A thorough ophthalmic examination in the field

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Approximately 10 % of equine emergencies involve the ocular region. In general, it is thought that more than 50 % of horses have some kind of ophthalmic lesion. Therefore, a thorough ophthalmic examination is extremely important for the equine practitioner. The knowledge of anatomy (and the range of normal appearances of ocular and periocular structures) and physiology/pathophysiology are the basis for an ophthalmic examination, but also the how to assess ocular function and perform ocular diagnostic tests.

Before starting the clinical exam obtaining a thorough general and specific history and noticing the signalment of the patient will help to look for certain problems, like insidious ERU (equine recurrent uveitis) in horses with leopard complex (like Appaloosas or Knabstruppers) or squamous cell carcinoma in Haflingers. Young horses or foals are more likely to present with congenital defects and geriatric horses might present with senescent ocular changes or ocular problems related to a concurrent disease, like PPID (pituitary pars intermedia dysfunction). Regarding the history it has to be noted, that most eye diseases have already been treated and it is paramount to get information on applied medication, etc.

The first assessment of the patient should include the observation from a distance with regards to general condition, behaviour, comfort, and visual deficits. Before starting the ophthalmic examination, a clinical examination must be performed, not only to look for comorbidities but also because many systemic diseases have ocular manifestations. Furthermore, the majority of horses, especially when there is a painful eye condition, need to be sedated for a complete eye examination. In some performing periocular nerve blocks and using topical ophthalmic anaesthetic and a mydriatic agent can further facilitate ocular examination.

First, facial and ocular symmetry should be assessed, followed by an evaluation of cranial nerve function and vision testing (for example palpebral reflex, menace response, dazzle reflex and pupillary light reflexes) and palpation of the orbital rim as well as digital tonometry to subjectively assess ocular pressure. Following a standardised approach minimises the risk to miss lesions. Always both eyes must be examined. Detailed examination of ocular structures should be performed starting from the outside and proceeding to the inside of the eye using a bright light source and a direct ophthalmoscope: specifically, eyelids, third eyelid, conjunctiva, sclera, cornea, anterior chamber, iris, lens, vitreous and fundus. An additional test, which is easy to perform, is the fluorescein stain for corneal assessment and nasolacrimal patency. Additional examinations, which can be performed in the field, also depending on equipment and complaint are tonometry, further stains (like Rose Bengal) or a Schirmer tear test (which has to be performed before manipulation of the eye), taking samples for cytology and culture and very importantly, in case of a “cloudy eye”, which prevents evaluation of deeper structures, ocular ultrasound.

Summarising all detected ocular abnormalities and test results should lead to an ophthalmic diagnosis and a decision, if further complementary tests need to be performed or if referral is needed as well as the selection of the most appropriate (initial) treatment.

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Identifying Corneal Disease and First Aid

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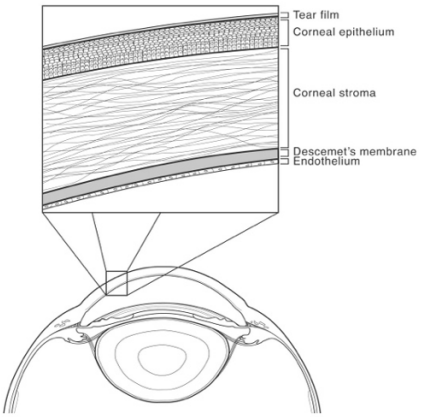
Introduction

Infectious keratitis is the most common ocular disease in horses, often leading to blindness. The equine cornea is relatively slow to heal, prone to infection, and receives much trauma (because of the prominent location of the eyes on a horse and because of the propensity for horses to throw their heads).

Ulcerative Corneal Disease

Corneal ulceration is usually the result of trauma, but secondary infection is common.[1] A corneal ulcer is present when there is a break in the corneal epithelium (Figure 1). Clinically, this results in lacrimation, blepharospasm, photophobia, conjunctival hyperemia, corneal edema, and possibly miosis and aqueous flare. The diagnosis of a corneal ulcer is made based on these clinical signs and fluorescein staining of the cornea. Bacterial and fungal cultures should be submitted on any ulcer that has not healed in 3-7 days. Mixed bacterial and fungal infections are common. It is essential with all corneal ulcers to find the cause of the ulceration and eliminate it. Topical corticosteroids must not be administered in the presence of a corneal ulcer, and a history of previous topical corticosteroid therapy increases the likelihood of infectious, especially fungal, keratitis.[1]



Simple uncomplicated corneal ulcers have characteristics of corneal epithelial cell loss with exposed corneal stroma, acute onset, absence of signs associated with infection (stromal malacia, cellular infiltrate, stromal defects). Treatment should consist of a topical broad-spectrum antibiotic every 6 hours (e.g., oxytetracycline; neomycin, bacitracin, gramicidin; ofloxacin); topical 1% atropine once daily; and treatment of any secondary uveitis, if present (e.g., systemic non-steroidal anti-inflammatory medications [NSAIDS]). Topical corticosteroids are contraindicated in equine ulcerative keratitis, and topical NSAIDS may delay re-epithelialization of the cornea and therefore are also contraindicated.

Complicated corneal ulcers

Complicated corneal ulcers are those that: do NOT heal within 72 hours, have a collagenase component (i.e., melting corneal ulcers or stromal loss), have a mechanical obstruction to healing (i.e., foreign body, indolent), are infected (either with bacteria or fungus), and or are in danger of perforation.

Indolent corneal ulcers in horses are similar to small animal indolent ulcers. They are chronic, superficial corneal ulcers where the corneal epithelium will not adhere to the underlying corneal stroma. The characteristic appearance is a superficial ulcer with a redundant epithelial border. Other signs include minimal corneal neovascularization, focal edema, and moderate discomfort. Indolent ulcer treatment is similar to that for small animals (debridement, diamond burr keratotomy, soft contact lenses, topical broad-spectrum antibiotics [esp. tetracycline class], serum).[2]

Bacterial keratitis generally has stromal involvement that produces edema, cellular infiltration, and stromal defects, potentially accompanied by keratomalacia, or "melting". Secondary anterior uveitis may be severe, resulting in miosis, aqueous flare, hypopyon, and hypotony. Culture and cytology should be collected in cases of stromal ulcers. Treatment should include frequent use of broad-spectrum topical antibiotics (e.g., moxifloxacin every 1-2 hours), topical atropine (q12 hours), systemic NSAIDs, and an anti-collagenase medication (autogenous serum (q1-2 hours) or EDTA). Rapidly progressing lesions should be managed surgically with the use of a keratectomy followed by a conjunctival graft.

Deep corneal ulceration in the horse is almost always the result of infections. A descemetocele is a severe deep corneal ulcer where the overlying corneal stroma has sloughed, exposing Descemet's membrane (DM). DM is easy to identify because it is usually transparent (i.e., does not become edematous) and does not retain fluorescein dye. DM is surgical emergency in most horses and a corneal graft, either fresh or synthetic, with an overlying conjunctival graft gives the best chance for the successful healing. [3,4]

Mycotic corneal ulcers / Mycotic keratitis - Fungal or mycotic keratitis is particularly common in horses, especially in areas in which the climate is warm and humid.[5] Corneal infections most commonly involve Aspergillus spp. or Fusarium spp., but other fungal organisms have been reported.[6] Most commonly, fungal keratitis appears clinically as worsening, sub-acute keratitis that generally appears very painful with severe secondary uveitis. The diagnosis of fungal keratitis carries a poor prognosis and requires long-term aggressive therapy. Antifungal therapy needs to be started early and involve both topical (i.e., voriconazole) and systemic therapy (e.g., fluconazole).[1] Surgical treatment (e.g., keratectomy, penetrating keratoplasty, conjunctival graft, or a combination) of fungal keratitis is generally indicated especially when there is minimal response to medical management if a corneal furrow develops, or if the lesion is very deep in the cornea.

Conclusions

Infectious corneal disease is common due to the high rate of injuries horses sustain to their cornea. Many corneal ulcers heal without incident, but when infections develop, they can be severe and vision-threatening. Globe-saving surgery may be needed if the lesion does not respond to initial medical therapy, progresses, or exists at or beyond 50% depth of the cornea.

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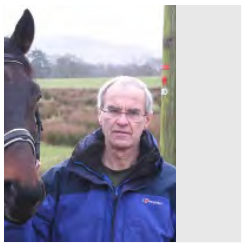

Addressing the issue of eye disease in working and performance horses

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Human and to a somewhat lesser extent small animals ophthalmology has developed dramatically over the last 30-50 years but equine ophthalmology continues to rely on relatively few specialists and specialist centers. However, the horse donkey, and mule are badly neglected in this respect, and it is unfortunate therefore that amongst working populations of horses, eye disease is very prevalent. Even in leisure and performance horses eye disease is often overlooked as being trivial. The range of pathology is extremely wide but on presentation, it is almost invariably in an advanced state and therefore usually in a state where repair or resolution, or even some element of visual restoration, is out of the question. This is particularly regrettable since the e eye does have remarkable powers of healing in spite of its incredible complexity and delicacy.

A number of studies have culminated in at least a recognition that there is a problem that needs to be addressed on a global basis rather than just a local basis. A study carried out in several different countries by Pritchard et al. (2005) showed that 66% of horses and 86% of donkeys had an ocular abnormality. These included discharges, ocular pain, keratitis, uveitis, and blindness. Individual measures may have been taken to try to prevent disease and of course, as always, prevention is better than cure. For example, the simple expedient of developing a "steering head collar" in Mauritania and Mali resulted in a dramatic reduction in the number of cases of ophthalmic disease suggesting that there was a strong management role in the instigation and maintenance of pathology of the eyes (Scantlebury et al., (2019); (Doumbia A and Reed K, personal communications). It is however very true to say that the circumstances under which working animals are forced to endure their existence are very often conducive to the development of serious eye pathology ranging from physical insult, infection, and neoplasia via almost every other potential class of etiology. A study carried out by Scantlebury et al. (2019) in Ethiopia identified that eye disease was extremely prevalent and that there were some interesting potential factors involved. For example, right eye pathology seemed more common than left eye pathology and this was then ascribed to the potential at least of a right-handed driver holding a whip in the right hand implying that there was a physical trauma involved in the instigation of some of the eye pathology. Anecdotal reports from Central America also identify interesting potential etiological, aspects that could be extrapolated from data derived from surveys of horses presented for other reasons as well as for ophthalmic disease. All these reports show a remarkable similarity in identifying the presence of advanced pathology on initial presentation and very little recognition that there was a problem at all by the owner/user. Of course, so long as the working horse works, there is probably little effort to seek professional guidance on the potential presence of pathology. Of course, again, there are few facilities for either diagnosis or treatment in any event and that is a matter of considerable concern.

The veterinary profession for the most part in such circumstances tends to have a rather more ambivalent attitude toward ophthalmic disease than we would like to see. There is little doubt at all that a little effort and a lot of publicity coupled with extra training in ophthalmic medicine and surgery would have a profound influence on the betterment of the welfare of working horses and donkeys. There are countless other diseases of course that are not necessarily easily managed, and, in this respect, infections are a major player. Infections such as viral or bacterial diseases or even fungal or parasitic diseases are very common

in various parts of the world. For example, in Ethiopia, ophthalmic forms of epizootic lymphangitis are relatively common and are extremely difficult to manage. Indeed, there is very little that can be done to help affected animals when the infection gets into the circumstance. On the other hand, Setaria digitata is a very common intraocular parasite in parts of India and Pakistan, and the veterinarians there are extremely adept at managing it by removing the parasites surgically – often without any need for general anesthesia. Once owners/users recognize the benefit of presenting their horses for early treatment, progress can be made and significant benefits in welfare can be accrued. Common things occur commonly in individual areas of the world and have significant differences in the implication and the ability of the veterinary profession to both recognize and manage ophthalmic disease in working animals. There is a massive demand for further information, expertise, and publicity amongst users and owners alike. When presented with an ophthalmic condition, the clinician needs a really logical thorough, and practical examination method that provides useful diagnostic and therapeutic information. It is of course far better to prevent ophthalmic disease than it is to cure it but until we take a very much more proactive stance, we will continue to encounter serious /advanced ophthalmic pathology – usually in a situation where the animal is already blind and where any prospects of site restoration have already been lost. The eye does not tolerate chronic insult or disease even though it has amazing powers of repair. Simple measures to prevent eye disease include proper fitment of harnesses around the head, the education of drivers/users of working horses in terms of cal solutions that can improve the short medium and long-term welfare of these valuable working animals as well as the more expensive sport horses can be devised and applied. It is remarkable how simple treatments can be if the conditions are dealt with early enough – and how complex and disappointing they can be in advanced, neglected or mistreated cases. The role of the horse in global society is immeasurable and their ability to see is a precious sense that we have no right to remove from any animal

The prevention of physical injury, and the early detection of infection of a relevant nature in the environment concerned, all help.

Figure 1: Traumatic eye damage is very common in equine practice worldwide. In working horses ill-fitting harness and poor handling also contribute significantly to this. This horse was diagnosed "incidentally) with a sever infected corneal ulceration that probably originated from poor fitting blinkers and a whip related injury

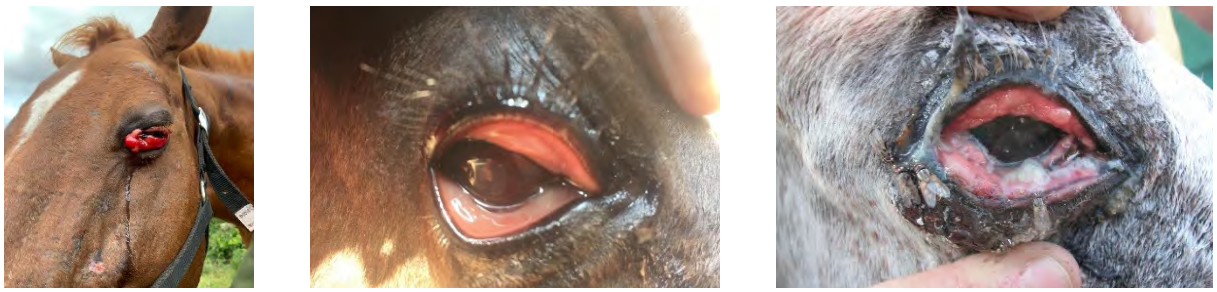

Figure 2: Primary and secondary infections involving the adnexal structures or the globe itself are common in working horses. Early recognition is not usually made however so many are presented very late. LEFT: A case of African Horse Sickness with severe chemosis and hemorrhage . CENTRE: A case of ocular leptospirosis resulting in sight threatening chronic uveitis and pain. Fungal infections are also encountered commonly. This case shows marked signs of epizootic]ymphangitis(histoplasmosis)m in a working horse in Ethiopia. Fungal infection of corneal ulceration is very serious and often results in perforation and sight loss.

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Ocular Manifestations of Trauma

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Introduction

Common ocular manifestations of trauma will be reviewed, including eyelid and corneal lacerations, hyphema and blunt trauma, and retinal detachments.

Eyelid lacerations are common in performance horses.[1] The extent of eyelid injury can vary from involving only a portion of a single eyelid or can affect large sections of both the upper and lower eyelids. During the initial evaluation, a complete ocular examination should be performed to identify the extent of the trauma and identify any concurrent abnormalities such as corneal ulceration, uveitis, ocular hemorrhage, or retinal damage (e.g., retinal detachment). Even with severe lacerations, the eyelids are highly vascularized and often heal well with primary closure. In rare cases, when eyelid trauma is so severe that repair is not possible such that the eyelids are completely severed and/or there is extensive concurrent ocular damage (globe rupture, large corneal laceration with iris prolapse), then enucleation is generally indicated. Eyelid lacerations should be repaired surgically. When repairing an eyelid laceration, the goal is to maintain integrity of the eyelid margin with as perfect apposition as possible. Gentle debridement of any necrotic tissue may be needed to obtain clean, fresh wound edges; however, overly aggressive eyelid debridement or excision of too much eyelid margin can result in persistent exposure keratitis and discomfort. Postoperatively, the horse should be fitted with a protective visor to prevent self-trauma. Treatment consists of topical antimicrobials administered three to four times daily, systemic anti-inflammatories for 3-5 days, and often systemic antibiotics. Topical treatment should be continued until skin sutures are removed in 10-14 days. Prognosis for eyelid lacerations is generally good as long as surgery was performed accurately.

Corneal lacerations - When treating a corneal ulcer, if the lesion is greater than 50 percent of the depth of the cornea, then surgical therapy, such as a conjunctival or amnion graft, should be considered to prevent possible perforation.[2] The prognosis is worse if the corneal laceration involves the limbus; significant hyphema is present; the lens is perforated; if a large uveal prolapse through the incision is present; or if the dazzle and consensual pupillary light reflexes are absent. Examination of a perforated eye should include complete ophthalmic examination (including evaluation of dazzle and consensual pupillary light reflexes) with the horse adequately tranquilized and eyelid nerve blocks done to ensure that no further damage is done as a result of the examination. If the posterior segment (vitreous and retina) of the eye cannot be visualized on the ophthalmic examination, then an ultrasound should be considered. If the vitreous is hyperechoic (i.e., blood or cellular infiltrate) or a retinal detachment is observed on the ultrasound, then the prognosis for return to vision is very poor. Repair of the laceration should be done as soon as possible to prevent further inflammation and contamination of the intraocular structures. Enucleation should be considered if there is no consensual PLR; a large uveal prolapse is present; or if ultrasound results suggest a poor prognosis for return of vision.

Hyphema and Blunt trauma - Blunt trauma can manifest as eyelid swelling, eyelid lacerations, corneal ulceration, cornea rupture, hyphema, lens luxation or cataract, vitreous hemorrhage and/or retinal detachment. If the clinician suspects blunt trauma, a complete ophthalmic examination is performed. If this is not possible due to opacities of the ocular media, , then an ocular ultrasound should be performed to assess the ocular posterior segment. Very commonly with severe blunt trauma, there is blepharoedema, limbal corneal rupture with iris prolapse, hyphema, and retinal detachment. Such severe trauma is generally not reparable, generally requiring an enucleation be performed.

In a recent study,[3] the most frequent ocular findings after blunt ocular trauma included cataract (36/55, 65.5%), corneal edema (26/55, 47.2%), decreased intraocular pressure (23/55, 41.8%), aqueous flare (19/55, 34.5%), lens subluxation, luxation, or lens loss (18/55, 32.7%), fibrin in the anterior chamber (18/55, 32.7%), hyphema (16/55, 29.1%), peripapillary depigmentation ("butterfly lesion") (16/55, 29.1%), conjunctival hyperemia (16/55, 29.1%), corneal fibrosis (15/55, 27.3%), corpora nigra avulsion (14/55, 25.5%), blepharospasm (13/55, 23.6%), and iridodialysis (11/55, 20.0%).

Retinal Detachment - A retinal detachment is the separation of the neurosensory retina (NSR) from the outer retinal pigmented epithelium (RPE). The retina can detach as a result of fluid accumulation between the NSR and RPE, a retinal tear and migration of fluid from the vitreous into the intraretinal space, blunt force trauma, or traction toward the vitreous secondary to resolution of vitreal hemorrhage or after hyalitis. Accumulation of fluid between the NSR and RPE is most commonly the result of inflammation, with ERU being the most common cause. The retina may re-attach with folds or wrinkles, most commonly radiating outward from the optic nerve. In a retrospective study of 40 horses (46 eyes) with retinal detachment,[4] the detachment was partial in 14 horses and complete in 32 horses. The etiology was diagnosed to be ERU in 27 horses (33 eyes) (67.5%) and trauma in 10 horses (10 eyes) (25%). The prognosis for vision in horses with retinal detachment is grave with many eyes going on to enucleation or evisceration. The underlying cause of inflammation needs to be managed, and if management is successful, a bullous detachment may re-attach if the inflammation is resolved and the RPE is able to pump the fluid out of the intraretinal space.

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Eye diseases in foals

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Knowledge of the different morphology and function of the neonate eye is essential for examining foals and understanding the different diseases. In general, eye diseases of foals can be categorised in congenital, inherited and acquired with congenital and inherited disease probably diagnosed more often in foals than in adult horses.

Specifically, it should be considered for examining foals, that the menace response is not a reflex and develops later in live, approximately within the first 2 weeks after birth. But depending for example on postnatal problems this period can be longer. The dazzle reflex is present from birth, also the pupillary light reflex, although this might be sluggish and incomplete for the first days of life. In neonates the globe appears to have a mild ventromedial orientation, which resolves after two to four weeks. Furthermore, eyelids might appear droopy and bilateral conjunctival congestion may appear for the first three weeks of life. Conjunctival haemorrhage, located dorsally, extending to the corneoscleral junction might be seen uni- or bilaterally and usually resolve spontaneously within the first two weeks. Bilaterally a perilimbal vascular ring, associated with diffuse corneal oedema has been reported in 1-day old foals, thought to follow the insult of amniotic or allantoic fluid over the cornea during the last days of gestation. The iris might be slightly grey in colour and the pupil is rounder than in adult horses. Lens suture lines are sometimes more prominent and hyaloid artery remnants might be seen. The optic disc appears more rounded than later in life. Optic nerve head congestion and multifocal haemorrhage within the tapetal area have been reported to occur in neonates, probably following increased intracranial pressure during birth or due to birth trauma. The cornea of foals has a decreased sensitivity, which explains why pain and discomfort are less evident compared to adults.

Congenital diseases can affect all parts of the globe, with some diseases being more common than others. A common congenital disease is entropion, but also other problems like ankyloblepharon, megalocornea, anterior segment dysgenesis, cataract, or different types of colobomas have been reported to occur in neonates. Congenital (sometimes inherited) diseases can affect one ocular structure or multiple structures, like MCOA (multiple congenital ocular abnormalities). For some of the diseases, like MCOA or CSNB (congenital stationary night blindness) there are clear predispositions, like coat colour or breed.

Acquired diseases like traumatic injuries, ulcerative or non-ulcerative keratitis are similar to the ones seen in adult horses. But some disease like uveitis associated with septicaemia are more common in foals.

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Equine uveitis

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Introduction

Equine uveitis, especially recurrent uveitis, is the most common cause of blindness in horses, and understanding the pathogenesis, diagnosis, and treatment of these uveitis diseases is essential for any veterinarian.

Uveitis is inflammation of the uveal tract of the eye. This inflammation may involve primarily the iris and ciliary body (anterior uveitis) or the choroid and retina (posterior uveitis), but most commonly all anatomic areas of the uveal tract are inflamed (pan-uveitis). In the horse, the inflammation can be acute in onset, chronic, or recurrent.[1–4] Further, recurrent uveitis can be active or quiescent (no inflammation). It is important that the equine clinician differentiates between acute uveitis, which has many underlying causes, and equine recurrent uveitis (ERU), which is an immune-mediated disorder.

Therefore, when the clinician examines a horse with suspected uveitis, they answer three important questions to best diagnose and manage the case:

1. **Does the horse have signs of active or quiescent uveitis?**
2. **Is the uveitis acute in onset, chronic (unresolved), or recurrent?**
3. **Is the uveitis primary (endogenous) or secondary to an ocular or systemic abnormality?**

Common signs of **active uveitis** include photophobia, blepharospasm, diffuse corneal edema, aqueous flare and cells, hypopyon, miosis, iris hyperemia, synechia, vitreous haze and cells, and chorioretinitis. Note that corneal opacities of any color, other than diffuse edema, are not common in primary uveitis (including ERU); instead, when corneal opacities are present, primary corneal disease should be considered.

Chronic uveitis may develop after a few days of unrelenting severe inflammation or following multiple recurrent episodes of uveitis. Common signs of chronic uveitis include corneal edema, keratic precipitates, iris fibrosis and hyperpigmentation, posterior synechia, corpora nigra degeneration (smooth edges), miosis, cataract formation, vitreous degeneration and discoloration, and peripapillary retinal degeneration. End-stage uveitis is an advanced stage of chronic uveitis when the eye has developed phthisis bulbi, a small and shrunken eye.

Equine Recurrent uveitis is characterized by episodes of intraocular inflammation that develop weeks to months after an initial uveitis episode subsides; however, not every case of initial equine uveitis will develop into ERU.

Three main clinical syndromes are observed in ERU: the "classic," "insidious," and "posterior" types of ERU.[1] "Classic" ERU is most common and is characterized by active inflammatory episodes in the eye followed by periods of minimal ocular inflammation. The acute, active phase of ERU predominantly involves inflammation of the iris, ciliary body, and choroid, with concurrent involvement of the cornea, anterior

chamber, lens, retina, and vitreous. The signs of active, acute uveitis can recede, and the disease enters a quiescent or chronic phase. After variable periods of time, the quiescent phase is generally followed by further and increasingly severe episodes of uveitis. It is the recurrent, progressive nature that causes cataract, intraocular adhesions, and phthisis bulbi (end-stage eye). In the "insidious" type of ERU, however, the inflammation never completely resolves, and a low-grade inflammatory response continues that leads to progression to chronic clinical signs of ERU. This type of uveitis is most commonly seen in Appaloosa and draft breed horses. The posterior type of ERU has clinical signs existing entirely in the vitreous and retina, with little or no anterior signs of uveitis. In this syndrome, there are vitreal opacities and retinal inflammation and degeneration.

Medical Therapy for Uveitis - Because vision loss is a common long-term manifestation of chronic uveitis, initial therapy must be aggressive. In acute cases, treatment in the form of systemic and local therapy consisting of antibiotics, corticosteroids, and non-steroidal anti-inflammatory drugs is used, many times simultaneously. Many horses respond well to intermittent topical and/or systemic therapy of their active episodes of ERU. Other horses, however, do not respond to traditional therapy and may experience frequent recurrences of uveitis.

Traditional treatments used for uveitis (i.e., corticosteroids and non-steroidal anti-inflammatory medications) are aimed at reducing inflammation and minimizing permanent ocular damage at each active episode. They are not effective in preventing the recurrence of disease (such as in ERU).

Low-dose intravitreal gentamicin - Use of ***intravitreal injections of low-dose gentamicin*** has been increasingly popular for treatment of uveitis and ERU. Single injections of 4-6 mg of gentamicin into the vitreous body are reported to minimize or eliminate recurrent episodes of uveitis in cases of both leptospiral-associated and non-leptospiral ERU.[1,5,6] Further study is needed to determine mechanisms of action and long-term complications, both of which are currently not understood.

Surgical procedures are aimed at preventing the recurrence of uveitis and therefore provide long-term control of the disease: sustained-release cyclosporine devices (CsA) and vitrectomy (CV). Both procedures are performed on a referral basis.

Conclusions

Equine uveitis, especially recurrent uveitis, is the most common cause of blindness in horses, and understanding the pathogenesis, diagnosis, and treatment of these uveitic diseases is essential for any veterinarian. Advanced therapies are being developed, including methods to prevent some infectious causes of uveitis.

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