

Equine Ocular and Pre-Purchase Examinations

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Historical Data: A good ocular examination begins with a thorough medical history. The saying goes that the eyes are the window to the soul – to the ophthalmologist they are often a window to illness somewhere else in the body. Start with the basics; signalment, use, as well as housing, work, and turnout environments. Clinical signs or performance issues not thought to be directly related to the ocular condition may be very important in obtaining an accurate diagnosis. A vaccine and deworming history can also be integral in finding answers to the problem at hand. When assessing the primary ocular complaint, the timing of the onset of signs, the duration of signs of and response or lack of response treatments as well as current medications should be determined and considered.

Basic Equipment:

- A focal light source (halogen Finoff transilluminator)
- Loupe for magnification
- A direct ophthalmoscope or indirect ophthalmoscopy lens
- Schirmer Tear Test Strips
- Fluorescein strips
- Rose Bengal strips
- Kimura spatula or a #10 blade
- Glass Slides
- Sterile cotton tipped swabs
- Culture swabs with transport media
- Proparicaine
- Tropicamide 1%
- Mepivacaine or Lidocaine
- Polypropylene urinary catheter
- Digital camera

Ocular Anatomy: The globe is contained within the orbit and averages 4.48cm horizontally, 4.76cm vertically and 4.37cm in an anterior/posterior direction. The globe's movement is controlled by four rectus muscles, a dorsal and a ventral oblique muscle, and a set of retractor bulbi muscles. The eyelids are relatively thin with the upper lid being larger and more mobile than the lower lid. The palpebral fissure is normally oval with the lateral canthus being more rounded than the medial canthus. There are eyelashes only on the upper lid, with coarse vibrissae dorsonasal to the upper lid and ventral to the lower lid. The third eyelid is a fold of conjunctiva enclosing a T-shaped piece of cartilage. It is large in the horse, with only the leading edge normally visible. The leading edge of the third eyelid may or may not be pigmented dependent upon coat color.

The lacrimal gland lies below the dorsolateral orbital rim and is innervated by parasympathetic postganglionic fibers of CN VII. The third eyelid gland surrounds the base of the third eyelid and is innervated by parasympathetic postganglionic fibers of CN IX. There are two lacrimal puncta, one each in the upper and lower lid approximately 8-9 mm lateral to the medial canthus. The puncta are 2mm in diameter and the nasal lacrimal duct averages 3-4mm in diameter. The nasal lacrimal duct follows a line

drawn from the medial canthus to just dorsal and rostral to the infraorbital foramen and then to the skin of the floor of the nostril near the mucocutaneous junction.

Corneal thickness varies being thickest peripherally at 1mm and thinnest centrally at 0.6mm. The iris is normally golden to dark brown, but can have heterochromia or be blue or white. The granular iridicans (corpra nigra), are extensions of the dorsal and ventral pupillary margins. These structures augment pupillary constriction and may have a sun-shade function. The lens in the horse has prominent developmental sutures that can be visualized without magnification using retroillumination. Most horses have a dorsally located tapetum that is green or yellow in color. Coat color can affect the presence or absence of a tapetum. In albinotic or subalbinotic coat colors the tapetum is absent or variable respectively. Endothelial capillaries can be seen as black dots throughout the tapetal fundus and are called the stars of Winslow. The non-tapetal retina is normally dark in color, but again can lack pigment dependent upon the coat color of the animal. If the non-tapetal retina lacks pigment, the choroidal vessels will be visible. The optic nerve head is oval in shape with the long axis oriented horizontally. It is located in the non-tapetal fundus ventrotemporal to the axis of the globe. The vasculature of the equine retina is paucangiomatic and normally vessels are only visible extending a few millimeters from the optic disc. The central aspect of the ventral margin of the optic disc has fewer vessels and can appear white in color.

Initial Examination: The initial examination of the horse eye should occur in a well lighted area that is quiet and away from distractions. Like most examinations, it is best to begin from a distance to assess the horse as it moves in its stall or on a lead. Assess head carriage, response to stimuli, and response to obstacles. Next, symmetry, swelling, exophthalmos, and eyelash direction should be noted. The eyelashes in the horse normally are positioned perpendicular to the cornea. Ocular and nasal discharge can be characterized and collected for culture or cytology if appropriate. Comfort can be assessed by lid position as well as the presence or absence of blepharospasm, enophthalmos and epiphoria. Prior to sedation vision testing and a cranial nerve evaluation should be performed. Cranial nerve assessment should focus on cranial nerves II, III, IV, V, VI, VII.

Vision can be assessed with the menace response, pupillary light reflexes and the dazzle reflexes. These tests assess the function of multiple cranial nerves at once. Assure that the palpebral reflex is normal prior to calling the menace response or the dazzle reflex abnormal. The menace response is a learned protective response not a reflex. Stoic, depressed or stressed horses can give a false negative response. Tapping the medial or lateral canthus prior to the menacing gesture will get the animal's attention may result in a normal response. The afferent arm of the menace response involves the retina and CN II. The efferent arm is the palpebral branch of CN VII.

After examining pupils for shape, size, and symmetry the pupillary light reflex can be assessed. Note that anisocoria can be normal in horses with heterochromia iridis. The afferent arm of the pupillary light reflex involves the retina and CN II, the reflex path travels through the midbrain and the efferent arm is CN III. The equine pupillary light response is biphasic with the first portion being a small but fast response followed by a second slow and complete response. The indirect pupillary light reflex is a valuable but underutilized test. The indirect response is very helpful in assessing for vision and response to light when the iris in the affected eye is not visible or when assessing for optic nerve disease with the swinging flashlight test. In this test the light source is alternated between the two eyes. Normally both pupils will maintain a state of miosis when the light is moved back and forth. The pupil of an eye affected with an optic nerve lesion will constrict indirectly but will dilate upon direct light stimulation.

The dazzle reflex involves CN II, the rostral colliculus, the supraoptic nuclei of the hypothalamus, the visual cortex, and CN VII. Bright focal light stimulation will result in a brisk blink or blepharospasm. Avoid touching any of the vibrissae or getting the light too close as the heat from a strong light source will give a false positive response.

Ocular Component Examination: Examination from this point forward is often facilitated by sedation and an auriculopalpebral nerve block, especially if the horse is exhibiting pain or has corneal disease where pressure on the globe could result in corneal rupture. Close examination of the ocular structures, pupillary light and dazzle reflexes requires a darkened environment. Transillumination or retroillumination, with or without loop magnification will give a good picture of lid, conjunctival, corneal, anterior chamber, iris or lenticular disease. Complete examination of the lens and posterior segment cannot be done without mydriasis. Topical 1% tropicamide will give adequate dilation after 10-20 minutes in a normal eye. Dilation will last approximately 4-6 hours. The presence of uveitis will cause the iris to be resistant to dilation. Retroillumination is the observation of normal or pathologic structures in semitransparent media in light that is reflected from tissues situated more posteriorly. Retroillumination is very helpful in examination of the cornea and lens for subtle changes. Structures that obstruct light will appear dark on retroillumination. The ophthalmoscope set can be used to assess for flare, to assess the depth of a corneal or lenticular lesion and for fundic examination. The direct ophthalmoscope will give a highly magnified view of the retina that is upright, however you have a very short working distance and the field of view is very small. Indirect ophthalmoscopy gives an initially confusing upside down and backwards image, but it does give more panoramic view and allows the observer to stand an arm's distance from the horse.

Schirmer tear test: Schirmer tear testing measures aqueous tear production. Dry eye is not common in the horse, but can be seen with CN VII damage in cases of guttural pouch disease, stylohyoid osteopathy, West Nile virus and secondary to trauma. Normal values for the horse range from 11 to 30mm per wetting minute. Repeated measurements of less than 10mm per wetting minute should be considered abnormal.

Ophthalmic Stains: Fluorescein staining of the cornea is indicated for almost every condition of the equine eye. False positive tests can be seen if fluorescein is applied after the use of topical proparacaine or if the dye strip has direct contact with the cornea. Fluorescein stain can also be used to detect leakage of aqueous from descemetocoeles (Seidel Test). With the application of a concentrated drop of stain to the cornea the stain will appear yellow/orange in color. Gentle pressure is applied to the cornea and if there is leakage there will be a change in color from yellow to green as the stain is diluted by leaking aqueous. The patency of the Nasolacrimal apparatus can be assessed with fluorescein stain (Jones test). The dye should appear at the nares within 5 minutes of corneal application, but it can take up to 20 minutes for the dye to appear. Rose Bengal stain is used in the diagnosis of pre-ocular tear film deficiencies and in superficial corneal epithelial pathology. Rose Bengal should be used after fluorescein stain. Rose Bengal will stain dead and degenerating cells and mucus. Stain uptake is normally blocked by a normal tear film. In cases of keratomycosis ocular surface abnormalities will stain positive for Rose Bengal even when the cornea is negative for fluorescein stain uptake.

Intraocular pressure (IOP): Applanation Tonometry (Tono-pen) is the most commonly utilized measurement of IOP in the horse at this time. Normal intraocular pressures in the horse are 15-30mmHg. Applanation tonometry measures the force required to flatten the cornea when a weight is applied to estimate the IOP. Three readings with a standard of error of less than 5% are averaged to give an accurate IOP estimate. Pathologic corneal changes such as edema or fibrosis may falsely elevate intraocular pressure. Sedation with xylazine has been shown to lower IOP by up to 23%. IOP measurements are affected head height and the measurements should be taken with the head in a normal upright position. The auriculopalpebral nerve block and holding the head in a normal position will give the most accurate results. Tension on the eyelids was thought to falsely elevate IOP; however this finding was not supported by subsequent studies.

Documentation: I highly recommend purchasing or designing an ocular examination form. Consistent documentation of ocular findings, especially in a multi-doctor practice makes for a higher quality of patient care and service. Having the form also supports examination of the entire eye from the lids through the

globe and into the orbit. Digital photography is also a highly useful tool for the documentation of ocular pathology and for tracking changes in ocular conditions.

Prepurchase examination: The ophthalmic portion of a pre-purchase examination is not significantly different from any other complete ocular exam. Dependent upon the projected use and value of the horse, utilization of a board certified ophthalmologist may be appropriate in some cases. Pharmacologic mydriasis is required to fully assess the lens and the posterior segment during a complete ophthalmic examination.