

Pinkeye in cattle

Belinda Walker

Senior Regional Animal Health Manager,
Surveillance & Biosecurity Operations, Gunnedah

Introduction

Pinkeye is a painful, debilitating condition that can severely affect animal productivity.

Pinkeye (infectious bovine kerato-conjunctivitis, or IBK) is a bacterial infection of the eye that causes inflammation and, in severe cases, temporary or permanent blindness. Most cattle producers will be familiar with pinkeye, but may not know how best to treat it and minimise its spread within a herd.

Pinkeye can affect up to 80% of a mob, with affected weaner calves losing 10% of their body weight. When both eyes are affected, cattle may die from starvation, thirst and accidents.

Occasionally, damage to the eye can be severe enough for blindness to be permanent. It is poor management and unacceptable from a welfare standpoint to allow severe cases to progress to this stage without treatment. The infection can spread very rapidly and the economic impact due to weight loss and lowered milk production can be considerable.

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Cause

Pinkeye is caused by the bacterium *Moraxella bovis*, which infects the eye and produces a toxin. The toxin attacks the surface of the eye (cornea) and the surrounding membranes (conjunctivae), eroding the surface and causing severe inflammation. Seven strains of *M. bovis* have so far been identified, with some strains being more damaging than others.

Predisposing factors

Important factors that predispose cattle to infection include:

- dusty conditions
- flies
- bright sunlight
- physical irritation of the eye (such as from thistles).

In situations where animals are confined together in yards for long periods, such as for drought feeding, major outbreaks of pinkeye can occur.

Pinkeye outbreaks are most frequently seen in summer and autumn when flies are more prevalent and ultraviolet radiation is high. This also coincides with the time when mature dry thistles and dusty conditions are more likely.

The physical attributes of some animals may make them more susceptible to pinkeye than others. For example, animals with unpigmented eyelids and protruding eyes that are susceptible to damage are more prone to pinkeye, whereas hooded eye conformation, which offers some protection from sunlight and physical damage, may reduce susceptibility to pinkeye. British and European cattle are more susceptible to pinkeye than are *Bos indicus* cattle. The white faces of Herefords make them more susceptible than most other breeds.

Genetic selection for pigmented eyelids and hooded eye conformation is helping to reduce this susceptibility.

Methods of spread

Pinkeye persists in a herd in the eyes of carrier cattle that do not show any signs of disease. Eye irritation from dust, bright sunlight, thistles and long grass can then cause lachrymation (tear production) which attracts flies. The flies feed on infected secretions and move from animal to animal, spreading the bacteria. Carriers may also carry infection in the nose and vagina, so that discharges from these areas are also a source of infection.

Any cause of eye irritation, such as grass seeds, can predispose to the condition.



Diagnosis

Signs of pinkeye will be familiar to most cattle producers. The first sign usually noticed is profuse tear secretions running down the face.

The animal blinks frequently or holds the eye partly closed due to increased light sensitivity. There is also reddening of the membranes of the eye and in the margins of the eye itself.

A white spot which identifies the site where an ulcer is forming then develops in the centre of the eye. Depending on the severity of the infection and whether or not treatment is started, this ulcer may expand and affect the whole eye or remain localised and start to heal.

In severe cases, infection may spread to the inner chamber of the eye, which can fill with pus and cause the eye to appear yellow. If the ulcer involves the full thickness of the cornea, the fluid from the eyeball may be lost, resulting in a shrunken, sightless eye. Extreme care must be used when treating severe ulcers, as pressure on the eye may burst the eyeball.

The cornea has very few blood vessels. When it is damaged, blood vessels must grow in from the edge of the eye to heal the damage. These blood vessels growing into the centre of the eye give the characteristic pink appearance of pinkeye. As recovery progresses, these vessels recede and the eye becomes a cloudy blue. After about 4 weeks the only evidence of infection may be a small white scar in the centre of the cornea. If the infection has

been severe, the scar will be larger and there may be some permanent impairment of vision.

Progress of the disease

First stage

The first sign of pinkeye is an animal with a 'runny eye'. In the first two days, the membranes of the eye are red and swollen (hence the name 'pinkeye') with a watery discharge causing tear staining and a closed eye.

One or both eyes may be infected. The cornea then becomes cloudy or bluish and a small whitish spot appears in the centre. In the majority of cases, the infection then starts to resolve, leaving little or no permanent damage.



The first stage of pinkeye

Second stage

In more severe infections, the spot in the centre of the eye continues to enlarge. Over the next one to two weeks the cornea is eroded to form an ulcer that spreads and swells, with most of the eye changing from white to yellow and then to red (as white blood cells and then blood vessels move into the ulcer). Treatment should be given before the disease is this severe.

If ulceration is severe, the cornea may rupture at this point. Once the jelly-like fluid from the centre of the eyeball is lost, the sightless eye shrinks back into the eye socket.



The second stage of pinkeye



A less favourable outcome

Third stage

Most of the eye becomes red as blood vessels grow across the cornea. As recovery progresses, the blood vessels start to recede and the eye first becomes a cloudy blue colour, then begins to clear. Recovery is usually complete 3–5 weeks after the initial infection.

Most affected eyes heal completely; in some, scarring results in a small bluish-white spot remaining in the centre of the cornea. In about 2% of cases, the affected eye remains blue and the animal remains blind in that eye.



The third stage of pinkeye



Scarring often results in a bluish-white spot.

Treatment

Eye ointments

At the time of writing, the treatment of choice for pinkeye is Orbenin[®] eye ointment, which must be purchased from a veterinarian. This is a long-acting penicillin, first developed as a mastitis treatment for infusion into the udder of dairy cows.

The eye preparation (unlike the mastitis preparation) has a nil withholding period. A single

application to the eye lasts at least 48 hours. Orbenin[®] should not be used in animals with a history of allergic reactions to penicillin.

The ointment should be applied in the conjunctival sac – the space between the eyelid and the eye – by pulling the lower lid away from the cornea. If the animal is cooperative, apply the ointment under the upper lid as well.

About one-quarter to one-third of the tube is sufficient for each treatment. Do not apply the ointment directly to the central ulcer because, if the animal moves, the point of the tube could rupture the eyeball. In early cases, a single treatment may be sufficient to halt the course of the disease. The long-lasting effect of a single dose of Orbenin[®] is the main reason for its recommended use.

Other treatments such as oxytetracycline can also be effective, but these need to be instilled into the eye two or three times a day to work. This is usually not practical. Powders should be avoided, as they can irritate the eye further.

Antibiotic injections

Intramuscular injection of an antibiotic such as long-acting oxytetracycline can also be effective in treating pinkeye. Two doses, 3 days apart, is the recommended regime. This will cost more than the ointment so is usually not the treatment of choice, but in some situations may be worth considering (for instance, if the only animal affected has been recently introduced, and spread to the rest of the herd is to be avoided).

While antibiotics reduce the numbers of bacteria, they are not likely to be effective in the elimination of the carrier state. Therefore, even if all animals are treated in an outbreak, pinkeye can occur again in the herd.

Make sure that you check the withholding period if using injectable antibiotics. Most oxytetracycline preparations have a withholding period of 42 days, but one formulation, Engemycin[®], has a withholding period of only 10 days. Engemycin[®] can be given once daily or as a long-acting injection at a higher dose. With either treatment method, calves require a higher dose rate than adult cattle, so read the label carefully.

Eye patches

Eye patches can be glued over the affected eye, after a long-acting eye ointment has been applied. Eye patches offer protection from any further irritation from dust, flies and sunlight. Protection is probably only of value to an individual animal in the early stages of the disease, when there is still a chance of saving the sight in the eye. However, denying flies access to the affected eye will help to reduce spread of the disease within the herd.



A dust mask used as an eye patch

Veterinary treatment

In severe cases of pinkeye and especially in stud or pet animals in which a perfect eye is highly desirable, a veterinarian should be consulted. The vet's preferred treatment may be to suture the third eyelid across the eye, or to suture the eyelids together, after administering a local anaesthetic. The sutures are left in place for 7–14 days and then removed. Results are usually excellent.

Another possibility – which may be combined with the above – is to inject antibiotics, and in some selected cases corticosteroids, beneath the conjunctivae of the eye or through the upper eyelid.

Should pinkeye always be treated?

In hot, dusty conditions and with large populations of flies present, mustering cattle to treat pinkeye may only worsen the problem by increasing its spread. The likelihood of further spread, therefore, should be weighed against the number of cattle affected before deciding on treatment.

If risk factors are high, it may be better to risk blindness in one or two animals than to spread the infection throughout the herd. If only a few calves are affected, it may be possible to lasso the calves in the paddock to treat them, bearing in mind that half-blind calves may be easier to approach.

If mustering is considered necessary, avoid dusty conditions if possible, or water down the yards. Muster early in the morning to avoid the worst of the flies.

Long-term prevention

Fly control

The most effective form of prevention for pinkeye is to reduce the local fly population. This is best achieved by encouraging dung beetles which bury the dung in which the flies breed.

Care should therefore be taken to ensure that any drenches used on any stock on the property do not harm dung beetles or suppress the egg-laying activity of female beetles.

Many different species of dung beetles active at different times of the year have been introduced into Australia. These beetles have been screened by the CSIRO, and the most effective species are now commercially available. For more information about using dung beetles to control flies, contact NSW Department of Primary Industries.

Fly traps can also be tried. Various types are available from stock and station agents and hardware stores. Alternatively, you can experiment with making your own traps.

Thistle control

Heavy infestations of thistles and spiky, dry stubble will commonly injure cattle's eyes as they graze amongst them, thereby predisposing the animals to pinkeye infection. If at all possible, cows with calves at foot should not be grazed on spiky pastures, as calves seem more prone to eye damage in these situations. This may be because their eyes are closer to the ground or that they have not yet learned how to graze around thistles.

Weed control should be a standard part of your management program. If using chemical sprays, these should be used on thistles at the rosette stage before they shoot up. Tall dead thistles are just as damaging to eyes as live ones!

Vaccine development

Work has been under way on the development of a vaccine for several years, but an effective vaccine is unlikely to be available in the near future. This is because there are seven known strains of the bacterium responsible for pinkeye and they all have the ability to change when exposed to the vaccine developed.

Initial attempts to formulate a vaccine against *Moraxella bovis* focused on bacterial pili – the hairs by which the bacteria bind to their host. The different strains of *Moraxella bovis* are identified by differences in their pili. The vaccine that has been developed so far acts by binding to the pili, thus preventing them from binding to the host. If a vaccine is used that protects against only one strain, it is not effective against other strains because their pili are different. A successful vaccine must contain pili from each strain, and, to date, pili from all strains have not been produced in quantities that would permit the commercial development of a multivalent pili-based vaccine.

Haemolysins are enzymes produced by the pinkeye bacteria. They cause damage to the eye and are present in the same form in all strains of pinkeye. The so-called **haemolysin vaccine**, which is directed against the bacterial haemolysins rather than pili, has long been considered an alternative vaccine candidate; however, the lack of genetic

information about haemolysins has hindered attempts to develop a vaccine based on this protein.

Studies conducted with cattle at the CSIRO Livestock Industries' Australian Animal Health Laboratory in Geelong showed that an experimental vaccine containing a partially purified haemolysin preparation protected animals against infection, whereas a placebo preparation did not.

Genes and proteins related to the functions of haemolysins have recently been identified in all strains of pinkeye, and a prototype vaccine formulation has been developed using three of these as antigens.

Researchers from CSIRO are currently seeking opportunities to establish a commercial partnership to assure resources for animal trials and commercial development of an effective pinkeye vaccine. Even if their studies prove successful, it may be several years before a commercial vaccine is available.

Further information

Contact your nearest NSW Department of Primary Industries Veterinary Officer for further information

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