

Livestock Health Series

Blackleg and Other Clostridial Diseases

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Introduction

The clostridial bacteria cause several diseases that affect cattle. The most common in beef cattle are blackleg, enterotoxemia, malignant edema, black disease and tetanus. These typically affect young cattle (less than two years of age) and are widely distributed throughout Arkansas. The bacteria are frequently found in the environment (primarily in the soil) as well as the intestinal tracts of farm animals.

Clostridial bacteria produce long-lived structures called endospores. Endospores are forms of bacteria that are extremely resistant to environmental conditions (heat, drought, UV radiation and chemical disinfectants). When endospores are introduced into an animal, they can develop into the infectious bacteria. Once the bacteria begin to grow, they cause disease by producing and releasing toxins into the calf's body.

Clostridial diseases are typically infectious but not contagious. In other words, cattle that become infected will not directly transmit the disease to other cattle. Animals afflicted with clostridial diseases usually die very quickly, sometimes without any prior clinical signs. Therefore, prevention of these diseases through the use of vaccines is often much more successful than trying to treat infected animals.

Blackleg

Blackleg affects cattle worldwide and is caused by *Clostridium chauvoei*. This infection begins when the susceptible animal ingests the

endospores. The endospores then cross over the gastrointestinal tract and enter the bloodstream. Endospores are deposited in tissue throughout the animal's body. They lie dormant in the tissue until they become activated and trigger the disease.

This bacterium is activated in an anaerobic (oxygen deficient) environment. This means it requires a site where there is low oxygen content, such as damaged, devitalized or bruised tissue. Muscle tissue that has been damaged will have a compromised blood flow; as a result, oxygen will not be as readily delivered to the affected area. Therefore, any activity that causes bruising can promote the disease. Once this stimulating event occurs (transporting, handling, injection sites, rough/rigorous pasture activity), the spores germinate and multiply into the disease-causing bacteria. Disease can develop without any history of wounds to the animal.

Although blackleg has occurred in calves as young as two months of age, the disease generally affects animals between six months and two years of age. Occasionally, losses may be seen in adult cattle. Blackleg infections typically occur during the late summer and early fall, and blackleg usually affects rapidly growing calves.

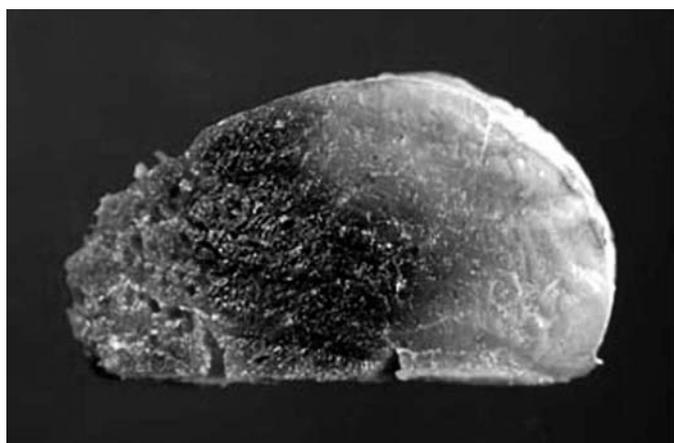
It may be more prevalent on farms that have recently moved or turned soil. It may also be noted in flooded areas (this allows the spores to rise to the surface of the ground). It may also occur during times of drought when the grass is very low, and cattle will ingest spores from the soil during grazing.

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Typically, animals infected with blackleg die rapidly without any signs of illness. However, clinical signs that may be noted very early in the disease include lameness, loss of appetite, fever and depression. Animals quickly die within 12 to 48 hours after contracting the disease. Although treatment usually fails, appropriate doses of penicillin may prove helpful. If an animal does survive, it will likely suffer from a permanent deformity.

Lesions in a dead animal associated with blackleg include swelling of the affected muscle tissue (legs, neck, hip, chest, shoulder, back or elsewhere). The swelling is due to fluid and gas accumulation, which is produced by the infectious bacteria. When pressure is applied to the affected areas, gas can often be felt moving while producing a crackling sound under the skin. As seen in the picture below, affected muscle tissue will contain dark areas of necrotic tissue, hence the name blackleg. This affected tissue may also have a foul odor (usually described as rancid butter).



Picture provided by The University of Georgia, College of Veterinary Medicine.

Vaccination is the only way to effectively control this disease. It is generally recommended to vaccinate calves between two and three months of age. Before this period, calves should be protected through passive transfer of antibodies from their dam's colostrum. A regular vaccination protocol should be followed at weaning. Calves should receive vaccine dosages according to the manufacturer's label. Some vaccines require one injection followed by a booster in two to six weeks. Other vaccines are now approved for a single dose injection.

Always be sure to read and follow the instructions on the label when using any vaccine. Blackleg vaccines should be administered subcutaneously (under the skin) in the neck area. The common blackleg vaccines are referred to as "7-way" because they protect against other clostridial diseases such as malignant edema, black disease, enterotoxemia, etc.

If an outbreak of this disease occurs, the producer should contact his/her local veterinarian so that a proper course of action is initiated. The veterinarian will probably recommend that all animals receive immediate vaccination and follow-up boosters. Further losses may occur for a two-week period until the animals develop ample immunity against the disease. Carcass disposal should be done carefully after an outbreak of disease occurs. If possible, bury carcasses deeply where they lie. Do not drag carcasses across the pastures, contaminating more ground.

Tetanus

Tetanus is found worldwide and is caused by *Clostridium tetani*, which is found in the soil and in the intestinal tracts of many animals. Cattle are less susceptible to tetanus than other domestic livestock such as horses; however, they are still at risk. *Clostridium tetani* is introduced into the animal's body through injury such as deep puncture wounds, castration, banding and dehorning.

The incubation period for tetanus is approximately 10 to 21 days. *Clostridium tetani* produces a very potent toxin that affects the nervous system. Clinical signs that develop include flared nostrils, prolapsed third eyelid, stiff tail, extended "sawhorse" stance and difficulty chewing food (hence the name "lock jaw"). Affected animals will exhibit severe muscle tremors and will experience violent spasms when stimulated by touch or sudden sounds.

Tetanus can be treated with penicillin, tetanus antitoxin and supportive therapy. Tranquilizers may need to be administered to control seizures. Intravenous fluids are indicated to control dehydration if the animal cannot eat or drink. Prevention can be achieved through the use of vaccination injections and being diligent about using clean instruments when performing invasive procedures.

Malignant Edema

Clostridium septicum is the agent causing malignant edema. Malignant edema is generally fatal in cattle and can affect cattle of any age. *Clostridium septicum* is found in the intestinal tracts of most domestic livestock, and it is shed in their feces, leading to pasture contamination. This disease develops when an open wound (due to accidental injury, castration, difficult parturition, etc.) gets infected with the bacteria.

The bacteria will invade the tissue, causing localized fluid accumulation, or "edema." Clinical signs may include decrease in appetite, high fever and localized swelling near the injured area.

Lesions in the dead animal include darkened discoloration of the affected tissue and a foul odor, and soft tissue swelling without gas accumulation will be associated with the diseased tissue. Death occurs quickly after infection, so treatment with penicillin is only effective if started very early in the disease onset. Vaccination is the most reliable form of control.

Red Water

Clostridium haemolyticum is the bacterium that causes red water disease. The spores of these bacteria gain entry to the animal's body by crossing the intestinal lining. These spores lodge in the liver, where they wait until the conditions are right for them to replicate and grow. These specific conditions occur when there is damage done to the liver tissue. Liver flukes (*Fasciola hepatica*) are usually the cause of the damage, which makes this disease limited geographically. Aquatic snails are needed for the flukes to complete their life cycle, so cattle must be in areas with considerable standing water. If no liver damage occurs, the conditions will not be right for growth of the bacteria.

Once the infection begins, *Clostridium haemolyticum* releases a specific toxin into the blood. This toxin attacks red blood cells and destroys them. The damage to the red blood cells will lead to a reddish discoloration of the urine, hence the name "red water disease." Early treatment is essential if the animal is to survive. Otherwise, some animals may be found dead before clinical signs are noted. Clinical signs include red urine, dehydration, fever, labored breathing, pale to yellow mucous membranes and anemia. Prevention and control of this disease should include vaccinating and controlling liver fluke infections. Not all clostridial vaccines immunize against this disease, so check the label if you need to purchase vaccine that contains it.

Black Disease

Infectious necrotic hepatitis, or "black disease," usually affects cattle on a high grain ration and is caused by *Clostridium novyi* type B. Black disease is somewhat similar to red water disease. The same pattern of events occurs: *Clostridium novyi* type B is ingested; the bacteria lodge in the liver; damage to the liver occurs; and the bacteria replicate and release toxins. The differences are that the toxin released is somewhat different, and flukes may not play as important a role in this disease in cattle as they do in sheep. However, fluke infections can create a desirable environment for this disease to occur. The toxin released causes severe tissue damage to the liver instead of causing red blood cell destruction (as in red water).

On postmortem examination, the liver will have large areas of damaged tissue that are gray to black in color. The dark color is what gives rise to the name "black disease." The diseased areas will also be associated with a foul smell. Infected animals die quickly without many signs of illness, usually before treatment can be considered. Prevention depends on vaccination.

Enterotoxemia

A pathogen that can be highly fatal in young calves is *Clostridium perfringens* type C, or enterotoxemia. It is usually seen in calves less than 30 days old. *Clostridium perfringens* type C is a normal inhabitant of the gastrointestinal tract but only causes disease under certain circumstances. The clinical signs produced by *Clostridium perfringens* type C are due to its release of an enterotoxin. There are six types of toxins released by *C. perfringens*, of which types B, C and D seem to be the most important in cattle. This disease has a sudden onset, and some calves will die without showing any symptoms.

The specific condition commonly associated with enterotoxemia is a sudden increase in the calf's dietary intake. Therefore, if management practices (penning the cows separate from the calves) or weather cause an increase in the interval between meals, a calf may overconsume milk and thereby establish the proper environment for the bacteria to grow. Clinical signs include weakness, abdominal distention, bloody diarrhea, uneasiness (straining or kicking at abdomen) and convulsions. Postmortem lesions normally seen are bloody, fluid-filled small intestines that give rise to the common name "purple gut."

Treatment should include intravenous fluid therapy, providing electrolytes to correct dehydration and acid-base imbalance. Antitoxins and a broad-spectrum antibiotic are indicated. However, animals may die regardless of treatment. Prevention is achieved through herd vaccination and consistent control of the animal's diet. Cows should be initially vaccinated at 60 and 30 days before calving and then once annually.

Overeating Disease

Overeating disease is caused by *Clostridium perfringens* type D. Unlike type C (above) which affects younger calves, type D affects older calves less than two years of age that are on a high grain ration, such as feedlot or stocker calves. Overeating disease occurs infrequently in cattle but is more common in sheep.

Clostridium perfringens type D is a normal inhabitant of the gastrointestinal tract and only

causes disease under certain circumstances. Ingestion of excessive amounts of feed or grain can hasten the disease. Clinical signs may include decrease in appetite, weakness, incoordination, diarrhea and nervous signs. Death may occur very quickly even before signs of illness occur. Treatment would include antibiotic therapy, intravenous fluids and antitoxins. A typical 7-way vaccine given following labeled instructions will protect most animals against this disease.

Botulism

Botulism occurs very rarely in cattle in the United States and is caused by *Clostridium botulinum*. Cases tend to be associated with contaminated feed. Clinical signs include ascending paralysis that typically starts in the hind legs and progresses up the spinal cord, usually leading to death. Since this disease is so rare, there are no protective vaccines available. No specific postmortem signs are associated with the disease, and treatment is ineffective because death occurs very quickly.

Summary

Clostridial diseases are very difficult to treat. Preventing these diseases through a proper vaccination program is a producer's best option. Several vaccines are available on the market and are very effective in preventing clostridial diseases. Many of these vaccines are marketed in a combined manner (7-way), which allows the producer to protect against several diseases with one vaccine. Many require

boosters after the initial injection, and then one annual injection. Some vaccines only require one initial injection without a booster, but they do require annual revaccination. It is always wise to follow the manufacturer's recommendations that can be found on the label of the vaccine bottle. This will allow for proper use of the product and less possibility of vaccination failure.

Remember to give injections in the neck area to avoid damaging expensive carcass cuts in the rump, top butt or round areas. Always use a vaccine that is administered under the skin (subcutaneous) rather than giving intramuscular injections.

Producers should work closely with their local veterinarians in an attempt to prevent or control an outbreak of clostridial disease. Timely diagnosis of a specific disease can decrease the likelihood of more death loss in the herd. For more information about blackleg and other clostridial diseases, contact your local county Extension office.

References

- Floyd, James G., Jr., 1994. *Blackleg and Other Clostridial Diseases in Cattle*. Alabama Cooperative Extension System. ANR-0888. Auburn, Alabama.
- Smith, Bradford. 1996. *Large Animal Internal Medicine*. pg. 1507-1509. Saint Louis. Mosby-Year Book, Inc.
- Texas Agriculture Extension Service. *Blackleg and Clostridial Diseases*. The Texas A&M University System. BCM-31A. College Station, Texas.