Ocular Manifestations of Systemic Disease in the Horse

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KEYWORDS

• Equine • Ophthalmology • Systemic • Ocular • Disease

KEY POINTS

- A thorough ophthalmic examination can aid in diagnosis of systemic abnormalities in horses and can easily be performed at the farm.
- The ophthalmic examination should be performed in a systematic sequence (eg, anterior structures to posterior), which allows for the periocular structures and globe to be fully examined.
- Ophthalmic findings should be used in conjunction with complete physical examination to elucidate accurate diagnosis and treatment plan.
- A variety of systemic diseases can cause ocular abnormalities, including bacterial, fungal, viral, and protozoal diseases, as well as parasites and endocrine abnormalities.

The diagnosis of systemic disease in horses can be elusive and the ophthalmic examination as part of a complete physical examination is often an underused tool for creating a differential diagnosis list. This article is organized for the equine practitioner as quick reference for systemic diseases causing ocular changes based on location around and in the eye. Many of these systemic diseases can cause multiple ocular ailments however the most common are presented here. Other exhaustive references for ocular manifestations of systemic disease include *Equine Ophthalmology*, 3rd edition, Dr Brian C. Gilger (2017) and *Veterinary Ophthalmology*, 5th Edition, Dr Kirk N. Gelatt, Dr Brian C. Gilger, and Dr Thomas J. Kern (2013).

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GLOBE ABNORMALITIES

Any disease of the central or peripheral nervous system that affects CN function might result in globe and lid functional abnormalities, specifically in abnormalities of palpebral fissure size, eyelid function, and globe position or movement. Of the 12 cranial nerves (CN), 7 (CN II, III, IV, V, VI, VII, VIII) directly affect ocular structure or function. Sympathetic nerves also affect globe appearance. For excellent reviews of neuroophthalmology in horses, readers are referred to (See Kathern E. Myrna's article, "Neuro-ophthalmology in the Horse," in this issue for further details) and a previous issue of this journal.[1] In brief, palpebral fissure size and symmetry can be affected by deficits of CN III, CN VII, and sympathetic nerves. Eyelid function is affected by CN VII deficits. Globe position and movement are affected by CN III, IV, VI, and VIII deficits.

Many infectious and noninfectious nervous system diseases can affect CN function, either centrally (within the brainstem) or peripherally. In the authors' experience, the most common diseases to manifest with globe abnormalities include equine protozoal myeloencephalitis (EPM), viral encephalitides, bacterial meningoencephalitis, temporohyoid osteoarthropathy (THO), polyneuritis equi, and head trauma. If CN VII is involved, the predominant ocular finding might be corneal disease rather than globe or lid abnormalities. Brief descriptions of selected diseases are provided.

Parasitic

Tapeworm: Echinococcus granulosus

Exophthalmos may develop secondary to retrobulbar formation of hydatid cysts owing to *Echinococcus granulosus*. The definitive host for this tapeworm is the dog, and horses, as well as humans, serve as an intermediate host. Dogs and other canids, as the definitive hosts, harbor the intestinal stage of the tapeworm, which produces infective eggs.[2] The intermediate hosts and human are infected by ingesting the eggs in contaminated food or water.

After oral ingestion of *E granulosus* eggs, cysts may develop in many anatomic sites, including the liver.[3] Retrobulbar cyst formation may be detected via ultrasound imaging; however, definitive diagnosis is made by histopathologic identification of tissue taken after enucleation, which is often necessary for resolution of orbital disease.[3,4]

Bacterial

Tetanus

Rapid globe retraction and resulting "flashing" third eyelid elevation are 2 well-recognized ocular signs of tetanus in the horse.[5] Hyperesthesia is also a common finding.[6] The anaerobic, gram-positive, spore-forming bacterium *Clostridium tetani* produces the exotoxin tetanospasmin, which is responsible for the ocular clinical signs as well as systemic signs, which commonly include rigidity of the face and neck, and "sawhorse" stance followed by tonic muscle spasms and recumbency.[7,8] In the advanced stages of the disease, dilated pupil and ventrolateral strabismus may be present.[6] Horses are most commonly infected by the spores of *C tetani* contamination of a wound from inoculated soil, manure, metal objects, or contaminated surgical sites.

Treatment with supportive care, including muscle relaxation via phenothiazine sedative, barbiturate, benzodiazepines, or high doses of magnesium sulfate, are needed in addition to cleaning the contaminated wounds. Antibiotics will aid in elimination of infection. Penicillin has been commonly used; however, metronidazole is currently the preferred antimicrobial at a dosage of 20 to 30 mg/kg by mouth every 12 hours, or 40 to 60 mg/kg per rectum if the patient is not able to safely take oral medications for 3 to 5 days is the preferred antimicrobial.[7,8] Tetanus antitoxin can be