

Infectious Bovine Keratoconjunctivitis (Pinkeye) in Cattle

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Introduction

Infectious Bovine Keratoconjunctivitis (IBK), also known as pinkeye, is a costly disease for the beef producer. Tremendous losses stem from poor weight gain and loss of appetite in affected animals suffering from visual impairment and ocular pain. The largest economic loss is incurred through decreased growth as affected calves are on average 35-40 pounds lighter at weaning compared to healthy calves. Lower performance in post-weaning cattle also has also been documented with reduced average daily gain, 365th day weight, and final weight. Additionally, the drug cost for treatment, decreased market value due to corneal scarring, the loss of value of show and breeding stock, and reduced milk production from dairy animals also make this disease a significant economic consideration.

The first reports of pinkeye appeared in 1889. More than a century later, despite all that is known about how the disease develops, control programs often are only partially successful. In particular, pinkeye vaccines are often ineffective in preventing outbreaks during the summer. It is important to understand that many factors are involved in the development of pinkeye, including environment, season of the year, concurrent diseases, the strain of bacteria involved, and the animal's genetic makeup and immune system. Once pinkeye begins, it is highly contagious and can spread rapidly within the herd. Control of contributing factors and prompt, effective treatment in the face of an outbreak are necessary to reduce the spread and limit the damaging

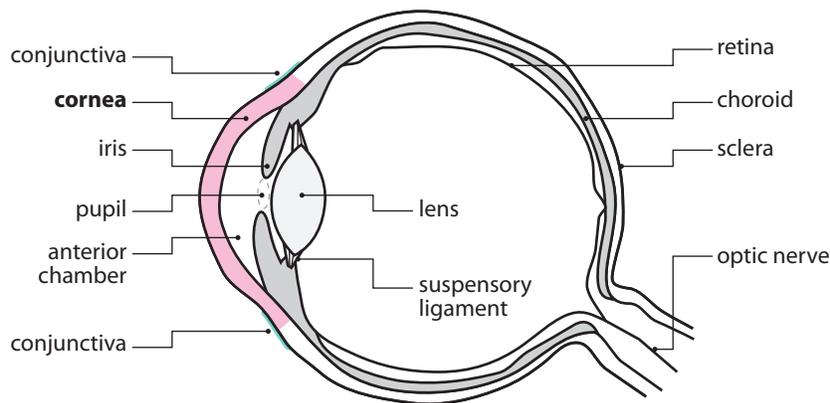


Figure 1. Parts of the eye.

effects of the disease. Prevention is based on maximizing herd immune status, minimizing the presence of pathogens, and maintaining an irritant-free environment as much as possible.

Cause

Pinkeye is caused by the bacteria *Moraxella bovis*. It sticks to the surface of the eyeball (cornea) with hairlike projections called pili. Once attached, it releases a toxin that kills the cells on the surface of the cornea, leading to the characteristic corneal ulcers seen with this disease. The organism is located in the eyes and nasal cavities of infected cattle. Cattle are the only known reservoir of *Moraxella bovis*, and infected carrier animals may harbor this organism year-round without showing any signs of eye problems. Once pinkeye begins in a herd, it is highly contagious and can spread rapidly by direct contact through nasal and ocular discharges and by vectors such as flies.

Contributing Factors

Many different combinations of these factors working together can occur within one herd at one time.

UV Light or Sunlight

Ultraviolet light or sunlight causes damage to corneal epithelial cells, allowing the bacteria to penetrate the cornea and multiply. Lack of pigment around the eye allows increased UV radiation to sensitize the eye, resulting in inflammation and infection.

Face Flies

These pests contribute to pinkeye in two ways. First, they irritate the eye when feeding on secretions. Then they efficiently transmit the organism from infected to non-infected animals. These insects may harbor the bacteria on their wings and legs for up to three days after feeding on infected material.

Excessive Eye Irritation

Irritation may be due to dust, trauma or injury, wind, tall grass with seed heads, thick-stemmed hay, or high ammonia levels. Grazing close to thorns, barbed wire, and tufts of dry grass can scratch the cornea. Pollen and seed heads, especially in unclipped pastures, may injure the eye. When animals eat in to the middle of round bales, the hay surrounding their heads may contain stems, seed heads, and dust which may cause eye irritation. Any irritation to the eye allows *Moraxella bovis* to invade and cause pinkeye.

Other Microorganisms

Certain viral diseases (infectious bovine rhinotracheitis or IBR and bovine viral diarrhea or BVD) and bacteria (*Mycoplasma* sp., *Chlamydomphila* sp.) may be contributors to pinkeye in certain cases. They either can create the right environment for infection or add to the severity of the disease. A newly isolated strain of bacteria known as *Moraxella bovoculi* may play an important role in pinkeye but research has not confirmed this. Other problems, such as physical trauma or trauma due to squamous cell carcinoma, may also predispose the eye to secondary bacterial infection.

Stress

Weaning, commingling, transport, poor nutrition, parasites, and weather are just a few examples of stressors for cattle. Stress tends to decrease the animal's immune response to disease.

Breed

All breeds of cattle can be affected by pinkeye, but some breed differences have been reported. More cases have been reported in Hereford cattle. Lower incidences have been reported in Brahman-type cattle and in cattle with greater pigmentation at the ocular margins. Older cattle appear less susceptible to *Moraxella* ocular infections compared to cattle two years old or younger. A higher prevalence has been reported in male cattle.

Clinical Signs

Pinkeye is a disease principally of the cornea. It occurs initially in one eye but may cross-infect the other eye. Onset of clinical signs may begin one day to two weeks post-infection.

Pinkeye is characterized early by tearing, overflow of tears onto the face, blinking, and squinting/seeking shade. These signs progress to corneal edema (the eye becomes cloudy or opaque) and central corneal ulceration (a circular pit develops in the center of the eye), usually within 24-48 hours.

Conjunctivitis (swelling and redness of the tissues) of varying severity is sometimes seen. Cattle have decreased appetite due to excessive pain. Some cases resolve spontaneously, however, severe damage to the cornea can arise if left untreated. In milder cases, corneal damage might completely resolve within two to four weeks. More severe corneal damage may lead to deep ulceration and corneal rupture, possibly with the loss of eye contents or a cone-shaped bulging of the eye. In contrast to other species, cattle may retain all or partial vision after corneal rupture. Once the severe stromal defects have healed, a dense corneal scar may result that can last years.

Treatment

Preventing spread by treating affected animals is the single most important factor in controlling a disease outbreak.

Early detection of animals with the first clinical signs (tearing, squinting, and blinking) and then prompt, effective treatment are essential to reducing spread and limiting damage to the eye. If possible, isolation of the affected animal away from the herd also will help limit the spread. In cases where a producer is unable to treat new cases quickly, giving an injectable antibiotic to all susceptible animals along with topical fly repellent may be the best course of action to reduce the spread of pinkeye in the herd.

Early and effective treatment with the correct antibiotic reduces the duration of the carrier state, when spread usually occurs to unaffected herd mates.

Long-acting antibiotics, such as long-acting tetracycline or the prescription antibiotic tulathromycin, are labeled for treatment of pinkeye. Your veterinarian may prescribe the antibiotics florfenicol or ceftiofur to be used in an off-label manner for treatment as well. Injectable antibiotics are generally the best option because of their long duration of activity and effectiveness in eliminating bacteria.

Topical sprays only remain in the eye a few minutes before tears wash them away, so application is generally required three to four times daily to be effective. It is difficult for any spray or ointment to remain in the eye long enough to eliminate the bacteria unless treatments are repeated multiple times daily.

When severe ulceration exists, the eyeball may need extra protection with either a patch or the eyelids may need to be sutured (stitched) together. Patches protect the eye from light, flies and other irritants but they remove the ability to monitor the affected eye. Suturing the eyelids together will physically support the stability of the globe and offers protection from irritants as well. Consult your veterinarian for assistance on how and when to apply these extra protective measures.

Prevention

Pinkeye is a complicated, multifaceted disease. It is said that "an ounce of prevention is worth a pound of cure," and nowhere is it more appropriate than with pinkeye. The best plan is to reduce or remove as many risk factors as possible in order to keep the eyes healthy and better equipped to fend off disease. Prevention is based on maximizing herd immune status, minimizing the presence of pathogens, and maintaining as irritant-free environment as possible.

Maximize Herd Immune Status

An overall good level of nutrition, adequate vitamin and trace mineral intake, a comprehensive vaccination program including the respiratory viral diseases IBR and BVD, parasite control, and basic biosecurity practices are all exceptionally

important in improving the cow's or calf's ability to fight off any disease process (not just pinkeye). There is no scientific evidence to support feeding excessive levels of any vitamin or mineral, including Vitamin A, will prevent diseases of the eye. Biosecurity measures such as quarantine of new arrivals to the farm (including show animals) for three weeks before commingling with the herd are important in case any of these animals is incubating a disease.

Maintain an Irritant-Free Environment

Prevent eye irritation with good face fly control, mow tall grass, provide shade and clean water, and reduce sources of stress (such as overcrowding/overgrazing) if possible. Control face flies with ear tags impregnated with insecticide and topically administered insecticides by way of back and face rubbers or dust bags they must walk under to get to water or mineral (see UK Extension Publication ENT-11, *Insect Control on Beef Cattle*). Removal of fly breeding grounds and the use of certain feed additives will decrease the number of flies. Provide shade to protect from UV rays. Clean drinking water (instead of stagnant pond water) is critical because intake is greater with clean water and this helps provide plenty of fluid in the eye, especially in dry, dusty, and/or windy conditions. The precorneal tear film is essential in eye defense mechanisms as tears wash away pathogens and tear proteins are an important part of protective mechanisms.

Minimize the Concentration of *M. Bovis* (and *M. Bovoculi*)

Immediate detection and isolation of affected animals followed by effective treatment with long-acting antibiotics will shorten the period of corneal ulceration and speed healing time. Perhaps most importantly, treatment will reduce the duration of the carrier state when recurrence and transmission most often occur. Active cases of pinkeye with excessive tearing attract flies that spread the bacteria so topical application of a fly repellent to the face will help reduce vector spread. Vaccination may help prevent disease and eliminate carriers but vaccines are not consistently effective.

Does vaccination work? Many different commercial vaccines against *Moraxella bovis* such as Piliguard, Vision 20/20, Alpha 7/MB-1, I-Site XP, Maxi/Guard, Pinkeye Shield, Ocuguard and SolidBac are marketed for pinkeye prevention; due to strain differences, these may or may not be useful. Of 123 clinical trials, only 48 trials reported significant protection from commercial vaccines. Therefore, it is unlikely that vaccination is the solution to all pinkeye problems although it may reduce the overall incidence of disease and severity of clinical signs. When commercial vaccines are not effective, some companies offer "autogenous bacterins" which are vaccines made from bacteria cultured from pinkeye cases from one particular farm. All cultures must be taken early in the course of disease;

preferably when the eye is just beginning to tear excessively and before any medications are used. A recent clinical trial of these "homemade vaccines" (autogenous *M. bovis* vaccines) concluded these are often ineffective in controlling naturally occurring pinkeye. Failure of the vaccine to present the "correct" *M. bovis* antigen may make the vaccine ineffective or induce a non-protective response. Although there are reports of autogenous vaccine success, they cannot be considered consistently effective.

Summary

Pinkeye is one of the most common diseases of cattle and is of major economic importance in Kentucky. The keys to prevention and control of an outbreak are maximizing the herd's immune status, minimizing the concentration of the *Moraxella* bacteria, and maintaining as irritant-free an environment as possible. Treatment decisions are influenced by numerous factors such as effectiveness of the drug selected, cost, labor availability, withholding times, facilities, and availability of veterinary support. Vaccines are not consistently effective in disease prevention and cannot be completely relied upon to prevent pinkeye. The best strategy of treatment, prevention and control of pinkeye for a particular herd is dependent on a thorough analysis of the current situation on that individual farm and is best accomplished with the help of the local veterinarian.

