

## Pinkeye in Beef Cattle

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Pinkeye, also known as infectious bovine keratoconjunctivitis (IBK), is one of the most common diseases of beef cattle in Virginia. It is a highly contagious disease, causing inflammation of the cornea (the clear outer layer) and conjunctiva (the pink membrane lining the eyelids) of the eye. It will also cause ulceration, which looks like a hole or depression in the cornea. The incidence of pinkeye increases in spring, peaks in the summer, and decreases in the fall. Pinkeye results in mild to severe disease and, in approximately 2 percent of the cases, will cause blindness.

Pinkeye is of major economic significance to producers, as an estimated 150 million dollars is lost yearly to pinkeye through decreased weight gain, decreased milk production, and treatment costs. Affected animals may also bring significantly discounted prices at sale. In a 20-year review study, calves diagnosed with pinkeye weighed 19.6 pounds less at weaning than healthy calves, while another study showed the loss to pinkeye to be 36 to 40 pounds at weaning. Also, it is estimated that a calf that is blind will gain 60 pounds less by weaning time compared to healthy calves. Animals blind in both eyes are also at risk of death through accident or starvation if they are unable to locate the feed and water sources. Pinkeye is the most common condition affecting breeding age beef heifers, and the second most common disease of nursing calves greater than three weeks old.

### Causes of Pinkeye

The primary infectious agent for pinkeye is the bacterium *Moraxella bovis*. This bacterium is found in the eyes of many recovered and apparently normal cattle. Pinkeye is a multifactorial disease, which means there are many factors that predispose and contribute to the development of the disease.

Eye irritation is necessary for the development of the disease. Face flies, which look like large houseflies, feed around the eyes and nostrils of cattle, causing a mechanical irritation to the eye and spreading the disease from one animal to another. The bacteria can survive on the flies for up to four days, so many animals may be infected by one fly.

Other sources of eye irritation are tall weeds and grasses rubbing the eyes as cattle walk and graze, and feed and dust when cattle eat from overhead feed bunks or the center of round bales. Dust on windy days, and exposure to excessive UV sunlight also increase the chances of disease development. Breeds which lack pigment on their eyelids (Herefords, Hereford crosses, Charolais, and some Holsteins) are more susceptible to pinkeye because of their increased sensitivity to sunlight and a decreased immune response in the eye. This is also the reason they are more susceptible to “cancer eye.” Crosses where the dam was the Hereford showed a slightly higher incidence of pinkeye than when the sire was a Hereford.

Calves are more likely to develop the disease than adult cattle, as adult cattle appear to develop protective antibodies on the surface of the eye. Bull calves have a higher incidence of disease than heifer calves.

As with many diseases, the disease outcomes can be influenced by nutritional imbalances, such as deficiencies of protein, energy, vitamins (especially vitamin A if the forage is lower quality), and minerals, (especially copper and selenium).

The presence of other organisms such as the IBR virus, mycoplasma, chlamydia, and *Branhemella ovis* will increase the incidence and severity of disease.

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## Transmission

Transmission occurs when a noninfected animal comes into contact with secretions infected with *M. bovis*. This may be direct contact, through face flies, or contact with an inanimate object that harbors the organism. Face flies are the primary vector for spreading the bacteria and disease. Secretions from the eye, nose, or vagina can be infected.

Carrier animals are animals that show no signs of clinical disease, but shed the bacteria in their secretions. Carrier animals can shed the organism for long periods of time so they are an important factor in the spread of the disease and its survival over winter. When the eyes of a carrier animal are irritated, its tear production increases, promoting the shedding of *M. bovis*.

## Clinical Signs

There are four stages of pinkeye. The disease may resolve at any of these stages while, without treatment, the most severe cases will progress through all four stages.

**Stage I:** Cattle have excessive tearing and increased sensitivity to light. They will blink frequently and there is redness along the eyelids. Cattle will often seek shade, which will decrease their grazing time. Pain associated with pinkeye also decreases their feed intake. Stage I will progress to a small ulcer in the center of the cornea which appears as a small white spot. The cornea develops a slightly cloudy grey appearance due to inflammation. One or both eyes may be affected.

**Stage II:** The clinical signs described in Stage I continue, but the ulcer spreads across the cornea. As more inflammation occurs, the cornea becomes increasingly cloudy. At this point, some of the dark color of the iris can still be seen. Blood vessels from the outside portion of the cornea begin to grow across the cornea to help with healing. These blood vessels make the cornea appear pink, which is how the disease received its name.

**Stage III:** The ulcer covers most of the cornea and the inflammation continues to spread into the inner parts of the eye. When this occurs, the inside of the eye fills with fibrin, which is a pus-like substance that gives the eye a yellow appearance versus the typical brown appearance.

**Stage IV:** The ulcer extends completely through the cornea, and the iris may protrude through the ulcer. The iris will become stuck in the cornea even after healing.

This may lead to glaucoma or persistent swelling of the eye. This eye will be partially or completely blind. The eye may go on to completely rupture, and will develop a shrunken appearance or enlarge if glaucoma (increased eye pressure) is present. This eye will be permanently blind.



Stage I



Stage II



Stage III



Stage IV



**Inactive scar**

Once healing occurs (except Stage IV) the blood vessels will recede, but the eye may continue to be a cloudy blue color. The blue appearance may eventually resolve and the eye appears clear again. In other cases, depending on the severity of the disease, a white scar may be present even after full resolution of the disease.

## Treatment

Early treatment of cattle with pinkeye is important, not only for a successful outcome of the individual animal affected, but also to stop the shedding of the bacteria to decrease the risk of transmission to other cattle.

**Stage I:** Long-acting tetracyclines (Biomycin 200®, LA200®, or their generic equivalents) are effective at this stage of infection. The recommended dose is 4.5 cc per 100 pounds of body weight subcutaneously (SQ). A second injection given 48 to 72 hours later may increase the percentage of cattle that responds to treatment. Another option is to inject penicillin and dexamethasone into the bulbar conjunctiva. The bulbar conjunctiva is the thin membrane that covers the white portion (or sclera) of the eye. If the injection is performed correctly, the conjunctiva will swell and a bulge should be seen in this area. A veterinarian, or someone who has been specifically trained by a veterinarian, should perform this procedure. Injections placed in the wrong area are ineffective in treating pinkeye and could damage the eye.

**Stage II:** Both tetracycline and a bulbar conjunctival injection are administered at the above dosages.

**Stage III:** Tetracycline and a bulbar conjunctival injection are administered in conjunction with either an eye patch, suturing the third eyelid over the eye, or suturing the eyelids shut. This makes the eye more comfortable, reducing further irritation, and, therefore, reducing

tearing and shedding of the bacteria. Suturing the third eyelid over the eye and suturing the eyelid shut also have the advantage of supporting a fragile cornea to help prevent corneal rupture. Again, this procedure should be done by a veterinarian or someone who has been adequately trained.

**Stage IV:** Same treatment as Stage III.

Note: Sprays and ointments are only effective if used three to four times daily, which generally is not feasible for most producers. Also, many of the commercially available ointments are either illegal to use in cattle or have very long withdrawal times. Give all SQ injections in the neck or in front of the shoulder. If treating several animals, you may want to wash your hands or change gloves between animals so you do not further spread this bacteria. Never use any powder or spray containing nitrofuracin, as its use in cattle has been illegal since May 2002. A veterinarian should be consulted before using any other medications.



**Bulbar conjunctival injections**

## Prevention

Many approaches have been tried over the years to prevent pinkeye. The random nature of pinkeye outbreaks and the numerous factors that contribute to the disease have led to many myths and misconceptions regarding pinkeye prevention. Management practices that reduce the risk factors associated with pinkeye are the most effective tools in decreasing the incidence of disease. With a lower incidence of disease, the overall concentration of bacteria on the farm will be lowered, reducing the risk of a severe pinkeye outbreak.

Fly control is essential, but can be difficult as face flies are only on the animal for a small percentage of the time. Therefore, addressing the egg and larval stages of the fly as well as the adults is most effective. A moderate to heavy fly infestation is when there are 10 to 20 flies per animal during the middle of the day. A single fly-control program will not work on every farm, so it often takes multiple methods of control to achieve good results. Fly tags, insecticide pour-ons, back rubbers, dust bags, and knock-down sprays are helpful in reducing the number of adult face flies on the animal. Fly traps can also be helpful in reducing the number of flies. Feed additives are available that target the maggots that are laid in the manure. Encouraging dung beetles, which break down the manure pat, will also decrease egg survival. Face flies can develop resistance to pesticides over time, so switching the drug class of the pesticides used every year is important. For example, if pyrethrins are used one year, then organophosphates should be used the following year. Waiting until the start of fly season to apply fly tags and removing the old fly tags in the fall also decreases the development of resistance. It is also extremely important to follow the safety precautions recommended by the manufacturer as these insecticides can be toxic to people if handled improperly.

Appropriate grazing, along with clipping pastures will prevent seed-head development, reducing the irritation to the eyes of cattle, as well as reducing the resting areas for the flies. Clipping pastures to a low stubble height in May, just after the seed heads emerge, and again in mid summer when weeds appear is recommended. Shaded areas need to be available to decrease the UV exposure and, in Herefords, breeding for pigmented eyelids has been successful, as this is a heritable trait. A good management program, including an appropriate vaccination program (especially IBR and BVD), good quality nutrition, and minerals available at all times will improve

the overall condition of the cattle and decrease the incidence of this disease. Overhead hay feeders should be lowered, and round bales should be rolled out. Ensuring adequate bunk space will decrease direct contact between the animals. Animals that develop pinkeye should be isolated if possible.

Chlortetracycline fed at 4 mg per pound per day has been reported to significantly decrease the incidence of pinkeye in some herds. These levels generally cannot be achieved with commercially available mineral mixes. Farms that are facing an outbreak, bringing stocker calves together, or weaning calves may consider this option, but consulting your veterinarian or nutritionist before doing this would be appropriate. An outbreak is considered to occur when 5 percent to 10 percent of the animals are affected.

The pinkeye vaccine has been disappointing as the sole means of controlling pinkeye because there are over 20 strains of the *M. bovis* bacteria and continuous mutation occurs in the bacteria. While the vaccines contain the most common strains of *M. bovis*, they do not contain all the strains that occur. Reportedly, there has been some success when producers have cultured the eyes of their calves and had a vaccine formulated to address the strains of *M. bovis* that are present on their farm. This generally is only feasible for larger herds, and, as yet, no scientific studies have been done to support this. Vaccines are best utilized when combined with other management strategies.

## Winter pinkeye

While most cases of pinkeye occur in the spring, summer, and fall, pinkeye is an important disease in the winter as well. The risk factors during the winter are close confinement and feeding, UV light reflected off of snow, irritation from feed, or infection with a virus. It is commonly thought that winter pinkeye is caused by infectious bovine rhinotracheitis (IBR) virus, but that is not the case. Winter pinkeye is caused by *M. bovis*. By itself, IBR can cause red runny eyes, but not the ulceration seen with pinkeye. Animals with IBR will also develop other respiratory symptoms such as nasal discharge, fevers, coughing and, possibly, pneumonia which are not associated with pinkeye. Pinkeye outbreaks may occur when IBR is present because IBR can cause irritation to the eye, making it more susceptible to *M. bovis*. Winter pinkeye needs to be treated, and the treatment is the same as described previously. Vaccinating for IBR with a modified live vaccine is not

recommended during an outbreak of pinkeye. The vaccine will damage the cells of the eye, making it easier for *M. bovis* to invade, and vaccination will not help the outbreak of pinkeye as it is caused by *M. bovis*, not the IBR virus.

Pinkeye is an important disease of cattle, but with proper prevention and treatment programs, its significant economic effect can be minimized.

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