Determing the significance of abnormalities of the outer eye and cornea

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Appearance of the eye and adnexa

The general appearance of the eye and the adnexa (globe, eyelids, lacrimal apparatus, orbit and paraorbital area) should be assessed and the symmetry of each side compared. The angle of the upper eyelashes to the cornea should be examined. Normally they should be at almost 90 degrees to the cornea.

The eyelids

The margins, outer and inner surfaces of the upper and lower eyelids should be examined. The position of the eyelashes on the upper lid is noted. Nonpigmented eyelids should be examined carefully as they are more susceptible to squamous cell carcinoma. The outer surface of the third eyelid can be easily protruded and examined by applying thumb pressure on the dorsolateral globe through the upper eyelid. The inner surface of the third eyelid is examined by everting it using atraumatic tissue forceps following the application of a local anaesthetic.

The ocular surface

The cornea and conjunctiva of the anterior ocular surface have a continuous epithelium which begins at the lid margins, extends onto the back of the lids into the conjunctival fornices, and then moves across the limbus to the cornea. The eye and focal light source allow examination to determine the health of the ocular surface. The conjunctiva of the eye and third eyelid should be shiny from the tear film and be examined with particular care, especially when nonpigmented, as this is a site where squamous cell carcinoma can develop. The limbus or junction between the ‘white’ of the eye (bulbar conjunctiva with underlying episclera and sclera) and the clear cornea is well defined by a narrow rim of pigment. The cornea should be lustrous and transparent, allowing the fine structure of the iris to be visualised clearly. The normal equine cornea is distinguished by its large size and prominence. In shape, the cornea is a horizontally elongated ellipse and the medial cornea is slightly wider than the lateral cornea. In most horses there is an obvious grey line on the corneal surface. The conjunctiva of the cornea (Descemet's membrane).

The anterior chamber and iris

These can be examined briefly with a pen light at this stage, but it is easier to examine these regions in the dark. The pupillary light reflex (PLR) and the position, shape and size of the pupils are checked. The normal equine pupil responds somewhat sluggishly and incompletely, especially in comparison with that of the cat and dog, unless the light is particularly bright. The presence of a PLR is not synonymous with vision, nor does the absence of a reflex necessarily indicate that the horse is blind. A reduced or absent PLR is usually indicative of an ocular problem or a sub-cortical lesion. A fixed and dilated pupil is associated with retinal and optic nerve disease, visual cortex problems, and glaucoma.

Slit lamp biomicroscopy of the anterior segment

The handheld or transilluminator mounted slit lamp biomicroscope provides a detailed means of examining the cornea, anterior chamber and lens of the equine anterior segment utilising high magnification. Its use may be essential to a definitive diagnosis, but for the most part it is usually employed at specialist centres. It consists of a light source which can produce diffus illumination or a narrowed slit beam illumination of 0.8 to 1 mm, and a binocular microscope which can move independently with respect to the light source.

Diffuse illumination is used initially to detect gross lesions involving the cornea, anterior chamber, iris, lens or anterior vitreous. The beam is then narrowed to a slit and directed obliquely so that a magnified optical section of the corneal epithelium, stroma and endothelium can be assessed. The anterior chamber contains optically clear aqueous humour. Increased protein levels in the anterior chamber can be noted clinically as aqueous flare. White cells in the anterior chamber are called hypopyon, and red cells in the anterior chamber are called hyphaema. Aqueous flare, hypopyon and hyphaema indicate uveitis. 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 of optical discontinuity, fine ‘dust-like’ lens opacities, and sparse “vacuoles” within the lens substance.

Topical ophthalmic stains

Fluorescein

This is an orange dye which changes to green in alkaline conditions. In horses it is primarily used to detect corneal ulceration as it is rapidly absorbed by the exposed hydrophilic stroma in such cases. It does not stain the lipid-rich corneal epithelium or the acellular posterior basement membrane of the cornea (Descemet’s membrane).

Fluorescein may also be used as a means of checking the patency of the naso-lacrimal drainage apparatus, evaluating the stability of the tear film (tear film break-up time), and is highly recommended for detecting leakage of aqueous humour associated with penetrating corneal or scleral injury and melting ulcers, or microleaks from corneal sutures following corneal repair (Seidel’s test).

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.
Rose bengal
Rose bengal evaluates the integrity and stability of the mucin layer of the precorneal tear film. It is a red dye which stains damaged or devitalised epithelium, mucous, and stroma following disruption or instability of the mucin layer of the tear film. It is absolutely necessary in horses with nonhealing ulcers, KCS, herpes, and/or keratomycosis. Rose bengal dye should be used immediately after installation of fluorescein to identify the integrity of the tear film. Some sources say that rose bengal is irritating to the horse eye but this has not been my experience.

Schirmer tear production test
More and more disorders of the precorneal tear film have been described in horses and testing tear production is now regarded as a routine part of equine ophthalmic examination. 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 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 to 34 mm wetting/min considered normal. Values less than 10 mm wetting/min are diagnostic for a tear deficiency state, and values less than 5 mm are indicative of a lack of tear production, clinically manifest as keratoconjunctivitis sicca (KCS).

Tear film break-up 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 3 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 10–12 s. A TFBUT of less than 10 s is abnormal and probably associated with instability of the mucin layer of the tear film.

Further reading