

Diagnosis and Treatment of Ocular Diseases in Camelids

Anne Gemensky Metzler DVM, MS
Diplomate ACVO
Professor – Comparative Ophthalmology
The Ohio State University

Diagnosis and Treatment of Ocular Disease in Camelids

- Over 14 years, percentage of animals per species presented to Purdue with an ocular problem:
 - 6% of llamas, alpacas
 - 5% of horses
 - 3% of cattle
- Traumatic injuries, uveitis & congenital anomalies are most commonly reported
- Corneal diseases, esp. ulcers most common
- Uveitis=second most common
- Cataracts, conjunctivitis=less common
- Eyelid tumors & disease, retinal disease, and glaucoma are rare
- Squamous cell carcinoma not reported in llamas/alpaca, even at high altitudes and in those with white faces

Congenital Abnormalities

- Eyelid abnormalities
- Multiple ocular anomalies (microphthalmia, etc.)
- Nuclear cataracts/lens anomalies
- Persistent hyperplastic primary vitreous
 - Retained embryonic retrolental vasculature and tissue
 - Secondary cataract is common
 - Can cause vision impairment or blindness in severe cases
- Optic nerve and peripapillary colobomas
 - Outpouching of scleral and optic nerve fibers
 - May predispose to retinal detachment and vision loss in severe cases
- Nasolacrimal atresia = failure of complete formation of the nasolacrimal apparatus (usually distally at nasal puncta, aka. “Imperforate puncta”)

-Diagnosis:

- 1) Epiphora progressing to mucopurulent ocular discharge in young animal (usually 6-12 mos)
- 2) Failure to irrigate from ocular puncta through nasal puncta
- 3) Absence of nasal puncta (a 2-3 mm orifice usually located 1.5-2 cm proximal to rostral boundary of the nasal vestibule)

4) Skull radiographs w/ contrast agent in nasolacrimal duct show where atresia occurs (usually occurs near the natural nasal punctal opening)

-Treatment:

- 1) Cannulate nasolacrimal duct via dorsal puncta w/ polyethylene tubing (IO 1.19 mm, OD 1.7mm) and palpate tube distally in nasal mucosa
- 2) If tube cannot be passed or palpated in nasal vestibule, irrigate saline or eyewash through nasolacrimal duct via the dorsal ocular puncta (use the PE tubing, 3.5 Tomcat catheter, 18 gauge catheter (w/o stylus), etc.)
- 3) Palpate area of nasal mucosa where tube or irrigation bleb occurs
- 4) Make stab incision w/ #15 blade, then excise a 5 mm crescent w/ scissors in nasal mucosa over area where bleb or tube is palpated
- 5) Leave indwelling polyethylene tubing for 4-6 weeks after tying ends together over the cheek or pass #2 PDS through tubing, pull through and tie ends together. Can also suture the free ends of the tubes to skin at medial canthus and lateral nostril rather than tying them together.
- 6) May omit indwelling tubing and most surgical openings remain patent.
- 7) Topical antibiotic-corticosteroid solution 3-4 times daily for 2-4 weeks.
- 8) Systemic antibiotics x 2-3 weeks.

Ocular Manifestations of Systemic Disease

- Concurrent neurologic disease is common
- Tick and facial nerve paralysis associated w/ ulcerative keratitis and sometimes fungal keratitis which is otherwise rare
- Meningitis, brain edema, *P. tenuis* (meningeal worm), toxoplasmosis associated w/ blindness
- Viral encephalitis w/ optic neuritis/retinitis (i.e EHV-1)
- Conjunctivitis, keratitis, uveitis in crias w/ failure of passive transfer (FPT)

Conjunctivitis

- Clinical signs: hyperemia, chemosis, serous to mucopurulent ocular discharge, periocular alopecia
- Diagnosis: Conjunctival culture and cytology
- Causes: Bacterial overgrowth, flies, *Thelazia californiensis*, nasolacrimal atresia, etc.
- Treatment: Antibiotics, fly control, parasite extraction (after DEC or ivermectin drops in conjunctival sac)

Corneal ulcers

- Commonly are infected
 - Healing delayed > 5-7 days, progressive depth or size, cellular infiltrate, increased corneal edema, increased pain, increased anterior uveitis (fibrin, hypopyon, aqueous flare)
- Generally resistant to fungal infection unless neurologic disease or immunosuppressed
- Culture and susceptibility testing indicated
- Corneal cytology to look for cocci, rods &/or hyphae

Acute superficial epithelial ulcer treatment

- Broad-spectrum antibiotic q 4-6 hours
 - Bacitracin-neomycin-polymixinB is a good initial choice
 - Oxytetracycline-polymixinB (Terramycin®)
- Atropine SID – PRN (do not exceed TID due to systemic toxicity/decreased gut motility)
 - Pupil usually dilates readily w/ 1 or 2 doses and may remain dilated for days
- Flunixin meglumine - 0.5-1.0 mg/kg SID-BID x 3-5 days, then 0.5 mg/kg SID x 3-5 days
- Omeprazole (Gastroguard®) 2-4 mg/kg PO SID-BID to prevent gastric ulcers
- Expect healing of uncomplicated ulcers w/in 5-7 days

Infected and Stromal Ulcers

- If < 50% stromal depth, medical management is appropriate for initial management
- Broad-spectrum antibiotic q 4 hours initially then q 6 hours after stabilized (bacitracin-neomycin-polymixinB, Terramycin or a fluoroquinolone such as levofloxacin or ofloxacin)
- With stromal ulcers, oxytetracycline q 4-6 hours or serum q 2-4 hours topically is indicated to inhibit collagenase activity
- If $\geq 50\%$ stromal depth or progressive depth or area despite medical management, consider surgery
- Keratectomy + conjunctival pedicle flap
- Healing may take 2-6 weeks

Stromal Abscesses

- Epithelialized infection in stroma
- Culture/cytology not helpful unless epithelium is debrided
- Epithelium prevents penetration of most antimicrobials
- Ciprofloxacin ointment (Ciloxan®), levofloxacin or ofloxacin solution or chloramphenicol solution or ointment will penetrate
- Healing may take 4-6 weeks

EHV-1 Keratitis

- Punctate to linear fluffy opacities
- Usually active superficial vessels
- +/- painful, +/- fluorescein positive
- Diagnosis: Clinical appearance; serology & conjunctival biopsy for VI to Oregon State; eosinophilic intranuclear inclusion bodies on cytology/histopathology
- Treatment:
 - Idoxuridine topically q 6 hours or 0.5% Cidofovir q 12 hours
 - Standard ulcer therapy including triple antibiotic if ulcerated to prevent bacterial infection, atropine, banamine as for ulcer treatment

Exposure Keratitis / Facial Nerve Paralysis

- Causes: otitis media/interna, meningeal worm, etc.

- Absent blink reflex leads to ulceration in palpebral fissure area of cornea
- Higher risk of fungal infection; therefore, culture and cytology are important!
- Treat as routine infected ulcer + artificial tear supplements as often as possible
- Partial temporary tarsorrhaphy until blink function returns

Fungal Keratitis

- Routine ulcer care as above + topical antifungal preparations
- Voriconazole 1% solution QID = best penetration and efficacy
- Miconazole ointment topically QID (inexpensive; available only through compounding pharmacy; may penetrate epithelium)
- Natamycin suspension topically QID (very expensive; won't penetrate epithelium)
- Fluconazole orally: 1 mg/kg PO q 12 hours x 1 week, then q 24 hours x 2 weeks

Bullous Keratopathy

- Camelids have "sensitive" corneal endothelium
- Tend to get **severe** corneal edema
- Causes: usually anterior uveitis or trauma

Treatment:

- Topical antibiotics
 - Oxytetracycline has anticollagenase effects
- Topical 5% NaCl ointment
- Atropine
- Flunixin meglumine
- Prognosis:
 - May slowly heal or rupture

Chemical Injury

- Alkaline injuries much more severe than acidic chemical as they penetrate cornea into chamber whereas acid coagulates the stroma and stops penetrate
- Treat to prevent infection, control uveitis and improve comfort (broad spectrum antibiotic, atropine, flunixin meglumine)

Uveitis

- Clinical signs: blepharospasm, lid swelling, conjunctival hyperemia, miosis, corneal edema, aqueous flare, fibrin and/or hypopyon in anterior chamber
- Diagnosis: Work up thoroughly for systemic disease as most uveitis is secondary
 - Failure of passive transfer/sepsis, EHV-1, toxoplasmosis, Listeriosis, Aspergillosis, parasites, etc. are possible causes
- Treatment: Flunixin meglumine 0.5-1.0 mg/kg PO SID-BID x 3-5 days, then decrease dose to 0.5-1.0 mg/kg SID x 3-5 days; atropine topically SID-PRN; omeprazole 2-4 mg/kg PO SID-BID; supportive care or empirical treatment for systemic disease

Chorioretinitis/Optic Neuritis

- Clinical signs: Acute onset blindness, dilated pupils, wondering gaze, disorientation
- Diagnosis: Work up for systemic disease
 - EHV-1, Toxoplasmosis, Parellophastrongylosis (meningeal worm), toxic plants (locoweed, bracken fern, etc.), heavy metals, Listeriosis, Rabies, etc.
 - EHV-1 causes choroidal, retinal & vitreal hemorrhages & exudates, retinal detachment, papillitis and/or retrobulbar optic neuritis +/- systemic neurologic disease
- Treatment: Supportive or empirical for systemic disease, systemic NSAID's or corticosteroids for optic neuritis in tapering doses
- Prognosis: Guarded. Systemic diseases causing blindness are commonly fatal. If animal survives, the blindness is often permanent.

Cataracts

- Most commonly reported in 2-7 year olds
- Small focal non-progressive cataracts that don't affect vision are common
- Congenital
- Hereditary
- Secondary to uveitis
- Senile?

Treatment of Cataracts

- Congenital cataracts may resorb resulting in return of aphakic (far-sighted) vision
 - Risk is failure of development of neuroretinal pathways which are responsible for image processing in the brain (critical timeframe unknown for camelids)
- Treat lens-induced uveitis:
 - Atropine topically q 24-72 hrs or as needed
 - Flunixin meglumine 0.5 mg/kg q 24 hours OR **one of the following:**
 - Diclofenac (Voltaren) 0.1% ophthalmic solution – topically q 12-24 hours
 - Prednisolone acetate 1% ophthalmic suspension – topically q 12-24 hours
 - Neomycin-polymyxinB-dexamethasone ointment – topically q 12-24 hours
- Phacoemulsification for cataract removal

Phacoemulsification-Procedure

- 3.2 mm incision at limbus
- Viscoelastic substance to reinflate the anterior chamber
- Large anterior capsulectomy
- Phacoemulsification if needed, but lens may be soft enough to remove via irrigation/aspiration alone

Phacoemulsification-Post-op Care

- Flunixin meglumine 0.5-1.0 mg/kg BID x 3-5 days, then SID x 3-5 days

- Omeprazole (Gastrogard®) 2-4 mg/kg PO SID-BID
- Atropine PRN
- Topical antibiotic-corticosteroid (NeopolyDex) QID x 2-4 weeks
- Confined environment x 2-4 weeks

Phacoemulsification outcome: The OSU Experience

- Surgery done on approximately 6 animals/12 eyes (bilateral surgery)
- All young animals w/ soft congenital or juvenile onset cataracts
- Approximately 50% developed severe corneal edema due to endothelial compromise and intraocular inflammation 2-4 weeks after surgery; other 50% had no problems, but no long-term follow-up obtained.
- Some required enucleation due to severe corneal thickening, ulceration, bacterial infection and rupture
- BSS Plus® irrigating solution with minimal intraocular drug administration may prevent endothelial decompensation (last patient with this protocol did well).

Phacoemulsification outcome: North Carolina State University CVM and others

- Using BSS Plus® reduces risk of endothelial decompensation and improves surgical success rates.
- In most published reports, success rates are limited by the endothelial disease

Glaucoma

- Primary and secondary glaucoma appear to be rare in camelids
 - Occasionally see glaucoma secondary to uveitis
- Measure intraocular pressure (IOP) by applanation tonometry (Tonopen®)
- IOP ranges and means:
 - Llamas: 7-18 mmHg (x=13 mmHg)
 - Alpacas: 11-21 mmHg (x=15 mmHg)
- Treatment: Topical 2% dorzolamide + 0.5% timolol (Cosopt) – q 8 hours

Suggested references:

Gionfriddo JR and Friedman DS. Ophthalmology of South American Camelids: Llamas, Alpacas, Guanacos, and Vicunas. In: Howard JL, ed. *Current Veterinary Therapy 4: Food Animal Practice*. Philadelphia: WB Saunders Co., 1999; 644-648.

Gionfriddo JR. Update on llama medicine. Ophthalmology. *Vet Clin North Am Food Anim Pract* 1994;10:371-382.

Gionfriddo JR, Gionfriddo JP, Krohne SG. Ocular diseases of llamas: 194 cases (1980-1993). *J Am Vet Med Assoc* 1997;210(12):1784-1787.