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# MOANA

## Veterinary Report by Embark

embarkvet.com

Test Date: April 16th, 2021

### Customer-supplied information

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Owner Name: Franklin Dobermans

Dog Name: Moana

Sex: Female (intact)

Date of birth: 03/03/18

Breed type: purebred

Breed: n/a

Breed registration: n/a

Microchip: n/a

### Genetic summary

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Genetic breed identification:

**Doberman Pinscher**

Breed mix:

 **Doberman Pinscher: 100.0%**

Predicted adult weight: **63 lbs**

Calculated from 17 size genes.

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Genetic age: **35 human years**

Human equivalent age based on size, date of birth provided, and other factors

# Clinical Tools

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These clinical genetic tools can inform clinical decisions and diagnoses. These tools do not predict increased risk for disease.

## **Alanine Aminotransferase Activity (GPT)**

 Moana's baseline ALT level may be Low Normal

### **Why is this important to your vet?**

Moana has one copy of a variant associated with reduced ALT activity as measured on veterinary blood chemistry panels. Please inform your veterinarian that Moana has this genotype, as ALT is often used as an indicator of liver health and Moana is likely to have a lower than average resting ALT activity. As such, an increase in Moana's ALT activity could be evidence of liver damage, even if it is within normal limits by standard ALT reference ranges.

### **What is Alanine Aminotransferase Activity?**

Alanine aminotransferase (ALT) is a clinical tool that can be used by veterinarians to better monitor liver health. This result is not associated with liver disease. ALT is one of several values veterinarians measure on routine blood work to evaluate the liver. It is a naturally occurring enzyme located in liver cells that helps break down protein. When the liver is damaged or inflamed, ALT is released into the bloodstream.

### **How vets diagnose this condition**

Genetic testing is the only way to provide your veterinarian with this clinical tool.

### **How this condition is treated**

Veterinarians may recommend blood work to establish a baseline ALT value for healthy dogs with one or two copies of this variant.

# Health Report

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## How to interpret Moana's genetic health results:

If Moana inherited any of the variants that we tested, they will be listed at the top of the Health Report section, along with a description of how to interpret this result. We also include all of the variants that we tested Moana for that we did not detect the risk variant for.

## A genetic test is not a diagnosis

This genetic test does not diagnose a disease. Please talk to your vet about your dog's genetic results, or if you think that your pet may have a health condition or disease.



**Moana is at increased risk for one genetic health condition.**

**Dilated Cardiomyopathy, DCM1**



**Breed-Relevant Genetic Conditions**

**4 variants not detected**



**Additional Genetic Conditions**


**201 variants not detected**



# Health Report

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## Dilated Cardiomyopathy, DCM1 (PDK4, Doberman Pinscher Variant 1)

 Moana inherited one copy of the variant we tested

Moana is at increased risk for DCM1

### How to interpret this result

Moana has one copy of a variant in the PDK4 gene associated with increased risk for DCM in the American Doberman Pinscher. This variant, also referred to as DCM1, is inherited in a dominant manner, meaning having one or two copies of this variant is thought to confer the same amount of risk. However, the variant is thought to have incomplete penetrance: That is, not all dogs with this variant will ultimately show signs of DCM. Moreover, the impact of this variant in other breeds of dog besides the Doberman has yet to be fully understood. However, if your veterinarian thinks Moana shows signs of having DCM based on their diagnostic testing, you now have the opportunity to discuss early treatment. Please consult with your veterinarian regarding a diagnostic and treatment plan for Moana.

### What is Dilated Cardiomyopathy, DCM1?

DCM is the most common acquired heart disease of adult dogs. The heart has two heavily muscled ventricles that pump blood away from the heart. This disease causes progressive weakening of the ventricles by reducing the muscle mass, which causes the ventricles to dilate. Dilated ventricles do not contract and circulate oxygenated blood well, which eventually leads to heart failure.

### When signs & symptoms develop in affected dogs

This disease can rarely be seen in puppies and young adults. It is typically seen in middle aged to older dogs.

### Signs & symptoms

In the early stages of DCM, you will likely not notice any changes in your dog. DCM typically presents at the end stages of the disease, when the heart is failing. Signs include weakness, cold toes and ears, blue-grey gums and tongue, and respiratory distress. If you see these signs, take your dog immediately to an emergency veterinarian!

### How vets diagnose this condition

The earlier a diagnosis can be reached, the better the outcome. If you are concerned about your dog's heart, discuss it with your veterinarian who can run basic preliminary tests. They may recommend a visit to a veterinary cardiologist for a complete evaluation, including an ultrasound of the heart (echocardiogram).

### How this condition is treated

Treatment is completely dependent on how advanced the disease is at the time of diagnosis. It can range from monitoring the patient periodically to intensive hospitalization at specialty veterinary practices.

### **Actions to take if your dog is affected**

- The cause of this disease is multifactorial and not completely understood. Genetics, nutrition, infections and environmental exposures can all play a role in the development of DCM. In fact, DCM has recently been featured extensively in the news due to suspected nutritional deficiencies in some grain free diets.
- Annual echocardiograms by a board certified cardiologist and annual Holter monitoring are the best ways to diagnose DCM early.

# Breed-Relevant Conditions Tested

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Moana did not have the variants that we tested for, that are relevant to her breed:

- ✔ Von Willebrand Disease Type I, Type I vWD (VWF)
- ✔ Deafness and Vestibular Syndrome of Dobermans, DVDob, DINGS (MYO7A)
- ✔ Dilated Cardiomyopathy, DCM2 (TTN, Doberman Pinscher Variant 2)
- ✔ Ehlers Danlos (ADAMTS2, Doberman Pinscher Variant)

# Additional Conditions Tested

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 Moana did not have the variants that we tested for, in the following conditions that the potential effect on dogs with Moana's breed may not yet be known.

- ✓ MDR1 Drug Sensitivity (ABCB1)
- ✓ P2Y12 Receptor Platelet Disorder (P2Y12)
- ✓ Factor IX Deficiency, Hemophilia B (F9 Exon 7, Terrier Variant)
- ✓ Factor IX Deficiency, Hemophilia B (F9 Exon 7, Rhodesian Ridgeback Variant)
- ✓ Factor VII Deficiency (F7 Exon 5)
- ✓ Factor VIII Deficiency, Hemophilia A (F8 Exon 10, Boxer Variant)
- ✓ Factor VIII Deficiency, Hemophilia A (F8 Exon 11, German Shepherd Variant 1)
- ✓ Factor VIII Deficiency, Hemophilia A (F8 Exon 1, German Shepherd Variant 2)
- ✓ Thrombopathia (RASGRP1 Exon 5, Basset Hound Variant)
- ✓ Thrombopathia (RASGRP1 Exon 8, Landseer Variant)
- ✓ Thrombopathia (RASGRP1 Exon 5, American Eskimo Dog Variant)
- ✓ Von Willebrand Disease Type III, Type III vWD (VWF Exon 4, Terrier Variant)
- ✓ Von Willebrand Disease Type III, Type III vWD (VWF Exon 7, Shetland Sheepdog Variant)
- ✓ Von Willebrand Disease Type II, Type II vWD (VWF, Pointer Variant)
- ✓ Canine Leukocyte Adhesion Deficiency Type I, CLADI (ITGB2, Setter Variant)
- ✓ Canine Leukocyte Adhesion Deficiency Type III, CLADIII (FERMT3, German Shepherd Variant)
- ✓ Congenital Macrothrombocytopenia (TUBB1 Exon 1, Cairn and Norfolk Terrier Variant)
- ✓ Canine Elliptocytosis (SPTB Exon 30)
- ✓ Glanzmann's Thrombasthenia Type I (ITGA2B Exon 13, Great Pyrenees Variant)
- ✓ Glanzmann's Thrombasthenia Type I (ITGA2B Exon 12, Otterhound Variant)
- ✓ May-Hegglin Anomaly (MYH9)
- ✓ Prekallikrein Deficiency (KLKB1 Exon 8)
- ✓ Pyruvate Kinase Deficiency (PKLR Exon 5, Basenji Variant)
- ✓ Pyruvate Kinase Deficiency (PKLR Exon 7, Labrador Retriever Variant)

# Additional Conditions Tested

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- ✔ Pyruvate Kinase Deficiency (PKLR Exon 7, Pug Variant)
- ✔ Pyruvate Kinase Deficiency (PKLR Exon 7, Beagle Variant)
- ✔ Pyruvate Kinase Deficiency (PKLR Exon 10, Terrier Variant)
- ✔ Trapped Neutrophil Syndrome, TNS (VPS13B)
- ✔ Ligneous Membranitis, LM (PLG)
- ✔ Platelet Factor X Receptor Deficiency, Scott Syndrome (TMEM16F)
- ✔ Methemoglobinemia (CYB5R3)
- ✔ Congenital Hypothyroidism (TPO, Tenterfield Terrier Variant)
- ✔ Congenital Hypothyroidism (TPO, Rat, Toy, Hairless Terrier Variant)
- ✔ Complement 3 Deficiency, C3 Deficiency (C3)
- ✔ Severe Combined Immunodeficiency, SCID (PRKDC, Terrier Variant)
- ✔ Severe Combined Immunodeficiency, SCID (RAG1, Wetterhoun Variant)
- ✔ X-linked Severe Combined Immunodeficiency, X-SCID (IL2RG Exon 1, Basset Hound Variant)
- ✔ X-linked Severe Combined Immunodeficiency, X-SCID (IL2RG, Corgi Variant)
- ✔ Progressive Retinal Atrophy, rcd1 (PDE6B Exon 21, Irish Setter Variant)
- ✔ Progressive Retinal Atrophy, rcd3 (PDE6A)
- ✔ Progressive Retinal Atrophy, CNGA (CNGA1 Exon 9)
- ✔ Progressive Retinal Atrophy, prcd (PRCD Exon 1)
- ✔ Progressive Retinal Atrophy, PRA1 (CNGB1)
- ✔ Progressive Retinal Atrophy (SAG)
- ✔ Golden Retriever Progressive Retinal Atrophy 1, GR-PRA1 (SLC4A3)
- ✔ Golden Retriever Progressive Retinal Atrophy 2, GR-PRA2 (TTC8)
- ✔ Progressive Retinal Atrophy, crd1 (PDE6B, American Staffordshire Terrier Variant)
- ✔ Progressive Retinal Atrophy, crd4/crd1 (RPGRIP1)



# Additional Conditions Tested

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- ✔ X-Linked Progressive Retinal Atrophy 1, XL-PRA1 (RPGR)
- ✔ Progressive Retinal Atrophy, PRA3 (FAM161A)
- ✔ Collie Eye Anomaly, Choroidal Hypoplasia, CEA (NHEJ1)
- ✔ Day blindness, Cone Degeneration, Achromatopsia (CNGB3 Exon 6, German Shorthaired Pointer Variant)
- ✔ Achromatopsia (CNGA3 Exon 7, German Shepherd Variant)
- ✔ Achromatopsia (CNGA3 Exon 7, Labrador Retriever Variant)
- ✔ Autosomal Dominant Progressive Retinal Atrophy (RHO)
- ✔ Canine Multifocal Retinopathy, cmr1 (BEST1 Exon 2)
- ✔ Canine Multifocal Retinopathy, cmr2 (BEST1 Exon 5, Coton de Tulear Variant)
- ✔ Canine Multifocal Retinopathy, cmr3 (BEST1 Exon 10 Deletion, Finnish and Swedish Lapphund, Lapponian Herder Variant)
- ✔ Primary Open Angle Glaucoma (ADAMTS10 Exon 9, Norwegian Elkhound Variant)
- ✔ Primary Open Angle Glaucoma (ADAMTS10 Exon 17, Beagle Variant)
- ✔ Primary Open Angle Glaucoma (ADAMTS17 Exon 11, Basset Fauve de Bretagne Variant)
- ✔ Primary Open Angle Glaucoma and Primary Lens Luxation (ADAMTS17 Exon 2, Chinese Shar-Pei Variant)
- ✔ Goniodysgenesis and Glaucoma, Pectinate Ligament Dysplasia, PLD (OLFM3)
- ✔ Hereditary Cataracts, Early-Onset Cataracts, Juvenile Cataracts (HSF4 Exon 9, Australian Shepherd Variant)
- ✔ Primary Lens Luxation (ADAMTS17)
- ✔ Congenital Stationary Night Blindness (RPE65, Briard Variant)
- ✔ Congenital Stationary Night Blindness (LRIT3, Beagle Variant)
- ✔ Macular Corneal Dystrophy, MCD (CHST6)
- ✔ 2,8-Dihydroxyadenine Urolithiasis, 2,8-DHA Urolithiasis (APRT)
- ✔ Cystinuria Type I-A (SLC3A1, Newfoundland Variant)
- ✔ Cystinuria Type II-A (SLC3A1, Australian Cattle Dog Variant)
- ✔ Cystinuria Type II-B (SLC7A9, Miniature Pinscher Variant)

# Additional Conditions Tested

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- ✔ **Hyperuricosuria and Hyperuricemia or Urolithiasis, HUU (SLC2A9)**
- ✔ **Polycystic Kidney Disease, PKD (PKD1)**
- ✔ **Primary Hyperoxaluria (AGXT)**
- ✔ **Protein Losing Nephropathy, PLN (NPHS1)**
- ✔ **X-Linked Hereditary Nephropathy, XLHN (COL4A5 Exon 35, Samoyed Variant 2)**
- ✔ **Autosomal Recessive Hereditary Nephropathy, Familial Nephropathy, ARHN (COL4A4 Exon 3, Cocker Spaniel Variant)**
- ✔ **Primary Ciliary Dyskinesia, PCD (CCDC39 Exon 3, Old English Sheepdog Variant)**
- ✔ **Primary Ciliary Dyskinesia, PCD (NME5, Alaskan Malamute Variant)**
- ✔ **Congenital Keratoconjunctivitis Sicca and Ichthyosiform Dermatitis, Dry Eye Curly Coat Syndrome, CKCSID (FAM83H Exon 5)**
- ✔ **X-linked Ectodermal Dysplasia, Anhidrotic Ectodermal Dysplasia, XHED (EDA Intron 8)**
- ✔ **Renal Cystadenocarcinoma and Nodular Dermatofibrosis, RCND (FLCN Exon 7)**
- ✔ **Canine Fucosidosis (FUCA1)**
- ✔ **Glycogen Storage Disease Type II, Pompe's Disease, GSD II (GAA, Finnish and Swedish Lapphund, Lapponian Herder Variant)**
- ✔ **Glycogen Storage Disease Type IA, Von Gierke Disease, GSD IA (G6PC, Maltese Variant)**
- ✔ **Glycogen Storage Disease Type IIIA, GSD IIIA (AGL, Curly Coated Retriever Variant)**
- ✔ **Mucopolysaccharidosis Type IIIA, Sanfilippo Syndrome Type A, MPS IIIA (SGSH Exon 6, Dachshund Variant)**
- ✔ **Mucopolysaccharidosis Type IIIA, Sanfilippo Syndrome Type A, MPS IIIA (SGSH Exon 6, New Zealand Huntaway Variant)**
- ✔ **Mucopolysaccharidosis Type VII, Sly Syndrome, MPS VII (GUSB Exon 5, Terrier Brasileiro Variant)**
- ✔ **Mucopolysaccharidosis Type VII, Sly Syndrome, MPS VII (GUSB Exon 3, German Shepherd Variant)**
- ✔ **Glycogen storage disease Type VII, Phosphofructokinase Deficiency, PFK Deficiency (PFKM, Whippet and English Springer Spaniel Variant)**
- ✔ **Glycogen storage disease Type VII, Phosphofructokinase Deficiency, PFK Deficiency (PFKM, Wachtelhund Variant)**
- ✔ **Lagotto Storage Disease (ATG4D)**
- ✔ **Neuronal Ceroid Lipofuscinosis 1, NCL 1 (PPT1 Exon 8, Dachshund Variant 1)**

✔ Neuronal Ceroid Lipofuscinosis 2, NCL 2 (TPP1 Exon 4, Dachshund Variant 2)

# Additional Conditions Tested

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- ✔ **Neuronal Ceroid Lipofuscinosis, Cerebellar Ataxia, NCL4A (ARSG Exon 2, American Staffordshire Terrier Variant)**
- ✔ **Neuronal Ceroid Lipofuscinosis 5, NCL 5 (CLN5 Exon 4 SNP, Border Collie Variant)**
- ✔ **Neuronal Ceroid Lipofuscinosis 6, NCL 6 (CLN6 Exon 7, Australian Shepherd Variant)**
- ✔ **Neuronal Ceroid Lipofuscinosis 8, NCL 8 (CLN8 Exon 2, English Setter Variant)**
- ✔ **Neuronal Ceroid Lipofuscinosis 7, NCL 7 (MFSD8, Chihuahua and Chinese Crested Variant)**
- ✔ **Neuronal Ceroid Lipofuscinosis 8, NCL 8 (CLN8, Australian Shepherd Variant)**
- ✔ **Neuronal Ceroid Lipofuscinosis 10, NCL 10 (CTSD Exon 5, American Bulldog Variant)**
- ✔ **Neuronal Ceroid Lipofuscinosis 5, NCL 5 (CLN5 Exon 4 Deletion, Golden Retriever Variant)**
- ✔ **Adult-Onset Neuronal Ceroid Lipofuscinosis, NCL A, NCL 12 (ATP13A2, Tibetan Terrier Variant)**
- ✔ **Late-Onset Neuronal Ceroid Lipofuscinosis, NCL 12 (ATP13A2, Australian Cattle Dog Variant)**
- ✔ **GM1 Gangliosidosis (GLB1 Exon 15, Shiba Inu Variant)**
- ✔ **GM1 Gangliosidosis (GLB1 Exon 15, Alaskan Husky Variant)**
- ✔ **GM1 Gangliosidosis (GLB1 Exon 2, Portuguese Water Dog Variant)**
- ✔ **GM2 Gangliosidosis (HEXB, Poodle Variant)**
- ✔ **GM2 Gangliosidosis (HEXA, Japanese Chin Variant)**
- ✔ **Globoid Cell Leukodystrophy, Krabbe disease (GALC Exon 5, Terrier Variant)**
- ✔ **Autosomal Recessive Amelogenesis Imperfecta, Familial Enamel Hypoplasia (ENAM Deletion, Italian Greyhound Variant)**
- ✔ **Autosomal Recessive Amelogenesis Imperfecta, Familial Enamel Hypoplasia (ENAM SNP, Parson Russell Terrier Variant)**
- ✔ **Persistent Mullerian Duct Syndrome, PMDS (AMHR2)**
- ✔ **Shar-Pei Autoinflammatory Disease, SPAID, Shar-Pei Fever (MTBP)**
- ✔ **Neonatal Interstitial Lung Disease (LAMP3)**
- ✔ **Alaskan Husky Encephalopathy, Subacute Necrotizing Encephalomyelopathy (SLC19A3)**
- ✔ **Alexander Disease (GFAP)**
- ✔ **Cerebellar Abiotrophy, Neonatal Cerebellar Cortical Degeneration, NCCD (SPTBN2, Beagle Variant)**

# Additional Conditions Tested

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- ✔ Cerebellar Ataxia, Progressive Early-Onset Cerebellar Ataxia (SEL1L, Finnish Hound Variant)
- ✔ Cerebellar Hypoplasia (VLDLR, Eurasier Variant)
- ✔ Spinocerebellar Ataxia, Late-Onset Ataxia, LoSCA (CAPN1)
- ✔ Spinocerebellar Ataxia with Myokymia and/or Seizures (KCNJ10)
- ✔ Hereditary Ataxia, Cerebellar Degeneration (RAB24, Old English Sheepdog and Gordon Setter Variant)
- ✔ Benign Familial Juvenile Epilepsy, Remitting Focal Epilepsy (LGI2)
- ✔ Degenerative Myelopathy, DM (SOD1A)
- ✔ Fetal-Onset Neonatal Neuroaxonal Dystrophy (MFN2, Giant Schnauzer Variant)
- ✔ Hypomyelination and Tremors (FNIP2, Weimaraner Variant)
- ✔ Shaking Puppy Syndrome, X-linked Generalized Tremor Syndrome (PLP, English Springer Spaniel Variant)
- ✔ Neuroaxonal Dystrophy, NAD (TECPR2, Spanish Water Dog Variant)
- ✔ Neuroaxonal Dystrophy, NAD (VPS11, Rottweiler Variant)
- ✔ L-2-Hydroxyglutaricaciduria, L2HGA (L2HGDH, Staffordshire Bull Terrier Variant)
- ✔ Neonatal Encephalopathy with Seizures, NEWS (ATF2)
- ✔ Polyneuropathy, AMPN (NDRG1 SNP, Alaskan Malamute Variant)
- ✔ Narcolepsy (HCRTR2 Intron 6, Labrador Retriever Variant)
- ✔ Narcolepsy (HCRTR2 Exon 1, Dachshund Variant)
- ✔ Progressive Neuronal Abiotrophy, Canine Multiple System Degeneration, CMSD (SERAC1 Exon 15, Kerry Blue Terrier Variant)
- ✔ Progressive Neuronal Abiotrophy, Canine Multiple System Degeneration, CMSD (SERAC1 Exon 4, Chinese Crested Variant)
- ✔ Juvenile Laryngeal Paralysis and Polyneuropathy, Polyneuropathy with Ocular Abnormalities and Neuronal Vacuolation, POANV (RAB3GAP1, Rottweiler Variant)
- ✔ Hereditary Sensory Autonomic Neuropathy, Acral Mutilation Syndrome, AMS (GDNF-AS, Spaniel and Pointer Variant)
- ✔ Sensory Neuropathy (FAM134B, Border Collie Variant)
- ✔ Juvenile-Onset Polyneuropathy, Leonberger Polyneuropathy 1, LPN1 (LPN1, ARHGEF10)
- ✔ Juvenile Myoclonic Epilepsy (DIRAS1)

# Additional Conditions Tested

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- ✓ Juvenile-Onset Polyneuropathy, Leonberger Polyneuropathy 2, LPN2 (GJA9)
- ✓ Spongy Degeneration with Cerebellar Ataxia 1, SDCA1, SeSAME/EAST Syndrome (KCNJ10)
- ✓ Spongy Degeneration with Cerebellar Ataxia 2, SDCA2 (ATP1B2)
- ✓ Long QT Syndrome (KCNQ1)
- ✓ Cardiomyopathy and Juvenile Mortality (YARS2)
- ✓ Muscular Dystrophy (DMD, Cavalier King Charles Spaniel Variant 1)
- ✓ Muscular Dystrophy (DMD, Golden Retriever Variant)
- ✓ Limb Girdle Muscular Dystrophy (SGCD, Boston Terrier Variant)
- ✓ Ulrich-like Congenital Muscular Dystrophy (COL6A3, Labrador Retriever Variant)
- ✓ Centronuclear Myopathy (PTPLA)
- ✓ Exercise-Induced Collapse (DNM1)
- ✓ Inherited Myopathy of Great Danes (BIN1)
- ✓ Myostatin Deficiency, Bully Whippet Syndrome (MSTN)
- ✓ Myotonia Congenita (CLCN1 Exon 7, Miniature Schnauzer Variant)
- ✓ Myotonia Congenita (CLCN1 Exon 23, Australian Cattle Dog Variant)
- ✓ Myotubular Myopathy 1, X-linked Myotubular Myopathy, XL-MTM (MTM1, Labrador Retriever Variant)
- ✓ Inflammatory Myopathy (SLC25A12)
- ✓ Hypocatalasia, Acatlasemia (CAT)
- ✓ Pyruvate Dehydrogenase Deficiency (PDP1, Spaniel Variant)
- ✓ Malignant Hyperthermia (RYR1)
- ✓ Imerslund-Grasbeck Syndrome, Selective Cobalamin Malabsorption (CUBN Exon 53, Border Collie Variant)
- ✓ Imerslund-Grasbeck Syndrome, Selective Cobalamin Malabsorption (CUBN Exon 8, Beagle Variant)
- ✓ Inherited Selected Cobalamin Malabsorption with Proteinuria (CUBN, Komondor Variant)
- ✓ Lunde hund Syndrome (LEPREL1)

# Additional Conditions Tested

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- ✔ Congenital Myasthenic Syndrome, CMS (CHAT, Old Danish Pointing Dog Variant)
- ✔ Congenital Myasthenic Syndrome, CMS (COLQ, Labrador Retriever Variant)
- ✔ Congenital Myasthenic Syndrome, CMS (CHRNE, Jack Russell Terrier Variant)
- ✔ Congenital Myasthenic Syndrome, CMS (COLQ, Golden Retriever Variant)
- ✔ Myasthenia Gravis Like Syndrome (CHRNE, Heideterrier Variant)
- ✔ Episodic Falling Syndrome (BCAN)
- ✔ Paroxysmal Dyskinesia, PxD (PGIN)
- ✔ Demyelinating Polyneuropathy (SBF2/MTRM13)
- ✔ Dystrophic Epidermolysis Bullosa (COL7A1, Golden Retriever Variant)
- ✔ Dystrophic Epidermolysis Bullosa (COL7A1, Central Asian Shepherd Dog Variant)
- ✔ Ectodermal Dysplasia, Skin Fragility Syndrome (PKP1, Chesapeake Bay Retriever Variant)
- ✔ Ichthyosis, Epidermolytic Hyperkeratosis (KRT10, Terrier Variant)
- ✔ Ichthyosis, ICH1 (PNPLA1, Golden Retriever Variant)
- ✔ Ichthyosis (SLC27A4, Great Dane Variant)
- ✔ Ichthyosis (NIPAL4, American Bulldog Variant)
- ✔ Hereditary Footpad Hyperkeratosis (FAM83G, Terrier and Kromfohrlander Variant)
- ✔ Hereditary Footpad Hyperkeratosis (DSG1, Rottweiler Variant)
- ✔ Hereditary Nasal Parakeratosis, HNPk (SUV39H2)
- ✔ Musladin-Lueke Syndrome, MLS (ADAMTSL2)
- ✔ Oculocutaneous Albinism, OCA (SLC45A2, Pekingese Variant)
- ✔ Bald Thigh Syndrome (IGFBP5)
- ✔ Lethal Acrodermatitis, LAD (MKLN1)
- ✔ Cleft Lip and/or Cleft Palate (ADAMTS20, Nova Scotia Duck Tolling Retriever Variant)
- ✔ Hereditary Vitamin D-Resistant Rickets (VDR)

# Additional Conditions Tested

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- ✔ Osteogenesis Imperfecta, Brittle Bone Disease (COL1A2, Beagle Variant)
- ✔ Osteogenesis Imperfecta, Brittle Bone Disease (SERPINH1, Dachshund Variant)
- ✔ Osteogenesis Imperfecta, Brittle Bone Disease (COL1A1, Golden Retriever Variant)
- ✔ Osteochondrodysplasia, Skeletal Dwarfism (SLC13A1, Poodle Variant)
- ✔ Skeletal Dysplasia 2, SD2 (COL11A2, Labrador Retriever Variant)
- ✔ Craniomandibular Osteopathy, CMO (SLC37A2)
- ✔ Raine Syndrome, Canine Dental Hypomineralization Syndrome (FAM20C)
- ✔ Chondrodystrophy and Intervertebral Disc Disease, CDDY/IVDD, Type I IVDD (FGF4 retrogene - CFA12)
- ✔ Chondrodystrophy (ITGA10, Norwegian Elkhound and Karelian Bear Dog Variant)



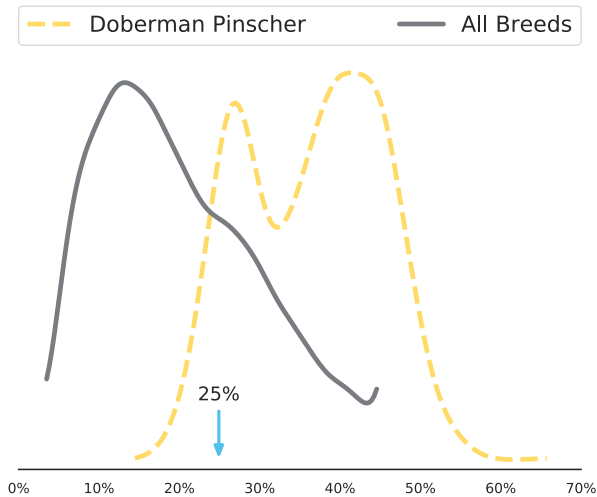
# Genetic Diversity and Inbreeding

## Coefficient of Inbreeding (COI)

**Genetic Result: 25%**

Our genetic COI measures the proportion of your dog's genome (her genes) where the genes on the mother's side are identical by descent to those on the father's side. The higher your dog's coefficient of inbreeding (the percentage), the more inbred your dog is.

## Your Dog's COI



This graph represents where your dog's inbreeding levels fall on a scale compared to both dogs with a similar breed makeup to her (the yellow dotted line) and all purebred dogs (the grey line).

# Genetic Diversity and Inbreeding

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## More on the Science

Embark scientists, along with our research partners at Cornell University, have shown the impact of inbreeding on longevity and fertility and developed a state-of-the-art, peer-reviewed method for accurately measuring COI and predicting average COI in litters.

## Citations

Sams & Boyko 2019 "Fine-Scale Resolution of Runs of Homozygosity Reveal Patterns of Inbreeding and Substantial Overlap with Recessive Disease Genotypes in Domestic Dogs"

(<https://www.ncbi.nlm.nih.gov/pubmed/30429214>)

Chu et al 2019 "Inbreeding depression causes reduced fecundity in Golden Retrievers"

(<https://link.springer.com/article/10.1007/s00335-019-09805-4>)

Yordy et al 2019 "Body size, inbreeding, and lifespan in domestic dogs"

(<https://www.semanticscholar.org/paper/Body-size%2C-inbreeding%2C-and-lifespan-in-domestic-Yordy-Kraus/61d0fa7a71afb26f547f0fb7ff71e23a14d19d2c>)

# About Embark

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Embark Veterinary is a canine genetics company offering research-grade genetic tests to pet owners and breeders. Every Embark test examines over 200,000 genetic markers, and provides results for over 200 genetic health conditions, breed identification, clinical tools, and more.

Embark is a research partner of the Cornell University College of Veterinary Medicine and collaborates with scientists and registries to accelerate genetic research in canine health. We make it easy for customers and vets to understand, share and make use of their dog's unique genetic profile to improve canine health and happiness.

Learn more at [embarkvet.com](https://embarkvet.com)

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