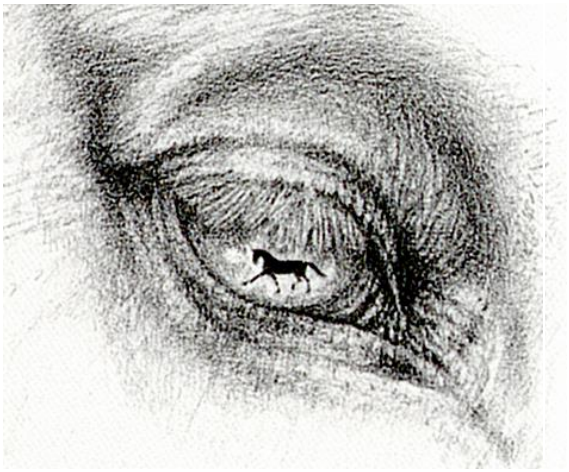

EQUINE OPHTHALMOLOGY
"You see what you know!"

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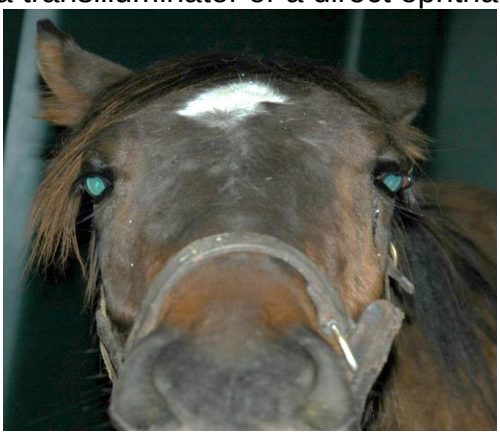
EXAMINATION OF THE EYE OF THE HORSE

To be able to perform a proper ophthalmic examination it is necessary to have a bright focal light source such as a transilluminator or a direct ophthalmoscope.



The head is examined for symmetry, globe size, movement and position of the globe, ocular discharge, and blepharospasm. The general appearance of the eyes and adnexa is noted.

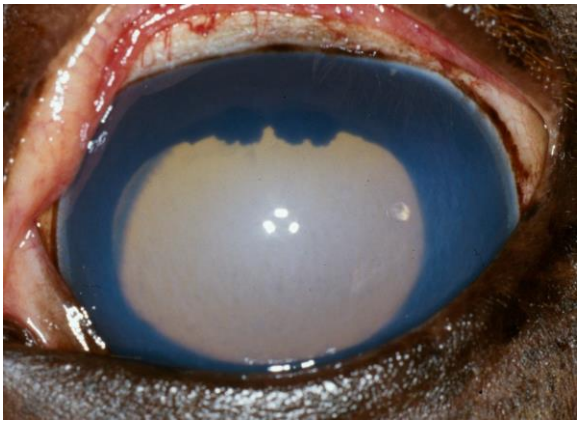
It can be useful to examine the angle of the eyelashes on the upper lid to the cornea of the two eyes, as droopiness of the lashes of the upper lid may well indicate blepharospasm, ptosis, enophthalmos, or exophthalmos. Normally the eyelashes are almost perpendicular to the corneal surface. The first sign of a painful eye often is the eyelashes pointing downwards.

Reflex testing
Making a quick, threatening motion toward the eye to cause a blink response and/or a movement of the head tests the **menace response**. This is a crude test of vision. Care is taken not to create air currents toward the eye when performing this test. Horses have a very sensitive menace response.


Menace response or Hand motion

The horse should also quickly squint or **"dazzle"** when a bright light is abruptly shown close to the eye. The **palpebral reflex** is tested by gently touching the eyelids and observing the blink response.

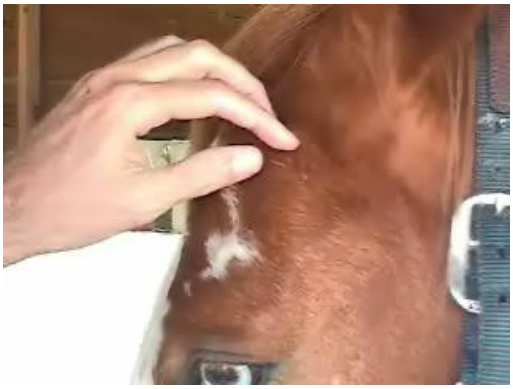
Vision could be further assessed with maze testing with blinkers alternatively covering each eye. The maze tests should be done under dim and light conditions. The **pupillary light reflex** (PLR; direct and indirect) evaluates the integrity of the retina, optic nerve, midbrain, oculomotor nerve, and iris sphincter muscle. The normal equine pupil responds somewhat sluggishly and incompletely unless the stimulating light is particularly bright. Stimulation of one eye results in the constriction of both pupils. The PLR is valuable in testing potential retinal function in eyes with severe corneal opacity.


Dilated pupil


Miosis

Diagnostic testing
It is important to approach each eye problem in the horse in an ordered and systematic manner. The majority of cases can be diagnosed by using standard ophthalmic clinical examination techniques. Intravenous sedation, a nose or ear twitch, and supraorbital sensory and auriculopalpebral motor nerve blocks may be necessary to facilitate the examination.

The **auriculopalpebral nerve** (motor nerve to the orbicularis oculi muscle) can be palpated under the skin and blocked with 2-3 ml of lidocaine just lateral to the highest point of the zygomatic arch.

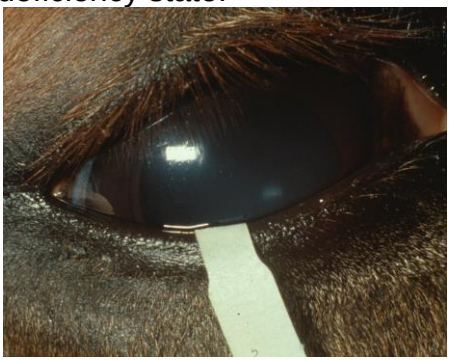

Motor lid block

The **frontal or supraorbital nerve** (sensory to the medial two thirds of the upper lid) can be blocked at the supraorbital foramen. This foramen can be palpated medially at

the superior orbital rim where the supraorbital process begins to widen. Line blocks can be used near the orbital rim to desensitize other regions.

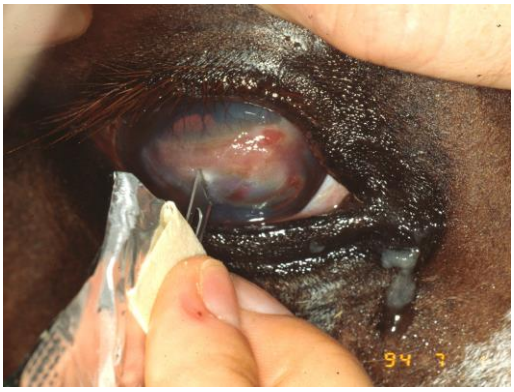

Upper lid sensory block

Schirmer tear testing is a method to measure reflex tearing and should be used for chronic ulcers and eyes in which the cornea appears dry. The Schirmer tear test must be done prior to instillation of any medications into the eye. The test strip is folded at the notch and the notched end inserted over the temporal lower lid margin. The strip is removed after one minute and the length of the moist end measured. Strips are frequently saturated in horses after one-minute with values ranging from 14-34-mm wetting/minute considered normal. Values less than 10-mm wetting/minute are diagnostic for a tear deficiency state.

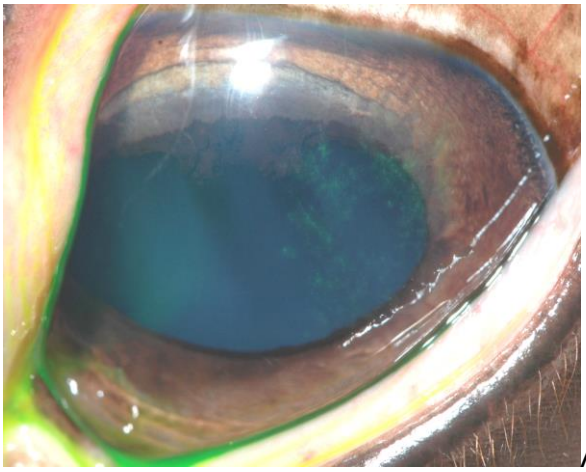

Schirmer Test

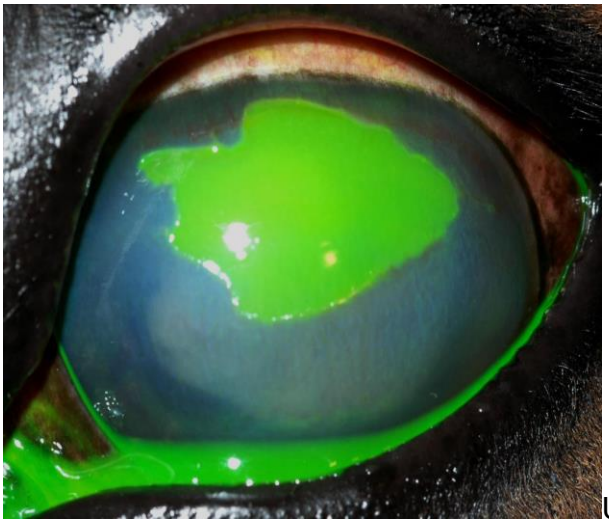
Corneal cultures using microbiologic culture swabs should be obtained prior to placing any topical medications in the eye. The moistened swabs should be gently touched to the corneal ulcer.

Corneal scrapings to obtain cytology specimens to detect bacteria and deep fungal hyphal elements can be obtained at the edge and base of a corneal lesion with topical anesthesia and the handle end of a sterile scalpel blade. Superficial swabbing cannot be expected to yield the organisms in a high percentage of cases so removing the superficial debris can be helpful prior to collecting the sample. Cytology of eyelid and conjunctival masses can also be diagnostic.



The cornea should be clear, smooth and shiny. Placing **fluorescein dye (USE IT NONDILUTED)** in the eye to identify corneal ulcers should be routine in every eye examination of the horse. Small corneal ulcers will stain that might otherwise be undetected.

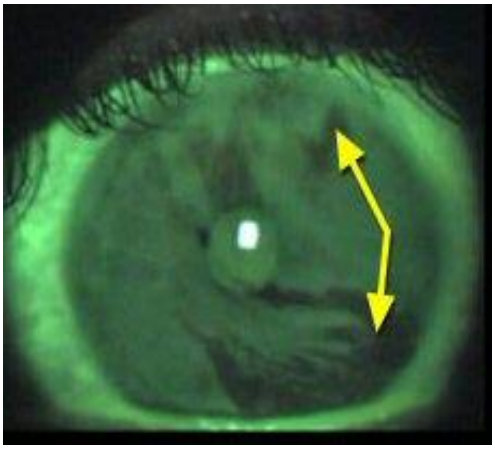

Abrasion


Ulcer

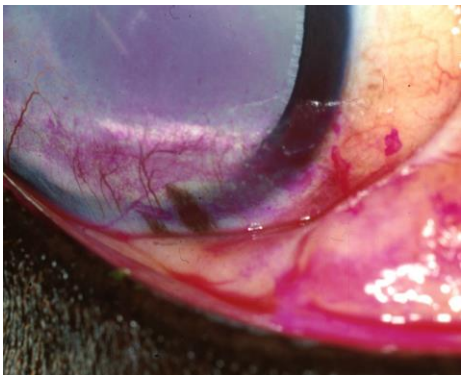

Seidel’s test

Seidel's Test: Fluorescein can be used to detect perforated corneas, or leaking corneal sutures. Placing fluorescein over a suspected corneal or scleral defect will result in a color change in the dye as the aqueous humor dilutes the fluorescein.

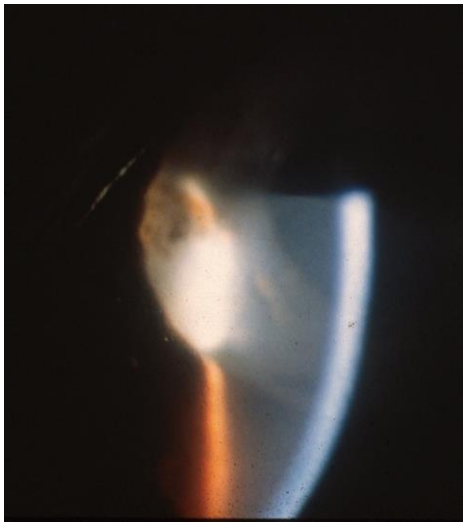
Tear Film Breakup Time: Normal tear film is continuous. Blinking maintains the tear film continuity. The tear film breaks up if blinking does not occur often enough. Dark dry spots will appear under cobalt blue filtered light as part of normal evaporation and diffusion of tears. Fluorescein dye is placed on the cornea and not flushed off. The lid is manually blinked three times and held open to expose the tear film to evaporation. The time required for a dry spot to appear on the corneal surface after blinking is referred to as the **tear film break-up time (TFBUT)**. In a normal healthy eye, dry spots start occurring between blinks at about 20 seconds. A TFBUT of less than 10 seconds is abnormal and probably associated with instability of the mucin layer of the tear film.


TFBUT

Rose Bengal dye should be used in selected cases after installation of fluorescein to identify the integrity of the tear film. Rose bengal dye strips are available at http://www.akorn.com.



The anterior chamber (AC) is best examined with a handheld or transilluminator mounted **slitlamp**. The anterior chamber contains optically clear aqueous humor. Increased protein levels in the AC can be noted clinically as **aqueous flare**. White cells in the AC are called hypopyon, and red cells in the AC are called hyphema. Aqueous flare, hypopyon and hyphema indicate uveitis.

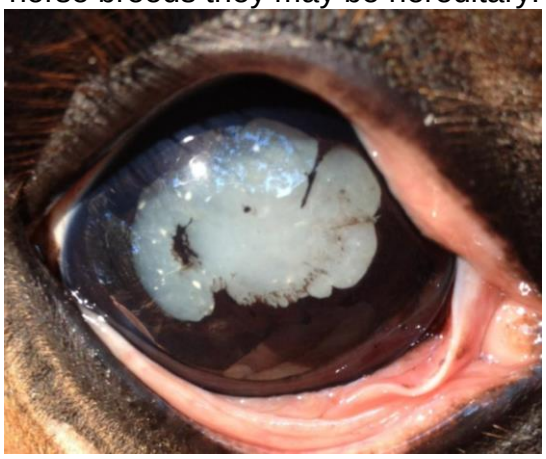

Flare and fibrin

The **intraocular pressure (IOP)** of horses is 16-37 mm Hg with a Tonopen applanation tonometer.

A **mydriatic** should be applied to the eye once the pupillary light response has been evaluated. The agent of choice is topical 1% tropicamide, which takes some 15-20 minutes to produce mydriasis in normal horses, and has an action that persists for approximately 8-12 hours. Atropine is used for therapeutic mydriasis as it can dilate the normal horse pupil for greater than 2 weeks.

The lens should be checked for position and any opacities or cataract. There are a number of lens opacities which may be regarded as normal variations: prominent lens sutures, the point of attachment of the hyaloid vessel, refractive concentric rings, fine "dustlike" opacities, and sparse "vacuoles" within the lens substance.

Cataracts are lens opacities and are associated with varying degrees of blindness. They can be congenital, secondary to previous uveitis, and be progressive or nonprogressive. In some horse breeds they may be hereditary.



Normal aging of the horse lens will result in cloudiness of the lens nucleus (**nuclear sclerosis**) beginning at 7 to 8 years of age, but this is not a true cataract. The suture lines and the lens capsule may also become slightly opaque as a normal feature of aging.

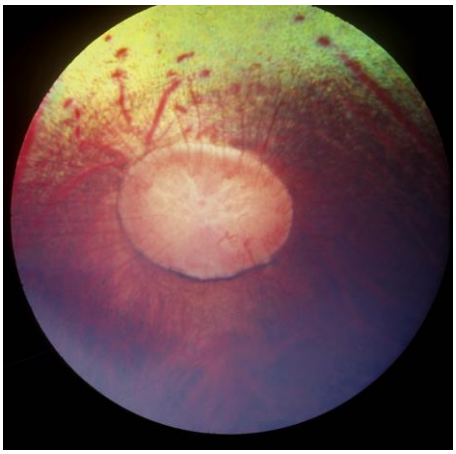
The adult **vitreous** should be free of obvious opacities. Vitreal floaters can develop with age or be sequelae to Equine Recurrent Uveitis (ERU). They are generally benign in nature.

The **retina and optic nerve** are examined with a **direct, Panoptic®, or indirect ophthalmoscopes**). The rotary lens setting of the direct ophthalmoscope should be set to 0 to examine the retina and optic nerve, and to a “green” number 20 to focus on the lids and cornea.

Magnification of the fundic image with the direct ophthalmoscope is 7.9X laterally and 84X axially in horses, and with the indirect ophthalmoscope and a 20D lens is 0.79X laterally and 8.4X axially. The Panoptic® ophthalmoscope has an intermediate level of magnification between the direct and indirect ophthalmoscopes. The fundus should be examined for any signs of ERU, such as peripapillary depigmentation. The nontapetal region ventral to the optic disc should be carefully examined with a direct ophthalmoscope, as this is the area where focal retinal scars are seen.

Distant

Closer to focus


Fundus

“Phoneoscopy”
Smartphones are becoming quite ubiquitous and all have digital photographic and video capability. They are always with us. The imaging technologies of these smartphones are increasingly quite impressive. Utilizing these capabilities will allow rapid telemedicine consults and are accessible for owners for use in monitoring eye conditions. An unintended consequence of this photographic capability is it can allow veterinarians to view and image the adnexa, cornea, iris, lens, retina, and optic disc of the horse. The technique mimics the distant direct technique of the ophthalmoscope. Adaptors, macrolenses, and other accessories also allow slitlamp photography and imaging of cytologic specimens. Software apps are already available to aid photography of the horse globe to levels that are, with a little practice, astonishing! The views with some smartphones are often superior to that of the direct ophthalmoscope.

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Conflict of Interest: Dr. Dennis Brooks has no conflict of interest.