

Small ruminant ophthalmology - The eyes have it

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Abstract

Infectious keratoconjunctivitis (pinkeye) is a common problem in sheep and goats. Several etiologies as well as diagnostic techniques, treatment, and control are considered. Entropion is an important differential diagnosis, especially in young animals with eye irritation, and several inexpensive treatment methods are described. Additionally, causes of exophthalmosis, important causes of central blindness, and field enucleation are presented.

Key words: sheep, goat, keratoconjunctivitis, entropion, ophthalmology

Résumé

La kératoconjunctivite contagieuse des bovins (*pinkeye*) est un problème courant chez les moutons et les chèvres. Plusieurs causes de même que plusieurs techniques de diagnostic, de traitement et de contrôle sont considérées. L'entropion est un diagnostic différentiel important surtout chez les jeunes animaux avec une irritation de l'œil. On décrit plusieurs méthodes de traitement peu peu coûteuses. On discutera aussi des causes de l'exophthalmie, de causes importantes de cécité centrale et de l'énucléation oculaire à la ferme.

Introduction

Ocular problems of sheep and goats are readily observed by the caretaker who may then request veterinary consultation. Most of the more common conditions can present as a herd problem due to infectious, genetic, or environmental causes. Small ruminant ophthalmology is well reviewed in veterinary textbooks,^{2,4,5} and this paper will serve to summarize on-farm evaluation and treatment of the major problems a general practitioner is likely to encounter.

Clinical Examination of Eyes and Eyelids

Evaluation of the eyes of small ruminants should begin with inspection of the conjunctiva of the lower lid for evidence of anemia. The paleness that is easily detected in small ruminants with haemonchosis can be quantified by comparison with a FAMACHA eye chart, and documented by hematocrit determination (spin the microhematocrit tube for 10 minutes) and parasite testing. Severe coccidiosis occasionally produces anemia, as does advanced paratuberculosis.

Great care must be taken in handling the animal with white conjunctiva, to avoid patient death. For detailed information on the FAMACHA system or for ordering a FAMACHA anemia chart, see the American Consortium for Small Ruminant Parasite Control website.¹

If the sclera of a sheep is yellow or yellow-brown, a diagnosis of copper toxicity should be pursued. In particular, efforts should be made to collect urine, typically voided by a sheep stressed by the physical examination process. Goats occasionally experience copper toxicity but may not show the icterus or hemoglobinuria typically observed in sheep.

A third aspect of the general clinical examination that should precede a directed ocular examination is evaluation for blindness (a hallmark of polioencephalomalacia, or cerebrocortical necrosis) and facial nerve paralysis (potentially present with listeriosis, otitis media/interna, or facial trauma). The animal that is blind with polioencephalomalacia will have normal palpebral reflexes and pupillary light reflexes but no menace response. Enterotoxemia, caused by the epsilon toxin of *Clostridium perfringens*, is another possible cause of central blindness in small ruminants but lead poisoning rarely if ever presents this way. The animal with facial nerve deficits also may lack a menace response and, in the case of listeriosis, may be too depressed to retract its eyeball when threatened.

Young lambs and kids, like young calves, lack a menace response. Instead, vision can be evaluated using the animal's success in following a bottle or avoiding obstacles in its environment.

The ruminant eye normally maintains a constant position relative to the ground rather than remaining centered between the lids. This can make ocular examination frustrating if the head cannot be restrained in the position required to expose the structures of interest. It is also important to recognize that a sheep or goat that is not a much-handled pet may be so stressed by examination that a pocket penlight is inadequate for overcoming fear-induced pupillary dilation.

Evaluate the eyelids and face for discharges (typical of keratoconjunctivitis) and the cornea for clarity, ulcers, and neovascularization. Fluorescein staining will document the presence of an active ulcer, which might be due to infection, trauma, or exposure of the cornea following facial nerve paralysis or eyeball protrusion caused by a retrobulbar space-occupying lesion. The fundus can usually be examined without resorting to mydriatics. The optic disc is rather round or oval in the goat, whereas in the sheep it is often more kidney-shaped. The optic disc in goats is frequently located totally within the tapetal fundus (tapetum lucidum, yellow

to bluish green). In cattle and sheep it is usually situated in the nontapetal fundus (tapetum nigrum, brownish) just beneath the horizontal junctional area of tapetal and nontapetal fundus. Older animals may have unilateral or bilateral cataracts that interfere with ophthalmoscopic examination of the retina.

Infectious keratoconjunctivitis (Pinkeye)

Pinkeye often occurs as a herd outbreak. *Mycoplasma conjunctivae* is a common cause of pinkeye in sheep and goats in the northeastern United States. It frequently is introduced to a farm by contact with other small ruminants and petting hands at fairs or by the purchase of carrier animals. Conjunctivitis with chemosis, epiphora, and photophobia make the ocular involvement obvious in some animals. Keratitis may be absent or severe enough to seriously impair vision, with opacity and aggressive neovascularization. Corneal ulcers, if present at all, may be shallow or quickly develop into desemetocoeles. Practitioners in the western United States and in the United Kingdom report that chlamydia cause pinkeye in their regions. If chlamydia are involved, they are strains that are not associated with abortion but might also cause polyarthritis.

Diagnosis of the inciting agent will require culture, using appropriate transport media (such as Amies without charcoal for mycoplasma), as recommended by the receiving diagnostic laboratory) or conjunctival scrapings for staining or immunofluorescent testing (or potentially polymerase chain reaction testing) for the organisms. Severely ulcerated eyes will have secondary bacterial infections, and organisms isolated vary from *Staphylococcus aureus* to *Moraxella (Branhamella) ovis* or *Moraxella bovis*.

Mild cases of pinkeye may be left untreated, especially in commercial herds. Extra-label subcutaneous injections of long-acting oxytetracycline^a at 9 mg/lb (20 mg/kg) will provide temporary remission in non-dairy animals, but a meat withdrawal of longer than 28 days must be observed. Milk withdrawal also needs to be longer than the 96 hours specified for dairy cattle, to meet Animal Medicinal Drug Use Clarification Act requirements. Although less clinical experience is available, tulathromycin^b at 1.1 mg/lb (2.5 mg/kg) might be an alternative systemic antibiotic for non-dairy animals. Oxytetracycline-polymyxin B ointment^c may be used when keratitis is severe, and atropine ointment is helpful when the eye seems especially painful due to presence of uveitis.

Topical application of a local anesthetic followed by a few drops of 5% silver nitrate solution will arrest severe melting lesions and appears to promote rapid and complete healing of the worst ulcers. This solution is not available commercially but can be approximated by mixing 0.5 grams of silver nitrate in 10 mL of sterile water or by dissolving the material coated onto one Grafco® silver nitrate applicator stick^d in 1 mL of sterile water. The totally opaque soft cornea is firm and shiny again in a few days, although total clearing of the cornea can be expected to require more than a week.

With or without treatment, immunity eventually develops and signs resolve, but the organism may remain latent in some animals and may be reactivated by shipping or other stress. Some producers administer long-acting oxytetracycline to stressed animals to avoid recurrence of keratoconjunctivitis and shedding at these times.

A typical outbreak in a completely naive herd lasts about 3 weeks. Heavy antibiotic therapy can prolong the outbreak duration to 6 weeks or longer. Presumably, antibiotics interfere with the development of local immunity. Individual therapy is indicated for animals with ulcers or particularly painful eyes, and for those that are unable to find food and water or stay with the herd because of impairment of vision. Prolonged treatment of the entire herd in an attempt to eradicate the infection is futile. In an endemic herd, it is common for pinkeye to develop in each crop of lambs while adults only rarely show clinical signs. Infectious keratoconjunctivitis can occur at any season of the year, if the population is susceptible.

Entropion

Entropion, a rolling inwards of the margin of the (usually lower) eyelid, occurs occasionally in neonatal lambs and kids. The condition may be unilateral or bilateral. Signs are usually noticed within a few days after birth. The producer may see squinting and tearing or discoloration of wool below the eye from ocular discharges. Cloudiness of the cornea develops where it is irritated by hairs or lashes. The condition is easily mistaken for pinkeye if the position of the lid margin is not noted. Corneal ulcers may develop, accompanied by growth of blood vessels across the cornea.

Mild cases can be corrected by manually rolling the lid outward into its normal position several times during the first day of life. Numerous other techniques have been employed by shepherds and veterinarians. Injection of 0.5 to 1 mL of procaine penicillin G subcutaneously, between skin and conjunctiva just below the lid margin using a 20 gauge needle, is a quick and effective treatment. Michel wound clips,^e usually 3 perpendicular to the lid margin, can be used to crimp up a fold of skin below the eyelid. The clips can also be placed parallel to the lid margin. Alternatively, snip out a thin ellipse of skin below the eyelid with clean sharp scissors or crush the same piece of skin with hemostats. If a corneal ulcer is present, apply an antibiotic eye ointment twice a day for several days, or give long-acting oxytetracycline, which is secreted into the tear film. If the condition cannot be corrected with 1 of these techniques, the palpebral fissure may be too small and necessitate a releasing cut at the lateral canthus of the eye to permit correct positioning of the lids.

When entropion develops in an older animal, dehydration or emaciation may have resulted in inward displacement of the globe. The cause of wasting and possible need for culling or a herd control program should be determined. Other animals develop spastic entropion as the result of

prolonged squinting when another painful eye condition is present. Typical examples are severe keratoconjunctivitis or the presence of a foreign body in the eye.

Entropion has been documented to be hereditary in sheep, and thus multiple cases may occur in one lambing period. The producer should be advised to watch closely for additional lambs with entropion, so they can be treated early. All lambs should be checked before releasing them from the claiming pens. The occurrence of entropion should be recorded in the lambing book, and the affected lamb should not be kept for breeding. A hereditary component to entropion in kids is likely, but evidence is mostly anecdotal.

Traumatic Injuries

Small ruminants on tall grass pasture or browse or eating out of large round bales may sustain corneal abrasions. The treatment would be similar to that for infectious keratoconjunctivitis, as differentiation will not be possible from clinical signs alone. Healing should be rapid if entropion or a foreign body (such as a burdock pappus bristle) is not present. However, it is very important to evaluate lid function in any small ruminant with a corneal abrasion or ulcer, as facial nerve paralysis is common in animals with listeriosis, and listeriosis is commonly fatal if not treated early and aggressively. The eyelids can be sutured together (being careful that no sutures can rub on the cornea) to protect the cornea while the underlying neurologic condition is addressed. Severe penetrating wounds of the globe may necessitate enucleation, if the corneal defect does not seal in a few days.

Another cause of severe exposure keratitis is protrusion of the eyeball due to a retrobulbar mass. Retrobulbar abscesses and neoplasia (enzootic intranasal tumor or lymphosarcoma) are possible causes. Ultrasonography of the orbit may be helpful in characterizing the lesion. Ideally, both a 7.5 MHz probe and an offset pad are used. The globe can be imaged through the upper eyelid or directly through the cornea. Tranquilization is followed by application of a local anesthetic to the cornea, and the probe is placed on a mound of sterile lubricating jelly on the lid or the cornea.

If a space-occupying mass restricts airflow through the nasal passages on the side of the bulging eyeball, a dorsoventral radiograph will confirm sinus involvement with a nasal tumor; euthanasia is appropriate, as this is a virus-induced tumor. If peripheral lymph nodes are enlarged or infiltration of internal organs can be documented by imaging studies, lymphosarcoma is the likely diagnosis and euthanasia is again appropriate. However, if the eye protrudes because of a retrobulbar abscess, enucleation will permit drainage of the abscess and a comfortable recovery by the patient.

Enucleation

Enucleation can be easily performed as a field procedure, using tranquilization with xylazine 0.022 mg/lb (0.05

mg/kg) intravenously or 0.045 mg/lb (0.10 mg/kg) intramuscularly in combination with local anesthesia. General anesthesia is possible with a xylazine/ketamine/butorphanol combination. This combination is prepared by adding 1 mL (100 mg) of large animal xylazine and 1 mL (10 mg) of butorphanol to a 10 mL bottle of 100 mg/mL ketamine. The resulting mixture is dosed at 1 mL per 100 lb intravenously or 1 mL per 50 lb intramuscularly. Lidocaine, diluted to 1% with saline or sterile water and buffered with sodium bicarbonate, is injected subcutaneously all the way around the eye to block the lids, and additional lidocaine is deposited behind the globe even if general anesthesia is being used. Because of potential toxicity, the total dose of lidocaine used should not exceed 2.7 mg/lb (6 mg/kg).

Generally the lid margins, globe, and extrinsic ocular muscles are removed using curved scissors during enucleation. A ligature around the vessels behind the globe is usually not needed.³ The skin is closed with interrupted everting mattress sutures, to help control hemorrhage and permit later drainage if required. If a retrobulbar abscess is encountered, copious flushing is followed by deposition of penicillin into the wound and placement of a drain for several days. As with any surgery in small ruminants, tetanus prophylaxis must be assured. Give 500 IU of tetanus antitoxin subcutaneously if the animal has not been previously vaccinated, otherwise a tetanus toxoid booster.

Cataracts

Occasionally sheep and goats develop dense, unilateral or bilateral cataracts. The eyes appear to be comfortable (no squinting or tearing) but vision is seriously impaired. The cause is usually unknown. Evaluation of the retina will not be possible without sophisticated equipment, and reports of surgical cataract removal in small ruminants are not available. If left in a familiar environment with herdmates or other animal that can serve as a guide, these blind animals function quite well.

Conclusions

This review of common ocular problems in small ruminants presents the personal experiences and treatments favored by the author when dealing with patients on-farm. If the economical approaches described do not resolve the problem in a particularly valuable animal, referral to a board-certified ophthalmologist should be considered.

Endnotes

^aBioMycin®, Boehringer Ingelheim Vetmedica Inc, St Joseph MO

^bDraxxin®, Zoetis, Parsippany NJ

^cTerramycin® ophthalmic ointment, Zoetis, Parsippany NJ

^dGF Health Products, Inc., Atlanta GA

^eMiltex Instrument Co., New York NY

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