoplasia	0		0		2	0.4%	0			
93.120 iris cyst	0		2	0.1%	0		0			
93.150 iris coloboma	2	0.2%	1	0.1%	1	0.2%	0			
93.710 persistent pupillary membranes, iris to iris	7	0.8%	30	1.8%	18	3.4%	5	5.2%		
93.720 persistent pupillary membranes, iris to lens	1	0.1%	3	0.2%	0		0			
93.730 persistent pupillary membranes, iris to cornea	0		3	0.2%	1	0.2%	0			
93.750 persistent pupillary membranes, lens pigment foci/no strands	0		0		1	0.2%	1	1.0%		
93.760 persistent pupillary membranes, endothelial opacity/no strands	0		0		1	0.2%	0			
93.810 uveal melanoma	0		0		0		2	2.1%		
LENS										
100.200 cataract, unspecified	9	1.0%	0		0		0			
100.210 cataract, significance unknown	17	1.8%	42	2.6%	16	3.0%	4	4.2%		
100.301 punctate cataract, anterior cortex	0		2	0.1%	2	0.4%	0			
100.302 punctate cataract, posterior cortex	1	0.1%	0		1	0.2%	0			
100.303 punctate cataract, equatorial cortex	0		1	0.1%	1	0.2%	0			
100.304 punctate cataract, anterior sutures	0		1	0.1%	0		0			
100.305 punctate cataract, posterior sutures	3	0.3%	1	0.1%	7	1.3%	1	1.0%		
100.306 punctate cataract, nucleus	0		0		1	0.2%	0			
100.307 punctate cataract, capsular	0		1	0.1%	1	0.2%	0			
100.311 incipient cataract, anterior cortex	4	0.4%	13	0.8%	3	0.6%	1	1.0%		
100.312 incipient cataract, posterior cortex	3	0.3%	8	0.5%	1	0.2%	0			
100.313 incipient cataract, equatorial cortex	0		5	0.3%	1	0.2%	0			
100.314 incipient cataract, anterior sutures	0		2	0.1%	0		0			
100.315 incipient cataract, posterior sutures	2	0.2%	2	0.1%	1	0.2%	0			

OCULAR DISORDERS REPORT TIBETAN SPANIEL

LENS CONTINUED	1991-1999	2000-2009	2010-2013	2014
100.316 incipient cataract, nucleus	0	5 0.3%	2 0.4%	1 1.0%
100.317 incipient cataract, capsular	0	2 0.1%	0	0
100.325 incomplete cataract, posterior sutures	0	0	2 0.4%	0
100.330 generalized/complete cataract	0	1 0.1%	0	0
100.375 subluxation/luxation, unspecified	0	0	1 0.2%	0
VITREOUS				
110.120 persistent hyaloid artery/remnant	5 0.5%	3 0.2%	0	0
110.135 PHPV/PTVL	0	0	1 0.2%	0
110.200 vitritis	0	0	1 0.2%	0
110.320 vitreous degeneration syneresis	2 0.2%	7 0.4%	3 0.6%	0
110.330 vitreous degeneration anterior chamber	0	0	1 0.2%	0
RETINA				
120.170 retinal dysplasia, folds	3 0.3%	3 0.2%	3 0.6%	0
120.180 retinal dysplasia, geographic	0	0	0	1 1.0%
120.190 retinal dysplasia, detached	0	2 0.1%	0	0
120.310 generalized progressive retinal atrophy (PRA)	6 0.6%	18 1.1%	2 0.4%	1 1.0%
OPTIC NERVE				
130.120 optic nerve hypoplasia	0	2 0.1%	0	0
130.150 optic disc coloboma	5 0.5%	1 0.1%	0	1 1.0%
OTHER				
900.000 other, unspecified	0	8 0.5%	24 4.6%	0
900.100 other, not inherited	3 0.3%	72 4.4%	10 1.9%	7 7.3%
900.110 other, suspected as inherited	4 0.4%	9 0.6%	2 0.4%	0
NORMAL				
0.000 normal globe	776 83.4%	1346 82.6%	412 78.3%	83 86.5%

OCULAR DISORDERS REPORT

TIBETAN TERRIER - 1

TIBETAN TERRIER

	DISORDER	INHERITANCE	REFERENCE	BREEDING ADVICE
A.	Distichiasis	Not defined	1	Breeder option
B.	Corneal dystrophy - epithelial/stromal	Not defined	2	Breeder option
C.	Persistent pupillary membranes - iris to iris - all other forms	Not defined Not defined	1,2 2	Breeder option NO
D.	Cataract	Not defined	1	NO
E.	Lens luxation * a DNA test is available	Simple autosomal recessive	1,3-8	NO
F.	Vitreous degeneration	Not defined	9	Breeder option
G.	Retinal atrophy - generalized	Not defined	1,4,10-18	NO
H.	Retinal atrophy - nyctalopia	Not defined	19	NO
I.	Retinal atrophy - Rod-cone dysplasia (rcd4) * a DNA test is available	Autosomal recessive	23	NO
J.	Ceroid lipofuscinosis	Not defined	20-22	NO

Description and Comments

A. Distichiasis

Eyelashes abnormally located on the eyelid margin which may cause ocular irritation. Distichiasis may occur at any time. It is difficult to make a strong recommendation with regards to breeding dogs with this entity. The hereditary basis has not been established

©2014, American College of Veterinary Ophthalmologists

OCULAR DISORDERS REPORT

TIBETAN TERRIER - 2

although it seems probable due to the high incidence in some breeds. Reducing the incidence is a logical goal. When diagnosed, distichiasis should be recorded and breeding discretion is advised.

B. Corneal dystrophy - epithelial/stromal

A non-inflammatory corneal opacity (white to gray) present in one or more of the corneal layers; usually inherited and bilateral.

C. Persistent pupillary membranes (PPM)

Persistent blood vessel remnants in the anterior chamber of the eye which fail to regress normally by 3 months of age. These strands may bridge from iris to iris, iris to cornea, iris to lens, or form sheets of tissue in the anterior chamber. The last three forms pose the greatest threat to vision and when severe, vision impairment or blindness may occur.

D. Cataract

A partial or complete opacity of the lens and/or its capsule. In cases where cataracts are complete and affect both eyes, blindness results. The prudent approach is to assume cataracts to be hereditary except in cases known to be associated with trauma, other causes of ocular inflammation, specific metabolic diseases, persistent pupillary membrane, persistent hyaloid or nutritional deficiencies. Cataracts may involve the lens completely (diffuse) or in a localized region.

E. Luxated lens

Partial (subluxation) or complete displacement of the lens from the normal anatomic site behind the pupil. Lens luxation not associated with trauma or inflammation is presumed to be inherited. Lens luxation may result in elevated intraocular pressure (glaucoma), causing vision impairment or blindness. A genetic test is available.

F. Vitreous degeneration

A liquefaction of the vitreous gel which may predispose to retinal detachment.

G. Retinal atrophy - generalized

A degenerative disease of the retinal visual cells which progresses to blindness. This abnormality, also known as progressive retinal atrophy or PRA, may be detected by electroretinogram (not part of a routine eye screening examination) before it is apparent clinically. Except for X-linked PRA in the Siberian Husky, in all breeds studied to date, PRA is inherited as an autosomal recessive trait.

OCULAR DISORDERS REPORT

TIBETAN TERRIER - 3

H. Retinal atrophy - nyctalopia (night blindness)

Loss of night (scotopic) vision caused by selective degeneration of the rod photoreceptors. There are reports to suggest there may be more than one variety of this disorder:

- **emerging night blindness** at 1-2 years of age (up to 1-4 years of age), with ophthalmoscopic signs of peripheral to central retinal atrophy emerging soon thereafter.
- **advanced night blindness** at a younger age but with no obvious ophthalmoscopic signs until perhaps 4 years of age.

There are ERG studies to indicate that there is depression of the B wave at 10-12 weeks of age in the second variety and slower depression in the first variety. Some may have no obvious signs at 5-6 years of age, only to develop clinical signs at 6-7 years of age. It is logical that any animal found with signs of bilateral atrophy should not be bred. Members of the family of the affected animal should be carefully screened. Perhaps, ERG in animals less than 4 years of age is logical, especially if the animal is intended for breed foundation. A genetic test is available.

I. Rod-cone dysplasia, type 4 (*rcd4*)

A form of PRA initially identified in the Gordon and Irish Setter breeds. Clinical night blindness is observed on average as late as 10 years of age and progresses to total blindness. This form of PRA has been referred to as late-onset PRA (LOPRA). The disorder is caused by a mutation present in the *C2orf71* gene. A mutation-based gene test is now available that will unequivocally identify genetically normal, affected and carrier dogs. The test is accurate only for this mutation and is of no value in identifying other forms of PRA

J. Ceroid Lipofuscinosis

An inherited disease of man and animal characterized by the accumulation of lipopigment in various tissues of the body including the eye. It results in progressive neurologic disease including blindness. (Also called Batten's disease).

References

1. ACVO Genetics Committee, 1999 and/or Data from CERF All-Breeds Report, 1991-1998.
2. ACVO Genetics Committee, 2005 and/or Data from CERF All-Breeds Report 2003-2004.
3. Willis MB, Curtis R, Barnett KC, et al. Genetic aspects of lens luxation in the Tibetan terrier. *Vet Rec.* 1979;104:409-412.
4. Barnett KC, Curtis R. Lens luxation and progressive retinal atrophy in the Tibetan terrier. *Vet Rec.* 1978;103:160.
5. Curtis R, Barnett KC. Primary lens luxation in the dog. *J Small Anim Pract.* 1980;21:657-668.
6. Curtis R. Aetiopathological aspects of inherited lens dislocation in the Tibetan Terrier. *J*

©2014, American College of Veterinary Ophthalmologists

OCULAR DISORDERS REPORT

TIBETAN TERRIER - 4

- Comp Pathol.* 1983;93:151-163.
7. Sargan DR, Withers D, Pettitt L, et al. Mapping the mutation causing lens luxation in several terrier breeds. *J Hered.* 2007;98:534-538.
 8. Gould D, Pettitt L, McLaughlin B, et al. ADAMTS17 mutation associated with primary lens luxation is widespread among breeds. *Vet Ophthalmol.* 2011;14:378-384.
 9. ACVO Genetics Committee, 2013-2014 and Data from OFA All-Breeds Report, 2013-2014.
 10. Arden GB, Fox B, Bull T. Abnormal photoreceptors in a dog with a delayed progressive retinal atrophy. *Trans Ophthalmol Soc U K.* 1983;103 (Pt 4):411-415.
 11. Millichamp N, Curtis R, Barnett K. Progressive retinal atrophy in Tibetan Terriers. *J Am Vet Med Assoc.* 1988;192:769-776.
 12. Dekomien G, Epplen JT. Exclusion of the PDE6A gene for generalised progressive retinal atrophy in 11 breeds of dog. *Anim Genet.* 2000;31:135-139.
 13. Gramer L, Lagerman-Pekari M, Schauman P, et al. Progressiv retinal atrofi tibetansk terrier. *Svensk Veterinartidning.* 1974;24:158.
 14. Curtis R. Progressive retinal atrophy in the Tibetan terrier. *Trans Am Coll Vet Ophthalmol.* 1985;16:208.
 15. Curtis R, Kemp C. Rhodopsin levels and visual sensitivity in Tibetan terriers with progressive rod-cone degeneration. *Invest Ophthalmol Vis Sci.* 1988;29 (Suppl):142.
 16. AA. H. Progressive retinal atrophy in the Tibetan terrier: Studies on cyclic GMP and taurine homeostasis. *Biochem Soc Trans.* 1988;16:317.
 17. Riis R, Loew E. Pathological notations of the retinak degeneration (RD1) in Tibetan terriers. *Trans Am Coll Vet Ophthalmol.* 1988;18:89.
 18. Riis R, Loew E. Tibetan terrier retinopathy: Update. *Trans Am Coll Vet Ophthalmol.* 1985;15 (Suppl).
 19. Loew E, Riis R. Congenital nyctalopia in the Tibetan terrier. *Trans Am Coll Vet Ophthalmol.* 1983.
 20. Katz ML, Narfstrom K, Johnson GS, et al. Assessment of retinal function and characterization of lysosomal storage body accumulation in the retinas and brains of Tibetan Terriers with ceroid-lipofuscinosis. *Am J Vet Res.* 2005;66:67-76.
 21. Drogemuller C, Wohlke A, Distl O. Characterization of candidate genes for neuronal ceroid lipofuscinosis in dog. *J Hered.* 2005;96:735-738.
 22. Brahm R, Matiasek K. Neuronal Ceroid Lipofuscinosis in two closely related Tibetan Terriers and on Polish Owczarek Nizinny (PON) dog: Clinical, ophthalmological and bioptical

©2014, American College of Veterinary Ophthalmologists

OCULAR DISORDERS REPORT

TIBETAN TERRIER - 5

- findings. *ECVO Proceedings*. 2004.
23. Downs et al., Late-onset progressive retinal atrophy in the Gordon and Irish Setter breeds is associated with a frameshift mutation in *C2orf71*. *Animal Genet*. 2013 Apr;44(2): 169-77

OCULAR DISORDERS REPORT TIBETAN TERRIER

Diagnostic Name	TOTAL DOGS EXAMINED	1991-1999 2213		2000-2009 4142		2010-2013 1480		2014 334		
		#	%	#	%	#	%	#	%	
GLOBE										
0.110	microphthalmia	2	0.1%	2	0.0%	0		0		
10.000	glaucoma	2	0.1%	1	0.0%	0		0		
EYELIDS										
21.000	entropion, unspecified	0		1	0.0%	0		0		
25.110	distichiasis	34	1.5%	60	1.4%	19	1.3%	3	0.9%	
NASOLACRIMAL										
32.110	imperforate lower nasolacrimal punctum	0		0		0		1	0.3%	
NICTITANS										
52.110	prolapsed gland of the third eyelid	1	0.0%	1	0.0%	2	0.1%	0		
CORNEA										
70.220	pigmentary keratitis	1	0.0%	2	0.0%	0		0		
70.700	corneal dystrophy	17	0.8%	59	1.4%	7	0.5%	4	1.2%	
70.730	corneal endothelial degeneration	1	0.0%	0		0		0		
UVEA										
93.710	persistent pupillary membranes, iris to iris	34	1.5%	278	6.7%	145	9.8%	24	7.2%	
93.720	persistent pupillary membranes, iris to lens	2	0.1%	16	0.4%	3	0.2%	0		
93.730	persistent pupillary membranes, iris to cornea	11	0.5%	25	0.6%	4	0.3%	0		
93.740	persistent pupillary membranes, iris sheets	7	0.3%	3	0.1%	0		0		
93.750	persistent pupillary membranes, lens pigment foci/no strands	0		1	0.0%	16	1.1%	6	1.8%	
93.760	persistent pupillary membranes, endothelial opacity/no strands	0		0		9	0.6%	2	0.6%	
LENS										
100.200	cataract, unspecified	34	1.5%	0		0		0		
100.210	cataract, significance unknown	66	3.0%	209	5.0%	81	5.5%	19	5.7%	
100.301	punctate cataract, anterior cortex	15	0.7%	28	0.7%	29	2.0%	5	1.5%	
100.302	punctate cataract, posterior cortex	11	0.5%	15	0.4%	9	0.6%	1	0.3%	
100.303	punctate cataract, equatorial cortex	1	0.0%	7	0.2%	5	0.3%	0		
100.304	punctate cataract, anterior sutures	2	0.1%	10	0.2%	1	0.1%	0		
100.305	punctate cataract, posterior sutures	2	0.1%	2	0.0%	2	0.1%	0		
100.306	punctate cataract, nucleus	1	0.0%	2	0.0%	3	0.2%	1	0.3%	
100.307	punctate cataract, capsular	0		10	0.2%	1	0.1%	0		
100.311	incipient cataract, anterior cortex	16	0.7%	22	0.5%	16	1.1%	5	1.5%	
100.312	incipient cataract, posterior cortex	23	1.0%	27	0.7%	8	0.5%	6	1.8%	
100.313	incipient cataract, equatorial cortex	7	0.3%	23	0.6%	4	0.3%	1	0.3%	
100.314	incipient cataract, anterior sutures	1	0.0%	5	0.1%	6	0.4%	0		
100.315	incipient cataract, posterior sutures	4	0.2%	8	0.2%	1	0.1%	0		
100.316	incipient cataract, nucleus	2	0.1%	2	0.0%	3	0.2%	2	0.6%	
100.317	incipient cataract, capsular	0		5	0.1%	0		0		
100.321	incomplete cataract, anterior cortex	0		0		1	0.1%	1	0.3%	
100.323	incomplete cataract, equatorial cortex	0		0		0		1	0.3%	
100.330	generalized/complete cataract	22	1.0%	14	0.3%	2	0.1%	0		
100.340	resorbing/hypermature cataract	0		0		1	0.1%	0		
100.375	subluxation/luxation, unspecified	2	0.1%	14	0.3%	0		0		

OCULAR DISORDERS REPORT TIBETAN TERRIER

	1991-1999	2000-2009	2010-2013	2014
VITREOUS				
110.120 persistant hyaloid artery/remnant	1 0.0%	2 0.0%	1 0.1%	0
110.135 PHPV/PTVL	0	1 0.0%	1 0.1%	0
110.320 vitreous degeneration syneresis	5 0.2%	20 0.5%	6 0.4%	1 0.3%
110.330 vitreous degeneration anterior chamber	0	4 0.1%	3 0.2%	0
FUNDUS				
97.110 choroidal hypoplasia	0	1 0.0%	0	0
97.120 coloboma	0	1 0.0%	0	0
RETINA				
120.170 retinal dysplasia, folds	0	7 0.2%	2 0.1%	1 0.3%
120.180 retinal dysplasia, geographic	2 0.1%	1 0.0%	0	0
120.190 retinal dysplasia, detached	0	3 0.1%	0	0
120.200 retinitis	0	0	0	1 0.3%
120.310 generalized progressive retinal atrophy (PRA)	49 2.2%	62 1.5%	8 0.5%	2 0.6%
120.400 retinal hemorrhage	2 0.1%	1 0.0%	0	0
120.910 retinal detachment without dialysis	1 0.0%	2 0.0%	0	0
120.960 retinopathy	0	0	2 0.1%	0
OPTIC NERVE				
130.110 micropapilla	0	2 0.0%	0	0
130.120 optic nerve hypoplasia	2 0.1%	2 0.0%	0	0
OTHER				
900.000 other, unspecified	0	26 0.6%	56 3.8%	0
900.100 other, not inherited	9 0.4%	138 3.3%	12 0.8%	14 4.2%
900.110 other, suspected as inherited	14 0.6%	12 0.3%	6 0.4%	0
NORMAL				
0.000 normal globe	1920 86.8%	3557 85.9%	1303 88.0%	287 85.9%

OCULAR DISORDERS REPORT

TOY AUSTRALIAN SHEPHERD - 1

TOY AUSTRALIAN SHEPHERD

	DISORDER	INHERITANCE	REFERENCE	BREEDING ADVICE
A.	Microphthalmia with multiple ocular defects	Presumed autosomal recessive with incomplete penetrance	1-6	NO
B.	Distichiasis	Not defined	1, 7	Breeder option
C.	Corneal dystrophy - epithelial/stromal	Not defined	8	Breeder option
D.	Iris coloboma	Not defined	1	NO
E.	Iris hypoplasia	Not defined	9	Breeder option
F.	Persistent pupillary membranes - iris to iris - all other forms	Not defined Not defined	1 1,8	Breeder option NO
G.	Cataract * a DNA test is available	Suspect autosomal dominant	1, 10, 11	NO
H.	Persistent hyaloid artery	Not defined	8	Breeder option
I.	Retinal atrophy - generalized (<i>prcd</i>) * a DNA test is available	Autosomal recessive	1,7,8,9,18	NO
J.	Cone degeneration - day blindness * a DNA test is available	Autosomal recessive	*	NO
K.	Multifocal retinopathy - <i>cmr1</i> * a DNA test is available	Autosomal	17	Breeder option
L.	Retinal dysplasia - folds	Not defined	8	Breeder option

©2014, American College of Veterinary Ophthalmologists

OCULAR DISORDERS REPORT

TOY AUSTRALIAN SHEPHERD - 2

M.	Choroidal hypoplasia, +/- coloboma, +/- retinal detachment * a DNA test is available	Simple recessive	1,7,12-15	NO
N.	Coloboma/ staphyloma without microphthalmia	Not defined	1	NO
O.	Micropapilla	Not defined	16	Breeder option

It is recommended that this breed be examined prior to pharmacological dilation to best facilitate identification of iris coloboma.

Description and Comments

A. Microphthalmia with multiple ocular defects

Microphthalmia is a congenital defect characterized by a small eye with associated defects of the cornea, iris (coloboma), anterior chamber, lens (cataract) and/or retina (dysplasia). In the Australian Shepherd, microphthalmia has long been suspected to be associated with merled coat coloration but a definitive genetic relationship has not been established. The eyes of affected homozygous merle (usually white) dogs have extreme forms of this entity and are usually blind at birth. Affected heterozygous merle-coated dogs demonstrate less severe manifestations.

B. Distichiasis

Eyelashes abnormally located on the eyelid margin which may cause ocular irritation. Distichiasis may occur at any time in the life of a dog. It is difficult to make a strong recommendation with regard to breeding dogs with this entity. The hereditary basis has not been established although it seems probable due to the high incidence in some breeds. Reducing the incidence is a logical goal. When diagnosed, distichiasis should be recorded; breeding discretion is advised.

C. Corneal Dystrophy - epithelial/stromal

A non-inflammatory corneal opacity (white to gray) present in one or more of the corneal layers. Corneal dystrophy implies a probable inherited basis and is usually bilateral.

OCULAR DISORDERS REPORT

TOY AUSTRALIAN SHEPHERD - 3

D. Iris coloboma

A congenital abnormality in iris development usually characterized by a full-thickness defect in iris tissue, commonly (though not exclusively) located at the 6 o'clock position associated with failure of closure of the optic fissure. A partial-thickness defect in iris tissue should be recorded as iris hypoplasia on the OFA form.

E. Iris hypoplasia

A congenital abnormality in iris development usually characterized by a reduced quantity of tissue identified as a partial-thickness defect in iris tissue. Full-thickness iris hypoplasia is rare and should be recorded as an iris coloboma on the OFA form.

F. Persistent pupillary membranes (PPM)

Persistent blood vessel remnants in the anterior chamber of the eye which fail to regress normally by 3 months of age. These strands may bridge from iris to iris, iris to cornea, iris to lens, or form sheets of tissue in the anterior chamber. The last three forms pose the greatest threat to vision and when severe, vision impairment or blindness may occur.

G. Cataract

A partial or complete opacity of the lens and/or its capsule. In cases where cataracts are complete and affect both eyes, blindness results. The prudent approach is to assume cataracts to be hereditary except in cases known to be associated with trauma, other causes of ocular inflammation, specific metabolic diseases, persistent pupillary membrane, persistent hyaloid or nutritional deficiencies. Cataracts may involve the lens completely (diffuse) or in a localized region. The condition is inherited as a co-dominant mutation in the HSF4 gene (HSF4-2). Genetic testing is available. Please refer to Genetic Testing for Canine Ocular Disorders Section.

H. Persistent hyaloid artery (PHA)

Congenital defect resulting from abnormalities in the development and regression of the hyaloid artery. The blood vessel remnant can be present in the vitreous as a small patent vascular strand (PHA) or as a non-vascular strand that appears gray-white (persistent hyaloid remnant).

I. Retinal atrophy - generalized (*prcd*)

A degenerative disease of the retinal visual cells which progresses to blindness. This abnormality may be detected by electroretinogram before it is apparent clinically. In most breeds studied to date, PRA is recessively inherited. The disease in the Australian Shepherd has not been characterized sufficiently to establish the disease frequency, the disease mechanism, or the age when early diagnosis by ophthalmoscopy and/or

OCULAR DISORDERS REPORT

TOY AUSTRALIAN SHEPHERD - 4

electroretinography is possible. A DNA test is available

J. Cone degeneration - day blindness or hemeralopia

Autosomal recessively inherited early degeneration of the cone photoreceptors. Affected puppies develop day-blindness, colorblindness, and photophobia between 8 and 12 weeks of age. Affected dogs remain ophthalmoscopically normal their entire life. Electroretinography is required to definitively diagnose the disorder. A DNA test is available.

K. Multifocal retinopathy

Canine Multi-focal Retinopathy type 1 (cmr1) is characterized by numerous distinct (i.e. multi-focal), roughly circular patches of elevated retina (multifocal bullous retinal detachments). There may be a serous subretinal fluid, or accumulation of subretinal material that produces gray-tan-pink colored lesions. These lesions, looking somewhat like blisters, vary in location and size, although typically they are present in both eyes of the affected dog.

The disease generally develops in young dogs between 11-20 weeks of age and there is minimal progression after 1 year of age. The lesions may flatten, leaving areas of retinal thinning and RPE hypertrophy, hyperplasia, and pigmentation. Discrete areas of tapetal hyper-reflectivity may be seen in areas of previous retinal and RPE detachments. Most dogs exhibit no noticeable problem with vision or electroretinographic abnormalities despite their abnormal appearing retinas.

Canine Multi-focal Retinopathy type 1 is caused by a mutation in the Bestrophin 1 gene (BEST1) and is described to be recessively inherited in the Great Pyrenees, Dogue de Bordeaux, Bullmastiff, and Mastiff.

L. Retinal dysplasia - folds

Linear, triangular, curved or curvilinear foci of retinal folding that may be single or multiple. When seen in puppies, this condition may partially or completely resolve with maturity. Its significance to vision is unknown. There are two other forms of retinal dysplasia (geographic, detached) which are known to be inherited in other breeds and, in their most severe form, cause blindness. The genetic relationship between folds and more severe forms of retinal dysplasia is undetermined.

OCULAR DISORDERS REPORT

TOY AUSTRALIAN SHEPHERD - 5

M. Choroidal hypoplasia (with or without coloboma and retinal detachment)

A congenital defect in which the choroid develops incompletely. The clinical appearance is similar to the same condition reported in Collies and Shetland Sheepdogs. A DNA test is available.

This disorder is collectively referred to as "Collie Eye Anomaly". Although there is a lack of scientific evidence, it is believed that the incidence and severity of this entity in Collies was decreased by breeding only "mildly affected" animals. At this time, the Genetics Committee of the ACVO recommends against breeding dogs with any form of the Collie Eye Anomaly.

N. Coloboma/staphyloma (unassociated with microphthalmia)

A coloboma is a congenital defect which may affect the iris, choroid or optic disc. Iris colobomas are seen as notches in the pupillary margin. Scleral ectasia is defined as a congenital thinning and secondary distention of the sclera; when lined by uveal tissue it is called a staphyloma. These may be anteriorly located, apparent as a bulge beneath the upper eyelid or posteriorly located, requiring visualization with an ophthalmoscope. These conditions may or may not be genetically related to the same anomalies seen associated with microphthalmia (entity "A" above).

O. Micropapilla

Micropapilla refers to a small optic disc which is not associated with vision impairment. Optic nerve hypoplasia refers to a congenital defect of the optic nerve which causes blindness and abnormal pupil response in the affected eye. It may be difficult to differentiate between micropapilla and optic nerve hypoplasia on a routine (dilated) screening ophthalmoscopic exam.

References

1. ACVO Genetics Committee, 1999 and/or Data from CERF All-Breeds Report, 1991-1998.
2. Gelatt KN, McGill LD. Clinical characteristics of microphthalmia with colobomas of the Australian shepherd dog. *J Am Vet Med Assoc.* 1971; 162.
3. Gelatt KN, Veith LA. Hereditary multiple ocular anomalies in Australian shepherd dogs. *Vet Med Small Anim Clin.* 1970; 65.
4. Cook CS, Burling K, Nelson EJ. Embryogenesis of posterior segment colobomas in the Australian shepherd dog. *Prog in Vet Comp Ophthalmol.* 1991; 1.
5. Bertram T, Coignoul F, Cheville N. Ocular dysgenesis in Australian shepherd dogs. *J Am Anim Hosp Assoc.* 1984; 20: 177.

©2014, American College of Veterinary Ophthalmologists

OCULAR DISORDERS REPORT

TOY AUSTRALIAN SHEPHERD - 6

6. Gelatt KN, Powell NG. Inheritance of microphthalmia with coloboma. *Am J Vet Res.* 1981; 1.
7. ACVO Genetics Committee, 2008 and/or Data from CERF All-Breeds Report, 2003-2007.
8. ACVO Genetics Committee, 2005 and/or Data from CERF All-Breeds Report 2003-2004.
9. ACVO Genetics Committee, 2011 and/or Data from CERF All-Breeds Report, 2010.
10. Mellersh CS, Pettitt L, Forman OP, et al. Identification of mutations in HSF4 in dogs of three different breeds with hereditary cataracts. *Vet Ophthalmol.* 2006; 9: 369-378.
11. Mellersh CS, McLaughlin B, Ahonen S, et al. Mutation in HSF4 is associated with hereditary cataract in the Australian Shepherd. *Vet Ophthalmol.* 2009; 12: 372-378.
12. Rubin LF, Nelson EJ, Sharp CA. Collie eye anomaly in Australian shepherd dogs. *Prog in Vet Comp Ophthalmol.* 1991; 1.
13. Lowe JK, Kukekova AV, Kirkness EF, et al. Linkage mapping of the primary disease locus for collie eye anomaly. *Genomics.* 2003; 82: 86-95.
14. Parker HG, Kukekova AV, Akey DT, et al. Breed relationships facilitate fine-mapping studies: a 7.8-kb deletion cosegregates with Collie eye anomaly across multiple dog breeds. *Genome Res.* 2007; 17: 1562-1571.
15. Munyard KA, Sherry CR, Sherry L. A retrospective evaluation of congenital ocular defects in Australian Shepherd dogs in Australia. *Vet Ophthalmol.* 2007; 10: 19-22.
16. ACVO Genetics Committee, 2007 and/or Data from CERF All-Breeds Report 2002-2006.
17. Hoffman I, Guzewicz KE, Zangler B, et al. Canine multifocal retinopathy in the Australian Shepherd: a case report. *Vet Ophthalmol.* 2012; 15: 134-138.
18. ACVO Genetics Committee, 2014 and/or Data from OFA/CERF All-Breeds Report 2013.

OCULAR DISORDERS REPORT TOY AUSTRALIAN SHEPHERD

Diagnostic Name	TOTAL DOGS EXAMINED	1991-1999		2000-2009		2010-2013		2014	
		#	%	#	%	#	%	#	%
GLOBE									
0.110 microphthalmia		0		2	0.4%	0		0	
EYELIDS									
25.110 distichiasis		0		15	3.0%	12	3.8%	8	15.7%
CORNEA									
70.700 corneal dystrophy		0		0		1	0.3%	0	
UVEA									
93.110 iris hypoplasia		0		4	0.8%	1	0.3%	2	3.9%
93.150 iris coloboma		0		7	1.4%	4	1.3%	1	2.0%
93.710 persistent pupillary membranes, iris to iris		0		67	13.6%	24	7.6%	8	15.7%
93.720 persistent pupillary membranes, iris to lens		0		3	0.6%	2	0.6%	0	
93.730 persistent pupillary membranes, iris to cornea		0		0		2	0.6%	0	
93.750 persistent pupillary membranes, lens pigment foci/no strands		0		0		1	0.3%	0	
LENS									
100.210 cataract, significance unknown		0		5	1.0%	4	1.3%	2	3.9%
100.302 punctate cataract, posterior cortex		0		1	0.2%	0		0	
100.303 punctate cataract, equatorial cortex		0		1	0.2%	0		0	
100.305 punctate cataract, posterior sutures		0		1	0.2%	0		0	
100.311 incipient cataract, anterior cortex		0		2	0.4%	1	0.3%	0	
100.312 incipient cataract, posterior cortex		0		1	0.2%	0		0	
100.313 incipient cataract, equatorial cortex		0		1	0.2%	1	0.3%	0	
100.317 incipient cataract, capsular		0		2	0.4%	0		0	
100.330 generalized/complete cataract		0		1	0.2%	0		0	
VITREOUS									
110.120 persistent hyaloid artery/remnant		0		3	0.6%	0		0	
110.135 PHPV/PTVL		0		2	0.4%	0		0	
110.320 vitreous degeneration syneresis		0		0		1	0.3%	0	
RETINA									
120.170 retinal dysplasia, folds		0		1	0.2%	2	0.6%	0	
120.180 retinal dysplasia, geographic		0		1	0.2%	0		0	
120.310 generalized progressive retinal atrophy (PRA)		0		1	0.2%	0		0	
OPTIC NERVE									
130.110 micropapilla		0		5	1.0%	4	1.3%	0	
130.120 optic nerve hypoplasia		0		1	0.2%	1	0.3%	0	
OTHER									
900.000 other, unspecified		0		1	0.2%	5	1.6%	0	
900.100 other, not inherited		0		6	1.2%	1	0.3%	1	2.0%
900.110 other, suspected as inherited		0		1	0.2%	0		0	
NORMAL									
0.000 normal globe		0		431	87.2%	293	93.3%	40	78.4%

OCULAR DISORDERS REPORT

TOY FOX TERRIER - 1

TOY FOX TERRIER

	DISORDER	INHERITANCE	REFERENCE	BREEDING ADVICE
A.	Persistent pupillary membranes - iris to iris	Not defined	1	Breeder option
B.	Lens luxation * a DNA test is available	Not Defined	2	NO

Description and Comments

A. Persistent pupillary membranes (PPM)

Persistent blood vessel remnants in the anterior chamber of the eye which fail to regress normally by 3 months of age. These strands may bridge from iris to iris, iris to cornea, iris to lens, or form sheets of tissue in the anterior chamber. The last three forms pose the greatest threat to vision and when severe, vision impairment or blindness may occur.

B. Lens luxation

Partial (subluxation) or complete displacement of the lens from the normal anatomic site behind the pupil. Lens luxation not associated with trauma or inflammation is presumed to be inherited. Lens luxation may result in elevated intraocular pressure (glaucoma), causing vision impairment or blindness. A DNA test is available.

References

1. ACVO Genetics Committee, 2009 and/or Data from CERF All-Breeds Report, 2008.
2. Gould D, Pettitt L, McLaughlin B, et al. ADAMTS17 mutation associated with primary lens luxation is widespread among breeds. *Vet Ophthalmol.* 2011 Nov;14:378-384.

OCULAR DISORDERS REPORT TOY FOX TERRIER

Diagnostic Name	TOTAL DOGS EXAMINED	1991-1999		2000-2009		2010-2013		2014	
		#	%	#	%	#	%	#	%
EYELIDS									
25.110	distichiasis	0		1	0.9%	1	2.1%	0	
CORNEA									
70.730	corneal endothelial degeneration	0		0		1	2.1%	0	
UVEA									
93.710	persistent pupillary membranes, iris to iris	1	8.3%	7	6.4%	7	14.6%	0	
93.720	persistent pupillary membranes, iris to lens	0		0		2	4.2%	0	
93.730	persistent pupillary membranes, iris to cornea	0		0		1	2.1%	0	
LENS									
100.210	cataract, significance unknown	0		3	2.8%	0		0	
100.311	incipient cataract, anterior cortex	2	16.7%	1	0.9%	1	2.1%	0	
100.312	incipient cataract, posterior cortex	0		0		1	2.1%	0	
100.375	subluxation/luxation, unspecified	0		1	0.9%	0		0	
VITREOUS									
110.120	persistant hyaloid artery/remnant	0		1	0.9%	0		0	
110.320	vitreous degeneration syneresis	1	8.3%	0		0		1	8.3%
110.330	vitreous degeneration anterior chamber	0		1	0.9%	0		0	
RETINA									
120.170	retinal dysplasia, folds	0		4	3.7%	3	6.2%	0	
120.310	generalized progressive retinal atrophy (PRA)	0		2	1.8%	0		0	
OPTIC NERVE									
130.120	optic nerve hypoplasia	0		2	1.8%	0		0	
OTHER									
900.000	other, unspecified	0		1	0.9%	1	2.1%	0	
900.100	other, not inherited	0		3	2.8%	1	2.1%	1	8.3%
NORMAL									
0.000	normal globe	9	75.0%	96	88.1%	36	75.0%	12	100.0%

OCULAR DISORDERS REPORT

VIZSLA - 1

VIZSLA

	DISORDER	INHERITANCE	REFERENCE	BREEDING ADVICE
A.	Distichiasis	Not defined	1	Breeder option
B.	Entropion	Not defined	2	NO
C.	Prolapse of gland of third eyelid	Not defined	5	Breeder option
D.	Corneal dystrophy - epithelial/stromal	Not defined	2	Breeder option
E.	Persistent pupillary membranes			
	- iris to iris	Not defined	3	Breeder option
	- all other forms	Not defined	3	NO
F.	Cataract	Not defined	4	NO
G.	Vitreous Degeneration	Not defined	5	Breeder option

Description and Comments

A. Distichiasis

Eyelashes abnormally located on the eyelid margin which may cause ocular irritation. Distichiasis may occur at any time in the life of a dog. It is difficult to make a strong recommendation with regard to breeding dogs with this entity. The hereditary basis has not been established, although it seems probable due to the high incidence in some breeds. Reducing the incidence is a logical goal. When diagnosed, distichiasis should be recorded; breeding discretion is advised.

B. Entropion

A conformational defect resulting in an "in-rolling" of one or both of the eyelids which may cause ocular irritation. It is likely that entropion is influenced by several genes (polygenic), defining the skin and other structures which make up the eyelids, the amount and weight of the skin covering the head and face, the orbital contents, and the conformation of the skull. The Vizsla Club of America, recognizing entropion as an unacceptable problem in their breed, has requested that entropion be given a "NO" rating.

OCULAR DISORDERS REPORT

VIZSLA - 2

C. Prolapse of the gland of the third eyelid

Protrusion of the tear gland associated with the third eyelid. The mode of inheritance of this disorder is unknown. The exposed gland may become irritated. Commonly referred to as "cherry eye".

D. Corneal Dystrophy - epithelial/stromal

A non-inflammatory corneal opacity (white to gray) present in one or more of the corneal layers; usually inherited and bilateral.

E. Persistent pupillary membrane (PPM)

Persistent blood vessel remnants in the anterior chamber of the eye which fail to regress normally by 3 months of age. These strands may bridge from iris to iris, iris to cornea, iris to lens, or form sheets of tissue in the anterior chamber. The last three forms pose the greatest threat to vision and when severe, vision impairment or blindness may occur.

F. Cataract

A partial or complete opacity of the lens and/or its capsule. In cases where cataracts are complete and affect both eyes, blindness results. The prudent approach is to assume cataracts to be hereditary except in cases known to be associated with trauma, other causes of ocular inflammation, specific metabolic diseases, persistent pupillary membrane, persistent hyaloid or nutritional deficiencies. Cataracts may involve the lens completely (diffuse) or in a localized region.

G. Vitreous degeneration

Liquefaction of the vitreous gel which may predispose to retinal detachment.

References

There are no references providing detailed descriptions of hereditary ocular conditions of the Vizsla breed. The conditions listed above are generally recognized to exist in this breed, as evidenced by identification on breed eye screening examinations and/or clinical experience of veterinary ophthalmologists.

1. ACVO Genetics Committee, 2006 and/or Data from CERF All-Breeds Report, 2001-2005.
2. ACVO Genetics Committee, 1999 and/or Data from CERF All-Breeds Report, 1991-1998.
3. ACVO Genetics Committee, 2002-2003 and/or Data from CERF All-Breeds Report, 2002-2003.
4. Strom AR, Hassig M, Iburg TM, et al. Epidemiology of canine glaucoma presented to

OCULAR DISORDERS REPORT

VIZSLA - 3

University of Zurich from 1995 to 2009. Part 1: Congenital and primary glaucoma (4 and 123 cases). *Vet Ophthalmol.* 2011 Mar;14:121-126.

5. ACVO Genetics Committee, 2014 and/or Data from OFA All-Breeds Report, 2013-2014.

OCULAR DISORDERS REPORT

VIZSLA

Diagnostic Name	TOTAL DOGS EXAMINED	1991-1999		2000-2009		2010-2013		2014	
		#	%	#	%	#	%	#	%
EYELIDS									
20.140	ectopic cilia	0		1	0.1%	0		0	
21.000	entropion, unspecified	1	0.2%	2	0.2%	0		0	
22.000	ectropion, unspecified	1	0.2%	2	0.2%	0		0	
25.110	distichiasis	4	1.0%	11	0.8%	7	0.9%	2	0.7%
NASOLACRIMAL									
40.910	keratoconjunctivitis sicca	0		0		1	0.1%	0	
NICTITANS									
51.100	third eyelid cartilage anomaly	0		0		2	0.3%	1	0.4%
52.110	prolapsed gland of the third eyelid	0		0		7	0.9%	0	
CORNEA									
70.700	corneal dystrophy	13	3.2%	19	1.4%	5	0.7%	1	0.4%
70.730	corneal endothelial degeneration	0		2	0.2%	0		0	
UVEA									
93.120	iris cyst	0		1	0.1%	0		0	
93.710	persistent pupillary membranes, iris to iris	5	1.2%	26	2.0%	22	2.9%	8	3.0%
93.720	persistent pupillary membranes, iris to lens	7	1.7%	5	0.4%	0		0	
93.740	persistent pupillary membranes, iris sheets	0		1	0.1%	0		0	
93.750	persistent pupillary membranes, lens pigment foci/no strands	0		6	0.5%	39	5.1%	28	10.3%
93.760	persistent pupillary membranes, endothelial opacity/no strands	0		0		1	0.1%	0	
LENS									
100.200	cataract, unspecified	4	1.0%	0		0		0	
100.210	cataract, significance unknown	7	1.7%	58	4.4%	24	3.1%	15	5.5%
100.301	punctate cataract, anterior cortex	0		5	0.4%	8	1.0%	0	
100.302	punctate cataract, posterior cortex	2	0.5%	7	0.5%	5	0.7%	1	0.4%
100.303	punctate cataract, equatorial cortex	0		2	0.2%	0		0	
100.305	punctate cataract, posterior sutures	1	0.2%	3	0.2%	0		0	
100.306	punctate cataract, nucleus	0		0		1	0.1%	0	
100.307	punctate cataract, capsular	0		7	0.5%	5	0.7%	0	
100.311	incipient cataract, anterior cortex	1	0.2%	11	0.8%	2	0.3%	0	
100.312	incipient cataract, posterior cortex	0		8	0.6%	5	0.7%	6	2.2%
100.313	incipient cataract, equatorial cortex	4	1.0%	11	0.8%	2	0.3%	1	0.4%
100.315	incipient cataract, posterior sutures	0		3	0.2%	0		0	
100.316	incipient cataract, nucleus	0		2	0.2%	0		0	
100.317	incipient cataract, capsular	0		2	0.2%	1	0.1%	1	0.4%
100.330	generalized/complete cataract	2	0.5%	0		0		0	
100.375	subluxation/luxation, unspecified	0		2	0.2%	0		0	
VITREOUS									
110.120	persistant hyaloid artery/remnant	2	0.5%	0		0		0	
110.135	PHPV/PTVL	0		1	0.1%	0		0	
110.320	vitreous degeneration syneresis	0		4	0.3%	6	0.8%	0	
110.330	vitreous degeneration anterior chamber	0		2	0.2%	1	0.1%	0	

OCULAR DISORDERS REPORT VIZSLA

	1991-1999	2000-2009	2010-2013	2014
RETINA				
120.170 retinal dysplasia, folds	2 0.5%	1 0.1%	0	0
120.200 retinitis	0	0	0	1 0.4%
120.310 generalized progressive retinal atrophy (PRA)	2 0.5%	3 0.2%	0	0
120.960 retinopathy	0	0	1 0.1%	0
OPTIC NERVE				
130.120 optic nerve hypoplasia	1 0.2%	0	0	0
OTHER				
900.000 other, unspecified	0	10 0.8%	41 5.4%	0
900.100 other, not inherited	5 1.2%	66 5.0%	16 2.1%	18 6.6%
900.110 other, suspected as inherited	3 0.7%	4 0.3%	5 0.7%	1 0.4%
NORMAL				
0.000 normal globe	347 85.3%	1210 92.1%	698 91.1%	239 88.2%

OCULAR DISORDERS REPORT

VOLPINO ITALIANO - 1

VOLPINO ITALIANO

	DISORDER	INHERITANCE	REFERENCE	BREEDING ADVICE
A.	Lens luxation * a DNA test is available	Not defined	1	NO

Description and Comments

A. Lens luxation

Partial (subluxation) or complete displacement of the lens from the normal anatomic site behind the pupil. Lens luxation not associated with trauma or inflammation is presumed to be inherited. Lens luxation may result in elevated intraocular pressure (glaucoma), causing vision impairment or blindness. A DNA test is available.

References

1. Gould D, Pettitt L, McLaughlin B, et al. ADAMTS17 mutation associated with primary lens luxation is widespread among breeds. *Vet Ophthalmol.* 2011; 14: 378-384.

OCULAR DISORDERS REPORT VOLPINO ITALIANO

Diagnostic Name	TOTAL DOGS EXAMINED	1991-1999		2000-2009		2010-2013		2014	
		#	%	#	%	#	%	#	%
NORMAL 0.000 normal globe		0		0		1	100.0%	0	

OCULAR DISORDERS REPORT

WEIMARANER - 1

WEIMARANER

	DISORDER	INHERITANCE	REFERENCE	BREEDING ADVICE
A.	Distichiasis	Not defined	1	Breeder option
B.	Entropion	Not defined	1	Breeder option
C.	Everted cartilage of the third eyelid	Not defined	1	Breeder option
D.	Corneal dystrophy - epithelial/stromal	Not defined	2, 3	Breeder option
E.	Persistent pupillary membranes - iris to iris	Not defined	3	Breeder option
F.	Cataract	Not defined	1	NO
G.	Retinal atrophy - generalized	Not defined	1	NO

Description and Comments

A. Distichiasis

Eyelashes abnormally located on the eyelid margin which may cause ocular irritation. Distichiasis may occur at any time in the life of a dog. It is difficult to make a strong recommendation with regards to breeding dogs with this entity. The hereditary basis has not been established although it seems probable due to the high incidence in some breeds. Reducing the incidence is a logical goal. When diagnosed, distichiasis should be recorded. Breeding discretion is advised.

In this breed, because there is significant clinical disease associated with the abnormal hairs, breeding should be discouraged.

B. Entropion

A conformational defect resulting in an "in-rolling" of one or both of the eyelids which may cause ocular irritation. It is likely that entropion is influenced by several genes (polygenic), defining the skin and other structures which make up the eyelids, the amount and weight of the skin covering the head and face, the orbital contents, and the conformation of the skull.

OCULAR DISORDERS REPORT

WEIMARANER - 2

C. Everted cartilage of the third eyelid

A scroll-like curling of the cartilage of the third eyelid, usually everting the margin. This condition may occur in one or both eyes and may cause mild ocular irritation.

D. Corneal Dystrophy - epithelial/stromal

A non-inflammatory corneal opacity (white to gray) present in one or more of the corneal layers. Corneal dystrophy implies a probable inherited basis and is usually bilateral.

E. Persistent pupillary membranes (PPM)

Persistent blood vessel remnants in the anterior chamber of the eye which fail to regress normally by 3 months of age. These strands may bridge from iris to iris, iris to cornea, iris to lens, or form sheets of tissue in the anterior chamber. The last three forms pose the greatest threat to vision and when severe, vision impairment or blindness may occur.

F. Cataract

A partial or complete opacity of the lens and/or its capsule. In cases where cataracts are complete and affect both eyes, blindness results. The prudent approach is to assume cataracts to be hereditary except in cases known to be associated with trauma, other causes of ocular inflammation, specific metabolic diseases, persistent pupillary membrane, persistent hyaloid or nutritional deficiencies. Cataracts may involve the lens completely (diffuse) or in a localized region.

G. Retinal atrophy - generalized

A degenerative disease of the retinal visual cells which progresses to blindness. This abnormality, also known as progressive retinal atrophy or PRA, may be detected by electroretinogram (not part of a routine eye screening examination) before it is apparent clinically. PRA is inherited as an autosomal recessive trait in most breeds.

References

There are no references providing detailed descriptions of hereditary ocular conditions of the Weimaraner. The conditions listed are generally recognized to exist in the breed, as evidenced by identification on breed eye screening examinations and/or clinical experience of veterinary ophthalmologists.

1. ACVO Genetics Committee, 1999 and/or Data from CERF All-Breeds Report, 1991-1998.
2. ACVO Genetics Committee, 2000-2002 and/or Data from CERF All-Breeds Report, 2000-2002.
3. ACVO Genetics Committee, 2005 and/or Data from CERF All-Breeds Report 2003-2004.

OCULAR DISORDERS REPORT WEIMARANER

Diagnostic Name	TOTAL DOGS EXAMINED		1991-1999		2000-2009		2010-2013		2014	
	#	%	#	%	#	%	#	%	#	%
EYELIDS										
21.000 entropion, unspecified	2	0.5%	1	0.1%	0		0		0	
25.110 distichiasis	122	30.7%	204	27.6%	87	28.3%	44	36.7%		
NICTITANS										
51.100 third eyelid cartilage anomaly	3	0.8%	6	0.8%	2	0.7%	2	1.7%		
CORNEA										
70.700 corneal dystrophy	5	1.3%	16	2.2%	7	2.3%	1	0.8%		
70.730 corneal endothelial degeneration	0		2	0.3%	3	1.0%	0			
UVEA										
93.120 iris cyst	3	0.8%	1	0.1%	0		0		0	
93.150 iris coloboma	1	0.3%	0		0		1	0.8%		
93.710 persistent pupillary membranes, iris to iris	3	0.8%	7	0.9%	2	0.7%	2	1.7%		
93.720 persistent pupillary membranes, iris to lens	1	0.3%	2	0.3%	0		0			
93.730 persistent pupillary membranes, iris to cornea	0		1	0.1%	0		0			
93.810 uveal melanoma	0		1	0.1%	0		0			
LENS										
100.200 cataract, unspecified	2	0.5%	0		0		0		0	
100.210 cataract, significance unknown	14	3.5%	52	7.0%	18	5.9%	6	5.0%		
100.301 punctate cataract, anterior cortex	3	0.8%	5	0.7%	3	1.0%	0			
100.302 punctate cataract, posterior cortex	1	0.3%	3	0.4%	1	0.3%	0			
100.303 punctate cataract, equatorial cortex	1	0.3%	4	0.5%	3	1.0%	0			
100.304 punctate cataract, anterior sutures	0		1	0.1%	0		0			
100.305 punctate cataract, posterior sutures	1	0.3%	0		0		0			
100.306 punctate cataract, nucleus	1	0.3%	3	0.4%	4	1.3%	0			
100.307 punctate cataract, capsular	0		0		2	0.7%	0			
100.311 incipient cataract, anterior cortex	9	2.3%	26	3.5%	2	0.7%	0			
100.312 incipient cataract, posterior cortex	4	1.0%	5	0.7%	0		1	0.8%		
100.313 incipient cataract, equatorial cortex	5	1.3%	2	0.3%	0		3	2.5%		
100.314 incipient cataract, anterior sutures	0		1	0.1%	0		0			
100.315 incipient cataract, posterior sutures	1	0.3%	1	0.1%	0		0			
100.316 incipient cataract, nucleus	2	0.5%	2	0.3%	0		0			
100.317 incipient cataract, capsular	0		1	0.1%	0		0			
100.330 generalized/complete cataract	4	1.0%	1	0.1%	0		0			
VITREOUS										
110.120 persistent hyaloid artery/remnant	1	0.3%	3	0.4%	0		0		0	
110.200 vitritis	0		0		0		2	1.7%		
110.320 vitreous degeneration syneresis	0		0		0		2	1.7%		
110.330 vitreous degeneration anterior chamber	0		0		1	0.3%	0			
RETINA										
120.170 retinal dysplasia, folds	0		2	0.3%	0		0		0	
120.180 retinal dysplasia, geographic	1	0.3%	1	0.1%	2	0.7%	0		0	
120.310 generalized progressive retinal atrophy (PRA)	3	0.8%	2	0.3%	0		0		0	
120.400 retinal hemorrhage	0		1	0.1%	0		0		0	

OCULAR DISORDERS REPORT WEIMARANER

	1991-1999	2000-2009	2010-2013	2014
OTHER				
900.000 other, unspecified	0	3 0.4%	9 2.9%	0
900.100 other, not inherited	4 1.0%	46 6.2%	5 1.6%	5 4.2%
900.110 other, suspected as inherited	2 0.5%	0	1 0.3%	0
NORMAL				
0.000 normal globe	245 61.7%	494 66.9%	233 75.9%	75 62.5%

OCULAR DISORDERS REPORT

WELSH SPRINGER SPANIEL - 1

WELSH SPRINGER SPANIEL

	DISORDER	INHERITANCE	REFERENCE	BREEDING ADVICE
A.	Glaucoma	Presumed autosomal dominant	1-3	NO
B.	Entropion	Not defined	4, 5	Breeder option
C.	Distichiasis	Not defined	1	Breeder option
D.	Corneal dystrophy - epithelial/stromal	Not defined	4, 5	Breeder option
E.	Persistent pupillary membranes - iris to iris - all other forms	Not defined Not defined	1, 5 5	Breeder option NO
F.	Cataract	Presumed autosomal recessive	1, 6, 7	NO
G.	Vitreous degeneration	Not defined	8	Breeder option
H.	Retinal atrophy - generalized	Not defined	1, 9	NO
I.	Retinal dysplasia - folds	Not defined	5	Breeder option

Description and Comments

A. Glaucoma

An elevation of intraocular pressure (IOP) which, when sustained, causes intraocular damage resulting in blindness. The elevated IOP occurs because the fluid cannot leave through the iridocorneal angle. Diagnosis and classification of glaucoma requires measurement of IOP (tonometry) and examination of the iridocorneal angle (gonioscopy). Neither of these tests is part of a routine breed eye screening exam.

Primary angle closure glaucoma has been reported in the Welsh Springer Spaniel. Females

©2014, American College of Veterinary Ophthalmologists

OCULAR DISORDERS REPORT

WELSH SPRINGER SPANIEL - 2

are affected more than males. Onset ranges from 10 weeks to 10 years. At the iridocorneal angle, the pectinate ligaments appear sparse and wispy in contrast to the sturdy fibers seen in other breeds. A dominant mode of inheritance is reported.

B. Entropion

A conformational defect resulting in an "in-rolling" of one or both of the eyelids which may cause ocular irritation. It is likely that entropion is influenced by several genes (polygenic), defining the skin and other structures which make up the eyelids, the amount and weight of the skin covering the head and face, the orbital contents, and the conformation of the skull.

C. Distichiasis

Eyelashes abnormally located on the eyelid margin which may cause ocular irritation. Distichiasis may occur at any time in the life of a dog. It is difficult to make a strong recommendation with regard to breeding dogs with this entity. The hereditary basis has not been established, although it seems probable due to the high incidence in some breeds. Reducing the incidence is a logical goal. When diagnosed, distichiasis should be recorded; breeding discretion is advised.

D. Corneal Dystrophy - epithelial/stromal

A non-inflammatory corneal opacity (white to gray) present in one or more of the corneal layers. Corneal dystrophy implies a probable inherited basis and is usually bilateral.

E. Persistent pupillary membranes (PPM)

Persistent blood vessel remnants in the anterior chamber of the eye which fail to regress normally by 3 months of age. These strands may bridge from iris to iris, iris to cornea, iris to lens, or form sheets of tissue in the anterior chamber. The last three forms pose the greatest threat to vision and when severe, vision impairment or blindness may occur.

F. Cataract

A partial or complete opacity of the lens and/or its capsule. In cases where cataracts are complete and affect both eyes, blindness results. The prudent approach is to assume cataracts to be hereditary except in cases known to be associated with trauma, other causes of ocular inflammation, specific metabolic diseases, persistent pupillary membrane, persistent hyaloid or nutritional deficiencies. Cataracts may involve the lens completely (diffuse) or in a localized region.

In the Welsh Springer Spaniel, lesions may be seen as early as 8-12 weeks of age and progress rapidly to complete cataract, impairing vision. A recessive mode of inheritance is reported.

G. Vitreous degeneration

Liquefaction of the vitreous gel which may predispose to retinal detachment.

OCULAR DISORDERS REPORT

WELSH SPRINGER SPANIEL - 3

H. Retinal atrophy - generalized

A degenerative disease of the retinal visual cells which progresses to blindness. This abnormality, also known as progressive retinal atrophy or PRA, may be detected by electroretinogram (not part of a routine eye screening examination) before it is apparent clinically. Except for X-linked PRA in the Siberian Husky, in all breeds studied to date, PRA is inherited as an autosomal recessive trait.

I. Retinal dysplasia - folds

Linear, triangular, curved or curvilinear foci of retinal folding that may be single or multiple. When seen in puppies, this condition may partially or completely resolve with maturity. Its significance to vision is unknown. There are two other forms of retinal dysplasia (geographic, detached) which are known to be inherited in other breeds and, in their most severe form, cause blindness. The genetic relationship between folds and more severe forms of retinal dysplasia is undetermined.

References

1. ACVO Genetics Committee, 1999 and/or Data from CERF All-Breeds Report, 1991-1998.
2. Cottrell B and Barnett K. Primary glaucoma in the Welsh springer spaniel. *Journal of Small Animal Practice*. 1988;29:185-199.
3. Gelatt KN and MacKay EO. Prevalence of the breed-related glaucomas in pure-bred dogs in North America. *Vet Ophthalmol*. 2004 Mar-Apr;7:97-111.
4. ACVO Genetics Committee, 2002-2003 and/or Data from CERF All-Breeds Report, 2002-2003.
5. ACVO Genetics Committee, 2005 and/or Data from CERF All-Breeds Report 2003-2004.
6. Barnett KC. Hereditary cataract in the Welsh Springer spaniel. *J Small Anim Pract*. 1980 Nov;21:621-625.
7. Barnett KC. The diagnosis and differential diagnosis of cataract in the dog. *J Small Anim Pract*. 1985;26:305.
8. ACVO Genetics Committee, 2006 and/or Data from CERF All-Breeds Report, 2001-2005.
9. Priester W. Canine progressive retinal atrophy: Occurrence by age, breed, and sex. *American Journal of Veterinary Research*. 1974;35:571-574.

OCULAR DISORDERS REPORT WELSH SPRINGER SPANIEL

Diagnostic Name	TOTAL DOGS EXAMINED		1991-1999 615		2000-2009 1225		2010-2013 548		2014 119	
	#	%	#	%	#	%	#	%	#	%
GLOBE										
10.000 glaucoma	1	0.2%	0		0		0		0	
EYELIDS										
21.000 entropion, unspecified	11	1.8%	17	1.4%	7	1.3%	2	1.7%		
22.000 ectropion, unspecified	0		3	0.2%	0		0			
25.110 distichiasis	78	12.7%	132	10.8%	49	8.9%	17	14.3%		
NASOLACRIMAL										
32.110 imperforate lower nasolacrimal punctum	0		0		1	0.2%	0			
CORNEA										
70.700 corneal dystrophy	12	2.0%	22	1.8%	3	0.5%	4	3.4%		
70.730 corneal endothelial degeneration	0		0		2	0.4%	0			
UVEA										
93.120 iris cyst	0		0		1	0.2%	0			
93.150 iris coloboma	1	0.2%	0		0		0			
93.710 persistent pupillary membranes, iris to iris	43	7.0%	323	26.4%	154	28.1%	34	28.6%		
93.720 persistent pupillary membranes, iris to lens	1	0.2%	1	0.1%	0		0			
93.730 persistent pupillary membranes, iris to cornea	0		1	0.1%	0		0			
93.740 persistent pupillary membranes, iris sheets	0		1	0.1%	0		0			
93.750 persistent pupillary membranes, lens pigment foci/no strands	0		0		2	0.4%	1	0.8%		
95.120 ciliary body cyst	0		0		0		1	0.8%		
LENS										
100.200 cataract, unspecified	6	1.0%	0		0		0			
100.210 cataract, significance unknown	27	4.4%	79	6.4%	17	3.1%	4	3.4%		
100.301 punctate cataract, anterior cortex	4	0.7%	4	0.3%	1	0.2%	0			
100.302 punctate cataract, posterior cortex	2	0.3%	1	0.1%	0		0			
100.303 punctate cataract, equatorial cortex	1	0.2%	0		0		0			
100.304 punctate cataract, anterior sutures	0		1	0.1%	0		0			
100.306 punctate cataract, nucleus	1	0.2%	0		1	0.2%	0			
100.307 punctate cataract, capsular	0		0		1	0.2%	0			
100.311 incipient cataract, anterior cortex	0		1	0.1%	4	0.7%	0			
100.312 incipient cataract, posterior cortex	0		1	0.1%	1	0.2%	0			
100.313 incipient cataract, equatorial cortex	0		2	0.2%	0		0			
100.316 incipient cataract, nucleus	1	0.2%	1	0.1%	0		0			
100.317 incipient cataract, capsular	0		1	0.1%	1	0.2%	0			
100.330 generalized/complete cataract	1	0.2%	0		0		0			
100.375 subluxation/luxation, unspecified	1	0.2%	0		0		0			
VITREOUS										
110.120 persistent hyaloid artery/remnant	4	0.7%	3	0.2%	1	0.2%	0			
110.135 PHPV/PTVL	0		1	0.1%	0		0			
110.320 vitreous degeneration syneresis	0		5	0.4%	0		0			
FUNDUS										
97.120 coloboma	0		2	0.2%	0		0			

OCULAR DISORDERS REPORT WELSH SPRINGER SPANIEL

	1991-1999	2000-2009	2010-2013	2014
RETINA				
120.170 retinal dysplasia, folds	8 1.3%	18 1.5%	3 0.5%	0
120.180 retinal dysplasia, geographic	0	4 0.3%	0	0
120.310 generalized progressive retinal atrophy (PRA)	6 1.0%	1 0.1%	1 0.2%	0
OPTIC NERVE				
130.110 micropapilla	0	3 0.2%	0	0
130.120 optic nerve hypoplasia	1 0.2%	5 0.4%	0	0
130.150 optic disc coloboma	0	4 0.3%	0	0
OTHER				
900.000 other, unspecified	0	11 0.9%	8 1.5%	0
900.100 other, not inherited	3 0.5%	44 3.6%	4 0.7%	3 2.5%
900.110 other, suspected as inherited	4 0.7%	4 0.3%	3 0.5%	1 0.8%
NORMAL				
0.000 normal globe	454 73.8%	809 66.0%	395 72.1%	82 68.9%

OCULAR DISORDERS REPORT

WELSH TERRIER - 1

WELSH TERRIER

	DISORDER	INHERITANCE	REFERENCE	BREEDING ADVICE
A.	Distichiasis	Not defined	1	Breeder option
B.	Keratoconjunctivitis sicca (dry eye)	Not defined	1	NO
C.	Persistent pupillary membranes			
	- iris to iris	Not defined	1-3	Breeder option
	- all other forms	Not defined	3	NO
D.	Glaucoma	Not defined	1	NO
E.	Cataract	Not defined	1	NO
F.	Lens luxation	Not defined	1, 4	NO
	* a DNA test is available			

Description and Comment

A. Distichiasis

Eyelashes abnormally located on the eyelid margin which may cause ocular irritation. Distichiasis may occur at any time in the life of a dog. It is difficult to make a strong recommendation with regards to breeding dogs with this entity. The hereditary basis has not been established although it seems probable due to the high incidence in some breeds. Reducing the incidence is a logical goal. When diagnosed, distichiasis should be recorded. Breeding discretion is advised.

B. Keratoconjunctivitis sicca (dry eye)

An abnormality of the tear film, most commonly a deficiency of the aqueous portion, although the mucin and/or lipid layers may be affected; results in ocular irritation and/or vision impairment.

C. Persistent pupillary membranes (PPM)

Persistent blood vessel remnants in the anterior chamber of the eye which fail to regress normally by 3 months of age. These strands may bridge from iris to iris, iris to cornea, iris to lens, or form sheets of tissue in the anterior chamber. The last three forms pose the greatest threat to vision and when severe, vision impairment or blindness may occur.

OCULAR DISORDERS REPORT

WELSH TERRIER - 2

D. Glaucoma

Glaucoma is characterized by an elevation of intraocular pressure (IOP) which, when sustained, causes intraocular damage resulting in blindness. The elevated IOP occurs because the fluid cannot leave through the iridocorneal angle. Diagnosis and classification of glaucoma requires measurement of the intraocular pressure (tonometry) and examination of the iridocorneal angle (gonioscopy). Neither of these tests is part of a routine breed eye screening exam.

E. Cataract

A partial or complete opacity of the lens and/or its capsule. In cases where cataracts are complete and affect both eyes, blindness results. The prudent approach is to assume cataracts to be hereditary except in cases known to be associated with trauma, other causes of ocular inflammation, specific metabolic diseases, persistent pupillary membrane, persistent hyaloid or nutritional deficiencies. Cataracts may involve the lens completely (diffuse) or in a localized region.

F. Lens luxation

Partial (subluxation) or complete displacement of the lens from the normal anatomic site behind the pupil. Lens luxation not associated with trauma or inflammation is presumed to be inherited. Lens luxation may result in elevated intraocular pressure (glaucoma) causing vision impairment or blindness. A DNA test is available.

References

There are no references providing detailed descriptions of hereditary ocular conditions of the Welsh Terrier breed. The conditions listed above are generally recognized to exist in the breed, as evidenced by identification on breed eye screening examinations and/or clinical experience of veterinary ophthalmologists.

1. ACVO Genetics Committee, 1999 and/or Data from CERF All-Breeds Report, 1991-1998.
2. ACVO Genetics Committee, 2000-2002 and/or Data from CERF All-Breeds Report, 2000-2002.
3. ACVO Genetics Committee, 2005 and/or Data from CERF All-Breeds Report 2003-2004.
4. Gould D, Pettitt L, McLaughlin B, et al. ADAMTS17 mutation associated with primary lens luxation is widespread among breeds. *Vet Ophthalmol.* 2011 Nov;14:378-384.

OCULAR DISORDERS REPORT WELSH TERRIER

Diagnostic Name	TOTAL DOGS EXAMINED	1991-1999		2000-2009		2010-2013		2014	
		#	%	#	%	#	%	#	%
GLOBE									
10.000 glaucoma		1	1.5%	0		0		0	
EYELIDS									
20.140 ectopic cilia		0		1	0.4%	0		0	
25.110 distichiasis		2	3.0%	8	3.3%	2	5.0%	0	
NASOLACRIMAL									
40.910 keratoconjunctivitis sicca		1	1.5%	0		0		0	
CORNEA									
70.700 corneal dystrophy		0		4	1.7%	0		0	
70.730 corneal endothelial degeneration		0		0		3	7.5%	0	
UVEA									
93.710 persistent pupillary membranes, iris to iris		3	4.5%	22	9.2%	3	7.5%	0	
93.720 persistent pupillary membranes, iris to lens		0		2	0.8%	0		0	
93.730 persistent pupillary membranes, iris to cornea		2	3.0%	1	0.4%	0		0	
93.750 persistent pupillary membranes, lens pigment foci/no strands		0		1	0.4%	2	5.0%	1	10.0%
LENS									
100.200 cataract, unspecified		1	1.5%	0		0		0	
100.210 cataract, significance unknown		3	4.5%	15	6.3%	4	10.0%	0	
100.301 punctate cataract, anterior cortex		0		1	0.4%	1	2.5%	0	
100.302 punctate cataract, posterior cortex		1	1.5%	0		1	2.5%	0	
100.307 punctate cataract, capsular		0		1	0.4%	0		0	
100.311 incipient cataract, anterior cortex		1	1.5%	2	0.8%	0		0	
100.312 incipient cataract, posterior cortex		0		2	0.8%	0		0	
100.313 incipient cataract, equatorial cortex		0		1	0.4%	0		0	
100.317 incipient cataract, capsular		0		2	0.8%	0		0	
100.375 subluxation/luxation, unspecified		1	1.5%	2	0.8%	0		0	
RETINA									
120.170 retinal dysplasia, folds		0		0		1	2.5%	0	
OTHER									
900.000 other, unspecified		0		1	0.4%	5	12.5%	0	
900.100 other, not inherited		2	3.0%	11	4.6%	0		0	
900.110 other, suspected as inherited		0		1	0.4%	0		0	
NORMAL									
0.000 normal globe		52	77.6%	200	83.7%	29	72.5%	10	100.0%

OCULAR DISORDERS REPORT

WEST HIGHLAND WHITE TERRIER - 1

WEST HIGHLAND WHITE TERRIER

	DISORDER	INHERITANCE	REFERENCE	BREEDING ADVICE
A.	Microphthalmia	Not defined	1	NO
B.	Keratoconjunctivitis sicca (dry eye)	Not defined	1-5	NO
C.	Persistent pupillary membranes			
	- iris to iris	Not defined	1, 6	Breeder option
	- all other forms	Not defined	6	NO
D.	Cataract	Presumed autosomal recessive	1, 7	NO
E.	Vitreous degeneration	Not defined	8	Breeder option
F.	Retinal atrophy - generalized	Not defined	1	NO
G.	Retinal dysplasia - folds	Not defined	1	Breeder option

Description and Comments

A. Microphthalmia

Microphthalmia is a congenital defect characterized by a small eye. The condition may be seen alone without vision impairment but it is most often associated with defects of the cornea, iris (coloboma), anterior chamber, lens (cataract) and/or retina (retinal dysplasia).

B. Keratoconjunctivitis/dry eye

An abnormality of the tear film, most commonly a deficiency of the aqueous portion, although the mucin and/or lipid layers may be affected; results in ocular irritation and/or vision impairment.

In the West Highland White Terrier this disease has been reported more commonly in females than males.⁵

OCULAR DISORDERS REPORT

WEST HIGHLAND WHITE TERRIER - 2

C. Persistent pupillary membranes (PPM)

Persistent blood vessel remnants in the anterior chamber of the eye which fail to regress normally by 3 months of age. These strands may bridge from iris to iris, iris to cornea, iris to lens, or form sheets of tissue in the anterior chamber. The last three forms pose the greatest threat to vision and when severe, vision impairment or blindness may occur.

In the West Highland White terrier, these membranes when present, often bridge from the iris to the lens and may result in cataract with vision impairment.

D. Cataract

A partial or complete opacity of the lens and/or its capsule. In cases where cataracts are complete and affect both eyes, blindness results. The prudent approach is to assume cataracts to be hereditary except in cases known to be associated with trauma, other causes of ocular inflammation, specific metabolic diseases, persistent pupillary membrane, persistent hyaloid or nutritional deficiencies. Cataracts may involve the lens completely (diffuse) or in a localized region.

The cataract described in the West Highland White terrier, initially involves the posterior Y sutures and may infrequently progress, resulting in vision impairment. The age of onset is less than 6 months of age. A recessive mode of inheritance is suggested by the pedigrees which have been studied.

E. Vitreous degeneration

Liquefaction of the vitreous gel which may predispose to retinal detachment.

F. Retinal atrophy - generalized

A degenerative disease of the retinal visual cells which progresses to blindness. This abnormality, also known as progressive retinal atrophy or PRA, may be detected by electroretinogram (not part of a routine eye screening examination) before it is apparent clinically. Except for X-linked PRA in the Siberian Husky, in all breeds studied to date, PRA is inherited as an autosomal recessive trait.

G. Retinal dysplasia - folds

Linear, triangular, curved or curvilinear foci of retinal folding that may be single or multiple. When seen in puppies, this condition may partially or completely resolve with maturity. Its significance to vision is unknown. There are two other forms of retinal dysplasia (geographic, detached) which are known to be inherited in other breeds and, in their most severe form, cause blindness. The genetic relationship between folds and more severe forms of retinal dysplasia is undetermined.

OCULAR DISORDERS REPORT

WEST HIGHLAND WHITE TERRIER - 3

References

1. ACVO Genetics Committee, 1999 and/or Data from CERF All-Breeds Report, 1991-1998.
2. Sansom J, Barnett KC, Neumann W, et al. Treatment of keratoconjunctivitis sicca in dogs with cyclosporine ophthalmic ointment: a European clinical field trial. *Vet Rec.* 1995; 137: 504-507.
3. Baker GJ, Formston C. An evaluation of transplantation of the parotid duct in the treatment of kerato-conjunctivitis sicca in the dog. *J Small Anim Pract.* 1968; 9: 261-268.
4. Kaswan RL, Martin CL, Chapman WL, Jr. Keratoconjunctivitis sicca: histopathologic study of nictitating membrane and lacrimal glands from 28 dogs. *Am J Vet Res.* 1984; 45: 112-118.
5. vom Hagen F, Dierks C, Westermann H, et al. Keratoconjunctivitis sicca (KCS) in west-highland- white-terriers (WHWT) – a clinical/genetic survey. *Annual Meeting of the European College of Veterinary Ophthalmologists* 2012 May 24 - 27.
6. ACVO Genetics Committee, 2005 and/or Data from CERF All-Breeds Report 2003-2004.
7. Narfstrom K. Cataract in the West Highland white terrier. *J Small Anim Pract.* 1981; 22: 467-471.
8. ACVO Genetics Committee, 2014 and/or Data from OFA All-Breeds Report 2013-2014.

OCULAR DISORDERS REPORT WEST HIGHLAND WHITE TERRIER

Diagnostic Name	TOTAL DOGS EXAMINED		1991-1999		2000-2009		2010-2013		2014	
	#	%	#	%	#	%	#	%	#	%
GLOBE										
0.110 microphthalmia	4	1.5%	1	0.2%	0		0		0	
EYELIDS										
25.110 distichiasis	0		1	0.2%	1	0.2%	0		0	
NASOLACRIMAL										
40.910 keratoconjunctivitis sicca	0		1	0.2%	1	0.2%	0		0	
CORNEA										
70.210 corneal pannus	1	0.4%	0		0		0		0	
70.700 corneal dystrophy	1	0.4%	0		0		0		0	
70.730 corneal endothelial degeneration	0		2	0.5%	1	0.2%	0		0	
UVEA										
93.710 persistent pupillary membranes, iris to iris	8	3.0%	34	8.2%	54	10.2%	12	14.0%		
93.720 persistent pupillary membranes, iris to lens	11	4.1%	3	0.7%	6	1.1%	1	1.2%		
93.730 persistent pupillary membranes, iris to cornea	1	0.4%	3	0.7%	1	0.2%	0			
93.750 persistent pupillary membranes, lens pigment foci/no strands	0		4	1.0%	10	1.9%	0			
93.760 persistent pupillary membranes, endothelial opacity/no strands	0		1	0.2%	3	0.6%	0			
LENS										
100.200 cataract, unspecified	21	7.8%	0		0		0		0	
100.210 cataract, significance unknown	13	4.8%	38	9.1%	50	9.5%	9	10.5%		
100.301 punctate cataract, anterior cortex	1	0.4%	7	1.7%	9	1.7%	0			
100.302 punctate cataract, posterior cortex	1	0.4%	5	1.2%	3	0.6%	0			
100.303 punctate cataract, equatorial cortex	3	1.1%	0		0		0			
100.304 punctate cataract, anterior sutures	1	0.4%	0		0		0			
100.305 punctate cataract, posterior sutures	3	1.1%	5	1.2%	8	1.5%	0			
100.306 punctate cataract, nucleus	2	0.7%	2	0.5%	6	1.1%	0			
100.307 punctate cataract, capsular	0		1	0.2%	7	1.3%	0			
100.311 incipient cataract, anterior cortex	8	3.0%	14	3.4%	9	1.7%	3	3.5%		
100.312 incipient cataract, posterior cortex	9	3.3%	10	2.4%	2	0.4%	0			
100.313 incipient cataract, equatorial cortex	2	0.7%	0		3	0.6%	0			
100.314 incipient cataract, anterior sutures	0		2	0.5%	0		0			
100.315 incipient cataract, posterior sutures	3	1.1%	0		1	0.2%	0			
100.316 incipient cataract, nucleus	3	1.1%	3	0.7%	8	1.5%	0			
100.317 incipient cataract, capsular	0		2	0.5%	7	1.3%	0			
100.322 incomplete cataract, posterior cortex	0		0		2	0.4%	0			
100.325 incomplete cataract, posterior sutures	0		0		2	0.4%	0			
100.330 generalized/complete cataract	15	5.6%	8	1.9%	6	1.1%	0			
VITREOUS										
110.120 persistent hyaloid artery/remnant	0		0		0		1	1.2%		
110.320 vitreous degeneration syneresis	1	0.4%	2	0.5%	6	1.1%	0			
110.330 vitreous degeneration anterior chamber	0		0		3	0.6%	0			
RETINA										
120.170 retinal dysplasia, folds	8	3.0%	16	3.8%	15	2.8%	2	2.3%		
120.180 retinal dysplasia, geographic	2	0.7%	1	0.2%	0		0			

OCULAR DISORDERS REPORT WEST HIGHLAND WHITE TERRIER

RETINA CONTINUED	1991-1999	2000-2009	2010-2013	2014
120.190 retinal dysplasia, detached	1 0.4%	0	0	0
120.310 generalized progressive retinal atrophy (PRA)	9 3.3%	5 1.2%	0	0
120.910 retinal detachment without dialysis	1 0.4%	0	0	0
120.920 retinal detachment with dialysis	0	0	2 0.4%	0
OPTIC NERVE				
130.150 optic disc coloboma	0	1 0.2%	0	0
OTHER				
900.000 other, unspecified	0	13 3.1%	20 3.8%	0
900.100 other, not inherited	6 2.2%	7 1.7%	9 1.7%	11 12.8%
900.110 other, suspected as inherited	4 1.5%	1 0.2%	3 0.6%	0
NORMAL				
0.000 normal globe	180 66.7%	319 76.7%	415 78.6%	60 69.8%

OCULAR DISORDERS REPORT

WHIPPET - 1

WHIPPET

	DISORDER	INHERITANCE	REFERENCE	BREEDING ADVICE
A.	Persistent pupillary membranes - iris to iris - all other forms	Not defined Not defined	1, 2 2	Breeder option NO
B.	Cataract	Not defined	3	NO
C.	Vitreous degeneration	Not defined	2-4	Breeder option
D.	Choroidal hypoplasia (Collie Eye Anomaly) - Staphyloma/coloboma - Retinal detachment - Retinal hemorrhage - Optic nerve coloboma * a DNA test is available	Autosomal recessive	5-7	NO

Description and Comments

A. Persistent pupillary membranes (PPM)

Persistent blood vessel remnants in the anterior chamber of the eye which fail to regress normally by 3 months of age. These strands may bridge from iris to iris, iris to cornea, iris to lens, or form sheets of tissue in the anterior chamber. The last three forms pose the greatest threat to vision and when severe, vision impairment or blindness may occur.

B. Cataract

A partial or complete opacity of the lens and/or its capsule. In cases where cataracts are complete and affect both eyes, blindness results. The prudent approach is to assume cataracts to be hereditary except in cases known to be associated with trauma, other causes of ocular inflammation, specific metabolic diseases, persistent pupillary membrane, persistent hyaloid or nutritional deficiencies. Cataracts may involve the lens completely (diffuse) or in a localized region.

C. Vitreous degeneration

A liquefaction of the vitreous gel which may predispose to retinal detachment. This is a significant problem in this breed.

OCULAR DISORDERS REPORT

WHIPPET - 2

- D. Choroidal hypoplasia
(Collie Eye Anomaly)
- Staphyloma/coloboma
 - Retinal detachment
 - Retinal hemorrhage
 - Optic nerve coloboma

This condition has been identified in the longhaired Whippet. A spectrum of malformations present at birth and ranging from inadequate development of the choroid (choroidal hypoplasia) to defects of the choroid, retina, or optic nerve (coloboma/staphyloma) to complete retinal detachment (with or without hemorrhage). Mildly affected animals will have no detectable vision deficit. This disorder is collectively referred to as "Collie Eye Anomaly". A DNA test is available.

References

There are no references providing detailed descriptions of hereditary ocular conditions of the Whippet breed. The conditions listed above are generally recognized to exist in this breed, as evidenced by identification on breed eye screening examinations and/or clinical experience of veterinary ophthalmologists.

1. ACVO Genetics Committee, 2000-2002 and/or Data from CERF All-Breeds Report, 2000-2002.
2. ACVO Genetics Committee, 2005 and/or Data from CERF All-Breeds Report 2003-2004.
3. ACVO Genetics Committee, 1999 and/or Data from CERF All-Breeds Report, 1991-1998.
4. ACVO Genetics Committee, 2008 and/or Data from CERF All-Breeds Report, 2003-2007.
5. Bedford PG. Collie eye anomaly in the Lancashire heeler. *Vet Rec.* 1998 Sep 26;143:354-356.
6. Parker HG, Kukekova AV, Akey DT, et al. Breed relationships facilitate fine-mapping studies: a 7.8-kb deletion cosegregates with Collie eye anomaly across multiple dog breeds. *Genome Res.* 2007 Nov;17:1562-1571.
7. Lowe JK, Kukekova AV, Kirkness EF, et al. Linkage mapping of the primary disease locus for collie eye anomaly. *Genomics.* 2003;82:86-95.

OCULAR DISORDERS REPORT WHIPPET

Diagnostic Name	TOTAL DOGS EXAMINED		1991-1999 3171		2000-2009 4940		2010-2013 1976		2014 496	
	#	%	#	%	#	%	#	%	#	%
GLOBE										
0.110 microphthalmia	1	0.0%	0		0		0		0	
EYELIDS										
20.140 ectopic cilia	1	0.0%	1	0.0%	0		0		0	
22.000 ectropion, unspecified	0		1	0.0%	0		0		0	
25.110 distichiasis	3	0.1%	4	0.1%	0		0		0	
NICTITANS										
52.110 prolapsed gland of the third eyelid	0		0		1	0.1%	0		0	
CORNEA										
70.210 corneal pannus	0		4	0.1%	0		0		0	
70.700 corneal dystrophy	13	0.4%	16	0.3%	4	0.2%	3	0.6%	0	
70.730 corneal endothelial degeneration	4	0.1%	1	0.0%	0		0		0	
UVEA										
93.120 iris cyst	2	0.1%	9	0.2%	3	0.2%	1	0.2%	0	
93.140 corneal endothelial pigment without PPM	0		1	0.0%	0		0		0	
93.170 anterior chamber cyst	0		0		1	0.1%	0		0	
93.710 persistent pupillary membranes, iris to iris	25	0.8%	44	0.9%	18	0.9%	4	0.8%	0	
93.720 persistent pupillary membranes, iris to lens	3	0.1%	5	0.1%	2	0.1%	0		0	
93.730 persistent pupillary membranes, iris to cornea	3	0.1%	3	0.1%	1	0.1%	2	0.4%	0	
93.740 persistent pupillary membranes, iris sheets	1	0.0%	14	0.3%	1	0.1%	0		0	
93.750 persistent pupillary membranes, lens pigment foci/no strands	0		0		4	0.2%	2	0.4%	0	
93.760 persistent pupillary membranes, endothelial opacity/no strands	0		0		3	0.2%	1	0.2%	0	
LENS										
100.200 cataract, unspecified	11	0.3%	0		0		0		0	
100.210 cataract, significance unknown	92	2.9%	183	3.7%	83	4.2%	25	5.0%	0	
100.301 punctate cataract, anterior cortex	14	0.4%	23	0.5%	7	0.4%	0		0	
100.302 punctate cataract, posterior cortex	6	0.2%	11	0.2%	3	0.2%	0		0	
100.303 punctate cataract, equatorial cortex	9	0.3%	9	0.2%	2	0.1%	0		0	
100.304 punctate cataract, anterior sutures	1	0.0%	3	0.1%	0		0		0	
100.305 punctate cataract, posterior sutures	0		4	0.1%	4	0.2%	0		0	
100.306 punctate cataract, nucleus	4	0.1%	10	0.2%	3	0.2%	0		0	
100.307 punctate cataract, capsular	0		0		2	0.1%	1	0.2%	0	
100.311 incipient cataract, anterior cortex	16	0.5%	23	0.5%	6	0.3%	5	1.0%	0	
100.312 incipient cataract, posterior cortex	11	0.3%	18	0.4%	7	0.4%	0		0	
100.313 incipient cataract, equatorial cortex	10	0.3%	30	0.6%	12	0.6%	2	0.4%	0	
100.314 incipient cataract, anterior sutures	0		1	0.0%	1	0.1%	0		0	
100.315 incipient cataract, posterior sutures	5	0.2%	3	0.1%	0		1	0.2%	0	
100.316 incipient cataract, nucleus	1	0.0%	11	0.2%	0		1	0.2%	0	
100.317 incipient cataract, capsular	0		15	0.3%	3	0.2%	0		0	
100.322 incomplete cataract, posterior cortex	0		0		2	0.1%	0		0	
100.323 incomplete cataract, equatorial cortex	0		0		2	0.1%	0		0	
100.326 incomplete cataract, nucleus	0		0		2	0.1%	0		0	
100.330 generalized/complete cataract	5	0.2%	10	0.2%	0		1	0.2%	0	
100.375 subluxation/luxation, unspecified	13	0.4%	18	0.4%	2	0.1%	0		0	

OCULAR DISORDERS REPORT WHIPPET

	1991-1999	2000-2009	2010-2013	2014
VITREOUS				
110.120 persistant hyaloid artery/remnant	4 0.1%	8 0.2%	2 0.1%	0
110.130 PHPV/PTVL	0	0	1 0.1%	0
110.135 PHPV/PTVL	5 0.2%	4 0.1%	2 0.1%	0
110.200 vitritis	0	0	20 1.0%	7 1.4%
110.320 vitreous degeneration syneresis	175 5.5%	251 5.1%	64 3.2%	8 1.6%
110.330 vitreous degeneration anterior chamber	0	53 1.1%	21 1.1%	0
FUNDUS				
97.110 choroidal hypoplasia	0	18 0.4%	1 0.1%	0
97.120 coloboma	0	4 0.1%	0	0
RETINA				
120.170 retinal dysplasia, folds	4 0.1%	18 0.4%	8 0.4%	0
120.180 retinal dysplasia, geographic	1 0.0%	2 0.0%	0	1 0.2%
120.190 retinal dysplasia, detached	1 0.0%	2 0.0%	1 0.1%	0
120.200 retinitis	0	0	1 0.1%	0
120.310 generalized progressive retinal atrophy (PRA)	14 0.4%	22 0.4%	2 0.1%	0
120.400 retinal hemorrhage	0	0	1 0.1%	0
120.910 retinal detachment without dialysis	1 0.0%	3 0.1%	0	0
120.960 retinopathy	0	0	5 0.3%	0
OPTIC NERVE				
130.110 micropapilla	0	3 0.1%	0	0
130.120 optic nerve hypoplasia	2 0.1%	1 0.0%	0	0
130.150 optic disc coloboma	5 0.2%	8 0.2%	1 0.1%	0
OTHER				
900.000 other, unspecified	0	28 0.6%	86 4.4%	0
900.100 other, not inherited	26 0.8%	205 4.1%	28 1.4%	26 5.2%
900.110 other, suspected as inherited	25 0.8%	7 0.1%	13 0.7%	1 0.2%
NORMAL				
0.000 normal globe	2779 87.6%	4396 89.0%	1859 94.1%	461 92.9%

OCULAR DISORDERS REPORT

WIRE FOX TERRIER - 1

WIRE FOX TERRIER*

*The Wire Fox Terrier and the Smooth Fox Terrier were originally considered two varieties of the same breed. They became separate breeds in 1985. It is likely that the same genetic diseases exist in both breeds

	DISORDER	INHERITANCE	REFERENCE	BREEDING ADVICE
A.	Glaucoma	Not defined	1, 2	NO
B.	Cataract	Not defined	1	NO
C.	Lens luxation * a DNA test is available	Not defined	3	NO
D.	Persistent pupillary membranes			
	- iris to iris	Not defined	4, 5	Breeder option
	- all other forms	Not defined	4	NO

Description and Comments

A. Glaucoma

Glaucoma is characterized by an elevation of intraocular pressure (IOP) which, when sustained, causes intraocular damage resulting in blindness. The elevated IOP occurs because the fluid cannot leave through the iridocorneal angle. Diagnosis and classification of glaucoma requires measurement of the intraocular pressure (tonometry) and examination of the iridocorneal angle (gonioscopy). Neither of these tests are part of a routine breed eye screening exam.

B. Cataract

A partial or complete opacity of the lens and/or its capsule. In cases where cataracts are complete and affect both eyes, blindness results. The prudent approach is to assume cataracts to be hereditary except in cases known to be associated with trauma, other causes of ocular inflammation, specific metabolic diseases, persistent pupillary membrane, persistent hyaloid or nutritional deficiencies. Cataracts may involve the lens completely (diffuse) or in a localized region. The cataracts observed in this breed begin in the posterior subcapsular region and are progressive.

OCULAR DISORDERS REPORT

WIRE FOX TERRIER - 2

C. Lens luxation

Partial (subluxation) or complete displacement of the lens from the normal anatomic site behind the pupil. Lens luxation not associated with trauma or inflammation is presumed to be inherited. Lens luxation may result in elevated intraocular pressure (glaucoma) causing vision impairment or blindness. A DNA test is available.

D. Persistent pupillary membranes (PPM)

Persistent blood vessel remnants in the anterior chamber of the eye which fail to regress normally by 3 months of age. These strands may bridge from iris to iris, iris to cornea, iris to lens, or form sheets of tissue in the anterior chamber. The last three forms pose the greatest threat to vision and when severe, vision impairment or blindness may occur.

References

1. ACVO Genetics Committee, 1999 and/or Data from CERF All-Breeds Report, 1991-1998.
2. Martin CL and Wyman M. Primary glaucoma in the dog. *Vet Clin North Am.* 1978 May;8:257-286.
3. Gould D, Pettitt L, McLaughlin B, et al. ADAMTS17 mutation associated with primary lens luxation is widespread among breeds. *Vet Ophthalmol.* 2011 Nov;14:378-384.
4. ACVO Genetics Committee, 2000-2002 and/or Data from CERF All-Breeds Report, 2000-2002.
5. ACVO Genetics Committee, 2005 and/or Data from CERF All-Breeds Report 2003-2004.

OCULAR DISORDERS REPORT

WIRE FOX TERRIER

Diagnostic Name	TOTAL DOGS EXAMINED	1991-1999		2000-2009		2010-2013		2014	
		#	%	#	%	#	%	#	%
GLOBE									
0.110 microphthalmia		1	1.3%	0		0		0	
EYELIDS									
25.110 distichiasis		3	4.0%	2	1.6%	2	2.1%	0	
CORNEA									
70.700 corneal dystrophy		2	2.7%	0		1	1.1%	0	
70.730 corneal endothelial degeneration		1	1.3%	0		0		0	
UVEA									
93.710 persistent pupillary membranes, iris to iris		9	12.0%	42	33.3%	38	40.0%	11	52.4%
93.720 persistent pupillary membranes, iris to lens		2	2.7%	1	0.8%	0		0	
93.730 persistent pupillary membranes, iris to cornea		2	2.7%	3	2.4%	0		0	
93.740 persistent pupillary membranes, iris sheets		0		1	0.8%	0		0	
LENS									
100.200 cataract, unspecified		4	5.3%	0		0		0	
100.210 cataract, significance unknown		0		1	0.8%	2	2.1%	0	
100.301 punctate cataract, anterior cortex		0		2	1.6%	0		1	4.8%
100.304 punctate cataract, anterior sutures		0		0		1	1.1%	0	
100.311 incipient cataract, anterior cortex		1	1.3%	2	1.6%	2	2.1%	0	
100.312 incipient cataract, posterior cortex		1	1.3%	3	2.4%	0		0	
100.313 incipient cataract, equatorial cortex		0		1	0.8%	0		0	
100.314 incipient cataract, anterior sutures		0		1	0.8%	0		0	
100.321 incomplete cataract, anterior cortex		0		0		2	2.1%	0	
100.322 incomplete cataract, posterior cortex		0		0		2	2.1%	0	
100.326 incomplete cataract, nucleus		0		0		2	2.1%	0	
100.330 generalized/complete cataract		1	1.3%	6	4.8%	0		0	
VITREOUS									
110.120 persistent hyaloid artery/remnant		0		1	0.8%	0		0	
110.320 vitreous degeneration syneresis		0		1	0.8%	0		0	
RETINA									
120.170 retinal dysplasia, folds		1	1.3%	0		0		0	
120.310 generalized progressive retinal atrophy (PRA)		0		4	3.2%	0		0	
OTHER									
900.000 other, unspecified		0		1	0.8%	2	2.1%	0	
900.100 other, not inherited		0		12	9.5%	0		0	
900.110 other, suspected as inherited		0		1	0.8%	0		0	
NORMAL									
0.000 normal globe		54	72.0%	74	58.7%	59	62.1%	17	81.0%

OCULAR DISORDERS REPORT

WIREHAIRD POINTING GRIFFON - 1

WIREHAIRD POINTING GRIFFON

	DISORDER	INHERITANCE	REFERENCE	BREEDING ADVICE
A.	Corneal dystrophy - endothelial	Not defined	1	Breeder option

Description and Comments

A. Corneal dystrophy - endothelial

Corneal endothelial dystrophy is an abnormal loss of the inner lining of the cornea that causes progressive fluid retention (edema). With time the edema results in keratitis and decreased vision. This usually does not occur until the animal is older.

References

There are no references providing detailed descriptions of hereditary ocular conditions of the Wirehaired Pointing Griffon breed. The conditions listed above are generally recognized to exist in this breed, as evidenced by identification on breed eye screening examinations and/or clinical experience of veterinary ophthalmologists.

1. ACVO Genetics Committee, 2002-2003 and/or Data from CERF All-Breeds Report, 2002-2003.

OCULAR DISORDERS REPORT WIREHAired POINTING GRIFFON

Diagnostic Name	TOTAL DOGS EXAMINED	1991-1999		2000-2009		2010-2013		2014	
		#	%	#	%	#	%	#	%
EYELIDS									
21.000	entropion, unspecified	1	2.2%	2	1.3%	0		0	
25.110	distichiasis	0		1	0.6%	0		1	1.8%
CORNEA									
70.700	corneal dystrophy	0		0		1	0.6%	0	
70.730	corneal endothelial degeneration	2	4.3%	1	0.6%	0		0	
UVEA									
93.710	persistent pupillary membranes, iris to iris	0		1	0.6%	2	1.2%	3	5.4%
93.750	persistent pupillary membranes, lens pigment foci/no strands	0		0		1	0.6%	0	
LENS									
100.210	cataract, significance unknown	0		2	1.3%	25	14.7%	3	5.4%
100.301	punctate cataract, anterior cortex	0		0		3	1.8%	0	
100.302	punctate cataract, posterior cortex	0		0		1	0.6%	0	
100.306	punctate cataract, nucleus	0		1	0.6%	0		0	
100.311	incipient cataract, anterior cortex	1	2.2%	0		1	0.6%	0	
100.313	incipient cataract, equatorial cortex	0		1	0.6%	0		0	
100.316	incipient cataract, nucleus	0		0		2	1.2%	0	
VITREOUS									
110.320	vitreous degeneration syneresis	0		0		5	2.9%	0	
110.330	vitreous degeneration anterior chamber	0		0		2	1.2%	0	
RETINA									
120.170	retinal dysplasia, folds	0		1	0.6%	3	1.8%	0	
120.180	retinal dysplasia, geographic	0		1	0.6%	0		0	
120.400	retinal hemorrhage	1	2.2%	0		0		0	
OTHER									
900.000	other, unspecified	0		1	0.6%	5	2.9%	0	
900.100	other, not inherited	0		2	1.3%	3	1.8%	2	3.6%
900.110	other, suspected as inherited	0		0		2	1.2%	0	
NORMAL									
0.000	normal globe	41	89.1%	147	93.0%	153	90.0%	51	91.1%

OCULAR DISORDERS REPORT

WIREHAired VIZSLA - 1

WIREHAired VIZSLA

	DISORDER	INHERITANCE	REFERENCE	BREEDING ADVICE
A.	Persistent pupillary membranes			
	- iris to iris	Not defined	1,2	Breeder option
	- all other forms	Not defined	2	NO
B.	Cataract	Not defined	1	NO

Description and Comments

A. Persistent pupillary membranes

Persistent blood vessel remnants in the anterior chamber of the eye which fail to regress normally by 3 months of age. These strands may bridge from iris to iris, iris to cornea, iris to lens, or form sheets of tissue in the anterior chamber. The last three forms pose the greatest threat to vision and when severe, vision impairment or blindness may occur.

B. Cataract

A partial or complete opacity of the lens and/or its capsule. In cases where cataracts are complete and affect both eyes, blindness results. The prudent approach is to assume cataracts to be hereditary except in cases known to be associated with trauma, other causes of ocular inflammation, specific metabolic diseases, persistent pupillary membrane, persistent hyaloid or nutritional deficiencies. Cataracts may involve the lens completely (diffuse) or in a localized region.

References

There are no references providing detailed descriptions of hereditary conditions of the Wirehaired Vizsla breed. The conditions listed above are generally recognized to exist in this breed, as evidenced by identification on breed eye screening examinations and/or clinical experience of veterinary ophthalmologists.

1. ACVO Genetics Committee, 1999 and/or Data from CERF All-Breeds Report, 1991-1998.
2. ACVO Genetics Committee, 2005 and/or Data from CERF All-Breeds Report 2003-2004.

OCULAR DISORDERS REPORT WIREHAISED VIZSLA

Diagnostic Name	TOTAL DOGS EXAMINED	1991-1999		2000-2009		2010-2013		2014	
		#	%	#	%	#	%	#	%
NICTITANS									
52.110 prolapsed gland of the third eyelid		0		0		3	3.7%	0	
UVEA									
93.710 persistent pupillary membranes, iris to iris		0		0		7	8.6%	0	
93.750 persistent pupillary membranes, lens pigment foci/no strands		0		0		7	8.6%	1	5.6%
LENS									
100.210 cataract, significance unknown		0		0		10	12.3%	3	16.7%
VITREOUS									
110.330 vitreous degeneration anterior chamber		0		0		1	1.2%	0	
RETINA									
120.910 retinal detachment without dialysis		0		0		1	1.2%	0	
OTHER									
900.000 other, unspecified		0		0		4	4.9%	0	
900.100 other, not inherited		0		0		2	2.5%	0	
NORMAL									
0.000 normal globe		0		5	100.0%	75	92.6%	16	88.9%

OCULAR DISORDERS REPORT

YORKSHIRE TERRIER - 1

YORKSHIRE TERRIER

	DISORDER	INHERITANCE	REFERENCE	BREEDING ADVICE
A.	Keratoconjunctivitis sicca (dry eye)	Not defined	1,2	NO
B.	Distichiasis	Not defined	3	Breeder option
C.	Corneal dystrophy - epithelial/stromal	Not defined	4	Breeder option
D.	Persistent pupillary membranes - iris to iris - all other forms	Not defined Not defined	1,3 3	Breeder option NO
E.	Cataract	Not defined	1	NO
F.	Lens luxation *a DNA is available	Not defined	5,6	NO
G.	Retinal atrophy - generalized *a DNA test is available	Not defined	1	NO
H.	Retinal dysplasia - geographic/detached	Not defined	4,7	NO
I.	Ligneous conjunctivitis	Not defined	8	NO

Description and Comment

A. Keratoconjunctivitis sicca (dry eye)

An abnormality of the tear film, most commonly a deficiency of the aqueous portion, although the mucin and/or lipid layers may be affected; results in ocular irritation and/or vision impairment.

B. Distichiasis

Eyelashes abnormally located on the eyelid margin which may cause ocular irritation. Distichiasis may occur at any time in the life of a dog. It is difficult to make a strong

©2014, American College of Veterinary Ophthalmologists

OCULAR DISORDERS REPORT

YORKSHIRE TERRIER - 2

recommendation with regards to breeding dogs with this entity. The hereditary basis has not been established although it seems probable due to the high incidence in some breeds. Reducing the incidence is a logical goal. When diagnosed, distichiasis should be recorded. Breeding discretion is advised.

C. Corneal dystrophy-epithelial/stromal

A non-inflammatory corneal opacity (white to gray) present in one or more of the corneal layers; usually inherited and bilateral.

D. Persistent pupillary membranes (PPM)

Persistent blood vessel remnants in the anterior chamber of the eye which fail to regress normally by 3 months of age. These strands may bridge from iris to iris, iris to cornea, iris to lens, or form sheets of tissue in the anterior chamber. The last three forms pose the greatest threat to vision and when severe, vision impairment or blindness may occur.

E. Cataract

A partial or complete opacity of the lens and/or its capsule. In cases where cataracts are complete and affect both eyes, blindness results. The prudent approach is to assume cataracts to be hereditary except in cases known to be associated with trauma, other causes of ocular inflammation, specific metabolic diseases, persistent pupillary membrane, persistent hyaloid or nutritional deficiencies. Cataracts may involve the lens completely (diffuse) or in a localized region.

F. Lens luxation

Partial (subluxation) or complete displacement of the lens from the normal anatomic site behind the pupil. Lens luxation not associated with trauma or inflammation is presumed to be inherited. Lens luxation may result in elevated intraocular pressure (glaucoma) causing vision impairment or blindness. A DNA test is available.

G. Retinal atrophy - generalized

A degenerative disease of the retinal visual cells which progresses to blindness. This abnormality, also known as progressive retinal atrophy or PRA, may be detected by electroretinogram (not part of a routine eye screening examination) before it is apparent clinically. PRA is inherited as an autosomal recessive trait in most breeds.

H. Retinal dysplasia - geographic / detached

Abnormal development of the retina present at birth.

Retinal dysplasia - geographic: Any irregularly shaped area of abnormal retinal development containing both areas of thinning and areas of elevation representing folds and retinal disorganization.

OCULAR DISORDERS REPORT

YORKSHIRE TERRIER - 3

Retinal dysplasia - detached: Severe retinal disorganization associated with separation (detachment) of the retina.

These two forms are associated with vision impairment or blindness. Retinal dysplasia is known to be inherited in many breeds. The genetic relationship between the three forms of retinal dysplasia is not known for all breeds.

I. Ligneous conjunctivitis

A rare type of conjunctivitis characterized by the formation of thick membranes covering conjunctiva of the nictitans and eyelids of affected dogs. This condition has been diagnosed in four unrelated Doberman Pinschers, three of which had life-threatening systemic disease. Ligneous conjunctivitis has also been reported in one Yorkshire terrier.

References

1. ACVO Genetics Committee, 1999 and/or Data from CERF All-Breeds Report, 1991-1998.
2. Herrera HD, Weichsler N, Gomez JR, et al. Severe, unilateral, unresponsive keratoconjunctivitis sicca in 16 juvenile Yorkshire Terriers. *Vet Ophthalmol.* 2007;10:285-288.
3. ACVO Genetics Committee, 2005 and/or Data from CERF All-Breeds Report 2003-2004.
4. Walde I. Retinal and corneal dysplasias in the Yorkshire terrier and other breeds in Austria. *Tiereztliche Praxix.* 1997;25:62.
5. Farias FH, Johnson GS, Taylor JF, et al. An ADAMTS17 splice donor site mutation in dogs with primary lens luxation. *Invest Ophthalmol Vis Sci.* 2010;51:4716-4721.
6. Gould D, Pettitt L, McLaughlin B, et al. ADAMTS17 mutation associated with primary lens luxation is widespread among breeds. *Vet Ophthalmol.* 2011;14:378-384.
7. Stades FC. Hereditary retinal dysplasia (RD) in a family of Yorkshire terriers. *Tijdschr Diergeneeskd.* 1978;103:1087-1090.
8. Torres MD, Leiva M, Tabar MD, et al. Ligneous conjunctivitis in a plasminogen-deficient dog: clinical management and 2-year follow-up. *Vet Ophthalmol.* 2009;12:248-253.

OCULAR DISORDERS REPORT YORKSHIRE TERRIER

Diagnostic Name	TOTAL DOGS EXAMINED		1991-1999		2000-2009		2010-2013		2014	
	#	%	#	%	#	%	#	%	#	%
GLOBE										
0.110 microphthalmia	2	0.5%	1	0.2%	0		0		0	
10.000 glaucoma	0		1	0.2%	0		0		0	
EYELIDS										
25.110 distichiasis	2	0.5%	10	2.5%	17	3.0%	4	3.1%		
NASOLACRIMAL										
40.910 keratoconjunctivitis sicca	1	0.2%	3	0.7%	1	0.2%	0			
NICTITANS										
52.110 prolapsed gland of the third eyelid	0		0		1	0.2%	0			
CORNEA										
70.210 corneal pannus	4	1.0%	0		0		0		0	
70.220 pigmentary keratitis	0		0		0		1	0.8%		
70.700 corneal dystrophy	3	0.7%	4	1.0%	4	0.7%	0			
70.730 corneal endothelial degeneration	0		1	0.2%	0		0			
UVEA										
93.110 iris hypoplasia	0		0		2	0.4%	0			
93.710 persistent pupillary membranes, iris to iris	21	5.2%	37	9.2%	81	14.4%	19	14.5%		
93.720 persistent pupillary membranes, iris to lens	0		4	1.0%	0		0			
93.730 persistent pupillary membranes, iris to cornea	0		3	0.7%	0		0			
93.750 persistent pupillary membranes, lens pigment foci/no strands	0		0		6	1.1%	3	2.3%		
93.760 persistent pupillary membranes, endothelial opacity/no strands	0		0		1	0.2%	0			
LENS										
100.200 cataract, unspecified	23	5.7%	0		0		0		0	
100.210 cataract, significance unknown	8	2.0%	16	4.0%	22	3.9%	4	3.1%		
100.301 punctate cataract, anterior cortex	5	1.2%	6	1.5%	16	2.8%	1	0.8%		
100.302 punctate cataract, posterior cortex	2	0.5%	3	0.7%	4	0.7%	0			
100.303 punctate cataract, equatorial cortex	3	0.7%	1	0.2%	1	0.2%	0			
100.304 punctate cataract, anterior sutures	0		1	0.2%	1	0.2%	0			
100.305 punctate cataract, posterior sutures	1	0.2%	0		1	0.2%	1	0.8%		
100.306 punctate cataract, nucleus	1	0.2%	0		0		0			
100.311 incipient cataract, anterior cortex	6	1.5%	7	1.7%	8	1.4%	1	0.8%		
100.312 incipient cataract, posterior cortex	5	1.2%	6	1.5%	4	0.7%	0			
100.313 incipient cataract, equatorial cortex	3	0.7%	5	1.2%	8	1.4%	0			
100.314 incipient cataract, anterior sutures	0		1	0.2%	1	0.2%	0			
100.315 incipient cataract, posterior sutures	3	0.7%	0		0		0			
100.316 incipient cataract, nucleus	2	0.5%	1	0.2%	0		0			
100.317 incipient cataract, capsular	0		0		1	0.2%	0			
100.321 incomplete cataract, anterior cortex	0		0		3	0.5%	0			
100.326 incomplete cataract, nucleus	0		0		2	0.4%	0			
100.330 generalized/complete cataract	15	3.7%	12	3.0%	0		0			
100.375 subluxation/luxation, unspecified	0		1	0.2%	0		0			

OCULAR DISORDERS REPORT YORKSHIRE TERRIER

	1991-1999	2000-2009	2010-2013	2014
VITREOUS				
110.120 persistant hyaloid artery/remnant	1 0.2%	0	0	1 0.8%
110.135 PHPV/PTVL	3 0.7%	0	1 0.2%	0
110.200 vitritis	0	0	0	1 0.8%
110.320 vitreous degeneration syneresis	5 1.2%	3 0.7%	3 0.5%	1 0.8%
110.330 vitreous degeneration anterior chamber	0	2 0.5%	3 0.5%	0
RETINA				
120.170 retinal dysplasia, folds	0	2 0.5%	4 0.7%	1 0.8%
120.200 retinitis	0	0	0	2 1.5%
120.310 generalized progressive retinal atrophy (PRA)	30 7.4%	13 3.2%	8 1.4%	0
OPTIC NERVE				
130.120 optic nerve hypoplasia	3 0.7%	0	0	0
130.150 optic disc coloboma	0	0	1 0.2%	0
OTHER				
900.000 other, unspecified	0	9 2.2%	10 1.8%	0
900.100 other, not inherited	2 0.5%	20 5.0%	1 0.2%	6 4.6%
900.110 other, suspected as inherited	5 1.2%	6 1.5%	4 0.7%	1 0.8%
NORMAL				
0.000 normal globe	294 73.0%	323 80.1%	440 78.2%	106 80.9%