Horses commonly present to veterinarians with ophthalmic conditions. A thorough resource for equine practitioners is the book *Equine Ophthalmology 3rd ed* by Brian Gilger.\(^1\) Equine chapters of other general ophthalmology texts are also beneficial, but do not have as many pictures nor as extensive discussion of equine ocular diseases. The first key to diagnosing and treating equine ophthalmic disorders is to perform a thorough, systematic ocular examination being cognizant of normal equine anatomy and variations of normal that may exist. It is imperative to have a dark environment to adequately assess the eye as it will allow for allow greater visualization of intraocular structures. Even in a field situation, this can be accomplished by placing a blanket over the heads of the horse and examiner or if needed by scheduling the appointment for a naturally dark time of the day (early a.m. or late p.m.). Prior to detailed ophthalmic examination, consciously make preliminary patient observations regarding visual behavior, facial symmetry and note obvious ophthalmic abnormalities for closer evaluation. Vision assessment should be done prior to examination of the ocular structures by observing the animal as it walks around (can use obstacles to set up a maze test).

- **Examination of Head and Face**
  - Prior to animal restraint the face should be carefully evaluated. Touching the animal’s face or stressing them may mask the true position of ocular structures.
  - Evaluate for symmetry and evidence of neurologic problems such as head tilt, ear droop, or loss of muscle mass. Evaluate eyelids for conformation prior to touching the face. The eyelashes should be directed outward (not down) and the eyelid margin should be visible along all edges.
  - Evaluate the eyes to determine if they are both tracking and are of equal size. Viewing the globes from head on helps to determine if one eye is further forward than the other.

- **Transilluminator** – This bright light source allows you to examine the eyelids, conjunctiva, cornea, anterior chamber, iris, pupil, and lens (anterior capsule/anterior cortex/nucleus/posterior cortex/posterior capsule). A magnification loop or glasses helps in seeing small things. Variation in the form of illumination highlights various portions of the eye, making lesions more easily identified.
  - Direct illumination – view the eye from the same direction as the light
    - Diffuse light- light source is held far from the eye
    - Focal light- light source is held close (1cm) to the eye
• **Transillumination** - shine the light across the eye and view from a 90° angle
• **Retroillumination** - reflecting light off the fundus to illuminate intraocular structures. Ocular lesions may appear dark against the tapetal reflection (e.g. cataracts).
• **Slit beam or smallest circle beam of ophthalmoscope** - using this as an illuminator highlights changes in shape or location of structures. Using a head loop, or magnification glasses, while the slit beam is passed transversely across the eye creates a form of slit-lamp biomicroscopy. The slit is useful for determining corneal/lens curvature and the depth of lesions, while the small circle is best for detecting/grading aqueous flare.

• **Pupillary light reflexes (PLR)**
  • Note the size of the pupils using retroillumination. Note the size of the pupils relative to each other, as well as normal. If there is anisocoria it is imperative to determine which pupil is abnormal and why. Stressed animals may have large pupils that are slow to respond. Patience and a bright light will aid the response.
  • **Direct PLR** - shine the light in the eye and watch that eye for pupillary constriction. This tests cranial nerves II and III, as well as the retina, optic nerve, and optic tracts.
  • **Indirect (consensual) PLR** - shine light in the eye and watch the opposite eye for constriction (may need a second person to assist with illumination or pupil evaluation in horses).
  • Remember it is possible to have a PLR and no vision, as well as vision and no PLR.

• **Schirmer tear test** - measures aqueous tear production (normal is >15 mm/min)
  • The test is completed by bending the strip at the notched mark, placing it in the lower conjunctival sac, and holding it gently in place for 1 minute.
  • This test does not have to be performed routinely on equine patients but is beneficial to check in cases of THO/facial nerve paralysis or in eyes with nonhealing/recurrent ulcers that do not show epiphora.

• **Fluorescein stain** - stains the corneal stroma
  • This test detects corneal ulceration. It can also be used to determine the depth as well as diameter of the lesion. To assess the depth of the ulcer view across the corneal surface (normal corneal curvature = stroma intact so epithelial defect only; flattening of cornea in area of ulcer = superficial stromal defect; slight indentation of cornea in area of ulcer = midstromal defect; deep indentation of cornea in area of ulcer = deep stromal defect; fluorescein stain around wall of deep ulcer but no stain in center = descemetocele).
  • Wet fluorescein strip and touch the strip to the conjunctival surface of the eye, or stain can be mixed with eye wash or topical anesthetic and
sprayed on the corneal surface (do not store this solution long-term due to possible bacterial contamination).

- The stain can be viewed with a normal light source or a cobalt blue filter to aid in fluorescence; a positive stain is green.
- Fluorescein stain can also be used to perform a Seidel test (for aqueous leakage) or a Jones test (for nasolacrimal system patency).

**Intraocular pressure (IOP) measurement** - normal horse is 15-30 mm Hg

- The IOP should be measured in all cases of suspected glaucoma, uveitis, lens position shift, or any “red eye” with no other obvious cause.
- Do not restrain eyelids too tightly or inadvertently press on the eye through the lids as this will result in a falsely elevated pressure.
- **TonoVet:** measures by rebound and the result is reported in mmHg
  - This instrument measures the return force of a small probe bounced off the corneal surface.
  - The animal’s head is held in a normal forward position above heart level. The instrument is held approximately 5 mm in front of the eye in a horizontal position and the lower button is pushed to release the probe. The button is pushed 6 times to allow for an average to be calculated. Error readings indicate the probe is too close, too far, or not perpendicular to the corneal surface.

**Ophthalmoscopy** - examination of the fundus

- It is very helpful to dilate the eye with tropicamide prior to examination in order to view the entire fundus and it should be noted whether dilation was used or not during a prepurchase exam. The optic nerve head in horses is salmon-colored and located ventrally in the nontapetal fundus so when trying to examine it you will be looking somewhat down in the eye. The retinal vasculature pattern is Paurangiotic with only small blood vessels coursing a short distance from the optic near head. If a tapetum is present note degree of reflectivity. Normal tapetal color varies with the coat color of the animal ranging from blue-green-yellow-orange. Eyes lacking a tapetum (or areas without tapetal tissues) will allow visualization of red choroidal blood vessels.

**Direct Ophthalmoscopy**

- Place the brow rest of the instrument on your own eyebrow, hold the instrument a few inches from the animal’s eye, and look directly into the eye. The instrument can be used to evaluate all levels of the eye. Dialing the central wheel of the instrument changes diopter setting. Red numbers are negative with white or green numbers being positive, a 0 has no diopter correction.
- The various diopter settings allow examination of the different structures of the eye: +20 focuses more anteriorly/on the surface of the eye while 0 to -2 focuses on the fundus. If you wear corrective
glasses and remove them prior to using the ophthalmoscope you will need to make your own corrections to these numbers.

- The front of the instrument has variable aperture settings to allow different types of illumination, small spot, large spot, slit beam, and variable color filters.
- Advantages are simplicity and high magnification for study of a specific area; disadvantages are the very small visible area, high degree of magnification, and the closeness to uncooperative animals.

- **Panoptic Direct Ophthalmoscopy**
  - Allows for a greater viewing field (5 times larger) when compared to regular direct instrument.
  - The instrument also allows for aperture and diopter setting changes. To view the fundus set the aperture setting (horizontal dial on instrument) to the green bar. Hold the instrument to your eye and with the room lights on view an object at approximately 5 feet. Use the diopter setting (the vertical, thumb operated dial) to focus on the object.
  - Turn off room lights and place instrument 2 cm from the patient’s eye (fill the pupil with light) and view the animal's fundus. Modify diopter setting slightly as needed to perfect focus.

- **Indirect Ophthalmoscopy** - viewing a virtual image of the fundus.
  - This requires a focused light source and a handheld lens (20D and 14D are recommended for horses).
  - Start at a comfortable arm’s length from the animal. Hold the transilluminator at eye level; create a line of light from your eye to the animal, place the lens perpendicular to the line of light in front of the patient's eye. Move the lens closer or further as needed to make the fundus image fill the lens.
  - Advantages are visualization of a large area of the fundus and placement of the examiner at a distance from the animal. Disadvantage is that it requires a slight degree of experience to use the technique and image is upside-down and reversed (effectively 180 degrees off).

- **Bacterial culture**
  - Use small swabs to prevent contamination. To improve results the swab should be pre-moistened in the carrier prior to sample collection. Topical ophthalmic anesthesia may be applied if necessary prior to obtaining a sample for culture.
  - Samples may be taken from eyelid, conjunctiva or cornea and processed in a routine manner. The longer the swab is held at room temperature after sample collection the lower the bacterial viability, thus the lower the test results.
• **Cytology**
  - Samples may be collected from the eyelids, conjunctiva or cornea.
  - A topical ophthalmic anesthetic is applied to the ocular surface to prevent the animal from feeling the procedure.
  - A cytobrush allows for the best sample collection, but a small blunt instrument of any kind may be used, including a Kimura spatula or the back (blunt) end of a scalpel blade.
  - The area to be sampled is lightly abraded and then gently smeared on a glass slide.
  - Routine staining procedures are then followed.

• **Nasolacrimal duct flush**
  - Tests the patency of the lacrimal puncta and drainage system. This test should be used when epiphora is present without concurrent signs of ocular irritation.
  - Topical anesthetic is applied to the ocular surface to prevent the animal from feeling the procedure when performing normograde NLD flushing. The puncta are located approximately 3-5 mm from the medial canthus (at the pigmented, non-pigmented junction) just inside the margin of the superior and inferior lids. A lacrimal cannula or soft and flexible 20-gauge IV catheter may be used. A 6ml syringe filled with eye wash, saline, or sterile water is attached to the cannula/catheter. The cannula/catheter is slid along the inner lid edge until it slides into the puncta. Fluid is injected into the duct until it is seen bubbling out of the opposing puncta and then both puncta are occluded to watch for fluid exiting the nose.
  - **Retrograde NLD flushing** can be performed in horses using an up to 8 French catheter inserted into the nasal punctum located near the mucocutaneous junction in the nares.
  - Fluorescein dye may be added to make the fluid more easily identified.

Horses that are uncooperative or painful should be sedated for ocular examination and diagnostics to prevent injury (to human or horse) and to improve assessment. Additional restraint with a nose/ear/shoulder twitch can be utilized when necessary. Periocular nerve blocks can be used for both ocular examination and periocular procedures. Using a 25-gauge 5/8 inch needle, 1-2 ml of anesthetic solution (e.g. lidocaine, mepivicaine) is injected subcutaneously in the region of interest. The most commonly utilized nerve block for examination is the auriculopalpebral nerve block, blocking the palpebral branch of the auriculopalpebral nerve to provide akinesia of the orbicularis oculi muscle. The nerve can be palpated as it passes over the zygomatic arch dorsolateral to the orbit. Following this block horses are still able to blink, but manual eyelid opening does not require as much force, reducing the risk of compromise to a potentially vulnerable globe. An additional block that provides partial upper eyelid akinesia as well as extensive upper lid anesthesia is the frontal (supraorbital) nerve block. The nerve exits the supraorbital foramen, a palpable depression in the dorsomedial orbital rim, allowing anesthetic to be deposited directly in or over the opening. The remaining sensory
nerves that supply the equine eyelids are the infratrochlear, lacrimal and zygomatic. The infratrochlear nerve innervates the area of the medial canthus and can be blocked at the palpable trochlear notch on the medial dorsal orbital rim. The lacrimal nerve innervates the lateral upper eyelid while the zygomatic nerve innervates the lateral lower eyelid. They are blocked by anesthetic deposition in a line along the lateral third of the dorsal and ventrolateral orbital rim respectively. Sensory nerve blocks are valuable for minor eyelid surgical procedures (e.g. tumor removal/biopsy, laceration repair) and subpalpebral lavage line placement and can be combined with infiltration anesthesia in the region of interest. If corneal sampling or ocular foreign body investigation is necessary a topical anesthetic should be applied to the eye.

If ocular axis clarity is impeded by corneal edema, hyphema, cataract, pupil seclusion, extreme eyelid swelling, or severe pain preventing eyelid opening, **ocular ultrasound** may be performed as a rapid, safe, noninvasive adjunct examination method. It is useful in awake, sedated and blocked horses for not only intraocular evaluation, but can also be used to examine periocular and retrobulbar structures. The most common indications are for detecting retinal detachment or lens luxation after globe trauma and in horses with uveitis, cataract, and severe corneal opacities. Orbital ultrasound evaluation is also useful in instances of exophthalmos or orbital trauma (e.g. can help differentiate between solid and cystic structures and/or foreign body presence). Various ultrasound transducer probes can be used, with a 7.5 or 10 MHz probe optimal for general ophthalmic use (7.5 MHz better for orbital evaluation given deeper penetration; 10 MHz better for ocular evaluation and resolution) and linear transducers providing better resolution of near-field structures. A small scan head transducer can be placed directly on the cornea (transcorneal approach) following sedation, periocular nerve blocks, and topical ophthalmic anesthesia to view intraocular and orbital tissues, or with use of an offset device the anterior aspect of the globe can be studied. The transpalpebral approach through closed eyelids can be used with larger transducers or in horses not amenable to corneal contact but will result in more ultrasound imaging artifacts. If the structural integrity of the globe is possibly compromised (i.e. from trauma), extreme care must be taken when the ultrasound examination is performed to not induce further damage to the eye.

**Top Equine Ophthalmic Issues:**

1. **Squamous Cell Carcinoma (SCC)**

Squamous cell carcinoma is the most common tumor of the equine eye and adnexa. It can occur on either eyelid, at the medial canthus, on the third eyelid, conjunctiva, limbus, cornea and even in the orbit. The most commonly implicated predisposing factors are ultraviolet radiation, light periocular hair/skin, and breed (e.g. Appaloosas and draft breeds). On the eyelids SCC typically starts as a hyperemic area that progresses to ulceration then papillomatous masses. Other locations may also show papillomatous or fleshy masses with variable degrees of ulceration, inflammation, and necrosis.

When a lesion is observed, biopsy should be performed to confirm the diagnosis (rule outs include granulation tissue, habronemiasis, inflammatory conditions, other tumors)
and plan definitive therapy. The goal of treatment is to eliminate the tumor while preserving ocular function and cosmesis. Surgical excision should be combined with additional therapy to improve the success rate. Adjunctive treatments include cryotherapy, carbon dioxide laser treatment, radiofrequency hyperthermia, brachytherapy, chemotherapy, immunotherapy, and photodynamic therapy.\(^3\) The most appropriate treatment is determined by tumor size, location, availability, and financial considerations. Systemic piroxicam therapy has also been used in one case report to control metastatic SCC,\(^4\) but efficacy with ocular tumors has not been investigated. Given that SCC can recur it is imperative to reevaluate treated horses every 6 months (or sooner if clients notice a lesion developing) and warn owners that repeated therapy may be necessary. Ocular SCC can invade locally into soft tissues, the bony orbit, sinuses, and the brain. It can also metastasize to regional lymph nodes, salivary glands, or the thorax. The prognosis for eyelid SCC is worse compared with other ocular sites.\(^5\)

Early recognition and treatment are imperative to allow favorable outcomes. Reducing ultraviolet radiation in predisposed horses or those with prior disease is also recommended and can be accomplished with the use of a mask that blocks the majority of UV light (e.g. Equine Sun Visor [https://www.equinesunvisor.com/] or Guardian mask [www.horsemask.com]). Eyelid tattooing has also been utilized but given that the pigment is deposited in the dermis, epithelial cell protection may be limited.

### 2. Corneal Ulceration and Corneal Stromal Abscessation

Damage to equine corneas is common given most horses’ environments, general behavior responses, and laterally protruding globes. An acute, superficial ulcer that is diagnosed early and treated appropriately should heal quickly. Trauma is the most common cause of ulceration, but foreign bodies and other causes should be ruled out during the eye examination. Fluorescein stain applied directly to the conjunctival surface or sprayed onto the eye after mixing with eyewash in a syringe (break needle off hub for fine stream) allows visualization of the ulcer extent and may provide additional assessment of depth. Rose bengal stain is helpful to visualize punctate epithelial lesions (more common with fungal infections or equine herpes virus) that prevent fluorescein access to the hydrophilic corneal stroma.

Simple, superficial, apparently noninfected ulcers can be managed medically. A topical broad-spectrum ophthalmic antibiotic (e.g. neomycin/polymyxin B/bacitracin, neomycin/polymyxin B/gramicidin, tetracycline or chloramphenicol) administered 3-4 times daily will help prevent infection while the cornea is healing, and reflex uveitis can be treated with topical atropine 1-2 times daily and systemic flunixin meglumine or phenylbutazone if needed. Recheck examination in 3-5 days generally shows dramatic improvement or complete epithelialization depending on the initial ulcer size.

Simple corneal ulcers that do not heal readily with appropriate therapy may have an ongoing cause (e.g. foreign body behind third eyelid) or may have become infected and further investigation is warranted. Stromal ulcers, following initial therapy or seen for the first time, always deserve thorough evaluation with culture and cytology, and in some circumstances require surgical repair (e.g. conjunctival graft). To obtain a culture it is best to moisten the sterile swab in the carrier and then gently touch/roll along the
margins of the ulcer without contacting the eyelids or skin. Aerobic bacterial and fungal cultures are most commonly performed, but anaerobic bacterial culture can also be considered. Corneal cytology should be performed on the ulcer margin, following topical anesthesia, using a cytobrush, Kimura spatula, or the blunt end of a scalpel blade (cotton swabs are not optimal because they do not allow adequate sample deposition on the slide). Bacteria can be observed within inflammatory cells or in severe infections extracellularly also. Fungal hyphae can be difficult to find but may be present within larger mats of cells as relatively translucent structures. Special stains can also be utilized to aid diagnosis.

The most common agents found in infected equine corneal ulcers are bacteria (Staphylococcus, Streptococcus, Pseudomonas) and fungi (Aspergillus, Fusarium). Microbial proteases as well as endogenous proteases can also complicate corneal ulceration by causing melting due to breakdown of collagen. Given the need to address a variety of infectious agents, corneal melting, and reflex uveitis, numerous ocular medications may be utilized to manage a complicated corneal ulcer. Placement of a subpalpebral lavage line greatly facilitates medicating horses that require numerous therapies, frequent treatments, and must receive liquid formulations. Lavage systems can be purchased (e.g. MILA eye lavage kit) or made from appropriate tubing and placed in either the upper or lower eyelid. Heavy sedation, periocular nerve blocks, regional and topical corneal anesthesia are indicated. To place the line, insert one clean finger deep under the eyelid to the conjunctival fornix, advance the 12-gauge needle alongside the finger being careful not to injure the cornea or use the provided “eyelid lifter”, and then quickly pass the needle through the fornix and out the eyelid skin. The line is then pulled through and the footplate is seated flush with the conjunctival surface. MILA brand lines have their name written on the tube a short distance from the footplate that allows for monitoring of appropriate position to avoid slippage and footplate-induced ulceration. The line is secured to the facial skin, woven through the forelock/mane, and a 20-gauge catheter with injection port is placed at the end of the line and secured to a mane braid or stent. To administer drugs 0.1-0.2 ml is injected into the line, followed by 2-3 ml of air injected slowly to advance the drug onto the eye. For additional medications it is ideal to wait at least 5 minutes to allow time for drug absorption.

Hospitalization of patients for complicated corneal ulcer management is optimal if 24-hour facilities exist to ensure medications are given and to allow frequent monitoring. Topical ophthalmic antibiotics should be selected based on corneal cytology and may be changed if necessary after culture and sensitivity results are received. Common formulations include ofloxacin, ciprofloxacin, gentamicin, tobramycin, compounded chloramphenicol and compounded 5% cefazolin (IV formulation reconstituted and diluted 1:1 to 50 mg/ml in artificial tears); with two drugs of different classes used in some circumstances until culture results are received. Antibiotics should be given every 1-2 hours initially, with the frequency decreased gradually after a positive response is seen. If improvement is not noted within 48 hours referral should be offered for surgical consideration. If blood vessels have already reached the ulcer or if there is a fear of corneal rupture systemic antibiotics (e.g. SMZ-TMP or doxycycline) may also be used.
Reflex uveitis must still be addressed with a systemic NSAID and topical ophthalmic atropine twice daily initially. Flunixin meglumine appears to provide superior ocular anti-inflammatory effects and can be used at 1.1 mg/kg twice daily for 3 days then decreased to once daily. In foals or horses at risk for gastrointestinal ulceration omeprazole should also be administered. Given that absorption of topical atropine can slow gut motility horses should be monitored closely for any signs of colic.

Eyes with confirmed or suspected fungal infections should be treated with topical antifungal medications 4-12 times daily depending on severity. Voriconazole is a highly effective drug that has been shown to be safe for the eye and penetrates ocular tissues well. It is available as an IV formulation that is reconstituted to 1% and is stable for 28 days with refrigeration. Natamycin is the only FDA approved ophthalmic antifungal and may be obtained from local pharmacies. Other medications commonly used include amphotericin B 0.15%, ketoconazole 1%, miconazole 1%, itraconazole 1% in 30% DMSO, fluconazole 0.2%, and silver sulfadiazine dermatologic cream 1%. Though these drugs have not been evaluated for safety and efficacy against fungal keratitis, due to financial considerations they may be utilized and are better than no antifungal therapy. If corneal blood vessels extend to the ulcer or intraocular extension is suspected systemic antifungals (fluconazole, itraconazole, voriconazole) may also be employed. The most cost-effective option is generic fluconazole at 14 mg/kg PO loading dose followed by 5 mg/kg PO daily thereafter.

Anticollagenase therapy can be utilized at the same frequency as topical antibiotics if corneal melting is noted. The most common antiproteinase agent used is autogenous serum/plasma. Blood can be collected from the patient (or another horse), spun down, and serum/plasma sterilely transferred to a new tube then refrigerated and kept for up to 7 days. Other anticollagenase agents include EDTA 1-2%, galardin (Ilomostat) 0.1%, N-acetylcysteine 5-10%, and tetracycline antibiotics.

Corneal stromal abscesses may form following rapid epithelial healing of an infected corneal ulcer or after a small puncture wound seals, trapping infectious agents within the cornea. Abscesses will appear whitish to yellow in color with extensive corneal vessel ingrowth, diffuse corneal edema, and severe reflex uveitis. Fluorescein staining will be negative so it is imperative to differentiate these eyes from those with primary uveitis as steroid treatment is contraindicated. Medical therapy with antibiotic and antifungal agents topically and systemically that can effectively penetrate the cornea is imperative (e.g. ofloxacin and voriconazole respectively). Reflex uveitis must also be controlled with topical atropine and systemic flunixin meglumine to prevent blinding sequelae. Referral to a specialist is warranted for eyes that do not respond to therapy or those that cannot be definitively diagnosed as corneal stromal abscess or primary uveitis.

Patients being managed for infected/melting corneal ulcers or corneal stromal abscesses that are not kept in the hospital should be rechecked frequently (initially in 2 days) as corneal disease can advance rapidly. Patients responding to therapy should then be checked on a weekly basis. Successful treatment of corneal fungal infection can
require weeks to months so clients should be prepared for extensive treatment. Some individuals may opt for referral and surgical repair to expedite the healing process. Subpalpebral lavage lines can be left in place for months if necessary but should be monitored daily by the client. Equine patients with ulcers or corneal stromal abscesses that attempt to rub their eyes should have a mask placed that has a firm eye cup, like the Eyesaver mask from Jorgensen Laboratories (www.jorvet.com), to prevent further damage and possible globe rupture.

Worsening corneal stromal abscesses, ulcers nonresponsive to medical therapy, those greater than 50% deep, and those that have already ruptured should be referred to a specialist immediately for the best chance of saving the eye and vision. If surgery is indicated a conjunctival graft or other appropriate procedure will be performed. Third eyelid flaps and temporary tarsorrhaphies are never recommended for equine ulcers given that they provide no tectonic support to the cornea and preclude visualization of the eye, delaying identification that a cornea may be worsening.

Topical steroids should not be used to expedite blood vessel regression following corneal ulceration or stromal abscessation in horses. If corneal vascularization and scarring are of concern to the client, topical cyclosporine ointment (Optimmune®) can be administered twice daily once the ulcer has healed; however, most corneas will remodel sufficiently on their own over time.

3. Uveitis and Equine Recurrent Uveitis
Uveitis is the most common cause of equine blindness and the acute form can affect any horse. Causes include local and systemic infectious diseases, blunt or penetrating trauma, neoplasia and idiopathic or immune-mediated inflammation. Clinical signs and findings may be numerous, but most clients first notice signs of ocular pain or vision compromise. It is imperative to rule out primary corneal disease prior to treatment with an ophthalmic steroid (see detailed treatment notes below).

Equine recurrent uveitis (ERU) is also known as “moon blindness” or “periodic ophthalmia,” and has a significant impact on the equine industry with a reported prevalence between 8 and 25% of horses in the United States. Appaloosas and draft horse breeds are predisposed to the disease, but it can affect any horse. Though not every acute uveitis episode will develop into ERU, clients should be warned of this disease process and if two or more episodes of uveitis are observed a diagnosis of ERU can be made. Clients should also be informed to contact a veterinarian for evaluation if similar ocular signs occur and should be cautioned against empiric treatment given the possibility of corneal ulceration, stromal abscessation, or a foreign body presenting similarly.

Clinical signs and findings with ERU will vary greatly and the disease can be unilateral or bilateral. With acute disease there is active ocular pain and observable inflammation. Insidious uveitis can be more challenging to diagnose as horses may not be outwardly painful and more subtle signs of low-grade on-going intraocular inflammation may be missed so one must consciously look for aqueous flare in a darkened exam setting. This
later manifestation is more common in Appaloosas and draft breeds and contributes to the higher frequency of vision loss. Chronic end-stage eyes have irreversible blinding deformities. Though numerous theories have implicated *Leptospira* infection and immune-mediated inflammation, the exact pathogenesis of ERU is currently unknown.

When making a diagnosis of ERU it is still important to rule out foreign body irritation or primary corneal disease (ulcer, stromal abscess). Tonometry can aid diagnosis and tracking of ERU or document secondary glaucoma. A complete physical exam should be performed and additional diagnostic tests can be considered (CBC, serum chemistry profile, Lepto serology and/or PCR on urine).

Active uveitis must be treated aggressively at first, with therapy slowly tapered over time and treatment extending 2-4 weeks past the resolution of signs. The goals of therapy are to reduce pain and preserve vision. The most critical component of treatment is anti-inflammatory therapy. Topical ophthalmic dexamethasone 0.1% (as neomycin/polymyxin B/dexamethasone) or prednisolone acetate 1% should be given 4 times daily or more frequently if needed. Concurrent topical NSAID therapy with ketorolac 0.5%, flurbiprofen 0.03% or diclofenac 0.1% may be needed in severe cases or can be utilized if steroids are contraindicated. Flunixin meglumine appears to be the most effective systemic NSAID, but phenylbutazone, firocoxib, or aspirin therapy may also be considered. Alternatively, oral steroid use may be necessary. Topical ophthalmic atropine 1% should be given once to twice daily to dilate the pupil, alleviate ciliary muscle spasm, and help stabilize the blood-aqueous barrier (while monitoring for signs of colic). If an active Leptospiral infection is suspected systemic antibiotics can also be administered. Severe or frequently recurring cases may require treatment by a specialist with intravitreal injections, vitrectomy, or suprachoroidal cyclosporine implantation. Low-dose (4 mg) intravitreal injections of preservative-free gentamicin are being used more commonly to treat horses with recurrent or persistent uveitis with encouraging results. Though a single bout of uveitis is manageable, ERU has a poor long-term prognosis; however chances can be improved with prompt diagnosis, appropriate treatment, and diligent monitoring.

Eyes that present with additional changes secondary to ERU may need supplemental therapy or referral to a specialist. Horses with calcific band keratopathy should be switched to a topical NSAID and started on topical EDTA to help reduce calcium deposition. Horses with secondary glaucoma (high IOP or inappropriately elevated IOP in the face of active inflammation) can be medically treated with topical carbonic anhydrase inhibitors and beta-blockers, but surgery may also be necessary. Horses that develop complete cataracts are unfortunately not good candidates for surgical removal due to preexistent inflammatory changes.

**Conclusion**
Ocular diseases are exceedingly common among horses. Early diagnosis, appropriate treatment, and close monitoring will help to provide successful outcomes in numerous cases. When a disease cannot be definitely diagnosed, worsens despite seemingly
appropriate therapy or is beyond one’s capability for treatment prompt referral should be offered.

References: