

Livestock Health Series

Blackleg and Other Clostridial Diseases

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Introduction

Clostridial bacteria cause several diseases that affect cattle and other farm animals. This group of bacteria is known to produce toxins with varying effects based on the way they enter the body. The bacteria are frequently found in the environment (primarily in the soil) and tend to multiply in warm weather following heavy rain. The bacteria are also found in the intestinal tracts of healthy farm animals, where they only cause disease under certain circumstances. The most common diseases caused by clostridial bacteria in beef cattle are blackleg, enterotoxemia, malignant edema, black disease and tetanus. These diseases are usually seen in young cattle (less than 2 years of age) and are widely distributed throughout Arkansas.

Bacteria of the *Clostridium* genus 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 animal'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

symptoms. Therefore, prevention of these diseases through immunization is more successful than trying to treat infected animals.

Blackleg

Blackleg, or clostridial myositis, affects cattle worldwide and is caused by *Clostridium chauvoei*. Susceptible animals first ingest endospores. The endospores then cross over the gastrointestinal tract and enter the bloodstream where they are deposited in muscle tissue in the animal's body. They then lie dormant in the tissue until they become activated and trigger the disease.

Clostridium chauvoei is activated in an anaerobic (oxygen deficient) environment such as damaged, devitalized or bruised tissue. Events such as transport, rough handling or aggressive pasture activity can lead to muscle damage that compromises blood flow, resulting in decreased oxygen delivery to that area. In these areas of damage, the clostridial endospores germinate and multiply into the disease-causing bacteria. Open wounds are not necessary for this disease to develop, making diagnosis difficult.

Although blackleg has occurred in calves as young as 2 months of age, the disease generally affects animals between 6 months and 2 years of age as they are rapidly growing. Occasionally, infections may be seen in immunocompromised adult cattle. In Arkansas, blackleg infections typically occur during the late summer

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and early fall, when weather is warm and wet. Incidence of disease increases after floods due to endospores rising to the surface of the soil or during drought when grass is very low, which allows cattle to ingest spores more readily when grazing.

Animals infected with blackleg usually die rapidly without any signs of illness. If clinical signs are seen very early in the progression of disease, they will include lameness, loss of appetite, high 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 suffer from a permanent defect in the tissue where the infection occurred.

Swelling of affected muscle tissue (leg, neck, hip, chest, shoulder or elsewhere) is the most common clinical sign of blackleg seen in dead animals. The swelling is due to fluid and gas accumulation produced by the anaerobic bacteria in the muscle tissue. When pressure is applied to the affected areas, gas can often be felt moving while producing a crackling sound under the skin. Affected muscle tissue will contain dark areas of necrotic tissue that gives off a foul odor often described as rancid butter.

Immunization is an inexpensive and effective way to prevent blackleg. Calves should be vaccinated between 2 and 3 months of age. Until that age, 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 2 to 6 weeks. Other vaccines are now approved for a single dose injection. The common blackleg vaccines are called "7-way" because they also protect against other clostridial diseases. In accordance with Beef Quality Assurance standards, vaccines should always be given subcutaneously (under the skin) in the neck area.

If an outbreak of this disease occurs, the producer should contact his/her local veterinarian to initiate an action plan. The veterinarian may recommend that all animals receive immediate vaccination and followup boosters. Further losses may occur for a 2-week period until the animals develop immunity against the disease. Carcass disposal should be done carefully by burying carcasses deeply where they lie as movement of the carcass can further contaminate the pasture with clostridial endospores.

Tetanus

Tetanus is a disease caused by *Clostridium tetani*, a bacterium found worldwide in 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.

A veterinarian can treat tetanus with antibiotics, tetanus antitoxin and supportive therapy if detected early in the disease process. Additional medication to control seizures may be needed. Intravenous fluids are indicated to control dehydration if the animal cannot eat or drink. Prevention can be achieved through vaccination and diligence in using clean surgical instruments when castrating or dehorning.

Malignant Edema

Malignant edema is caused by the bacteria *Clostridium septicum*. This clostridial bacteria is found in the intestinal tracts of most domestic livestock where it is shed in feces that in turn contaminate the pasture. Malignant edema develops when the bacteria enters the body through an open wound. Once in the body, the bacteria invade the subcutaneous tissue, causing localized fluid accumulation (edema). Symptoms may include decreased 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, but the tissue swelling will not have gas accumulation. Death occurs quickly after infection, so treatment with an antibiotic is only effective if started very early in the disease. Malignant edema is also best controlled through immunization of cattle.

Red Water

Red water disease is caused by the bacteria *Clostridium haemolyticum*. These bacteria gain entry into the animal's body by crossing the intestinal lining after ingestion of spores. These spores eventually lodge in the liver where they lie dormant until the conditions are right for them to replicate and grow. Damage to the liver by liver flukes (*Fasciola hepatica*) is often the trigger for the spores to become active, which is why this disease is limited geographically. Aquatic snails are needed for 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 infection begins, *Clostridium haemolyticum* releases a toxin into the blood that attacks and destroys red blood cells. The resulting damage leads 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 noticed. Symptoms include red urine, dehydration, fever, labored breathing, pale to yellow mucous membranes and anemia. Prevention of this disease is through immunization and control of fluke infections through an appropriate parasiticide. Not all clostridial vaccines immunize against this disease, so check the label if you need to purchase a vaccine that contains the *Clostridium haemolyticum* bacterin.

Black Disease

Black disease (infectious necrotic hepatitis) is caused by *Clostridium novyi* type B. Black disease is similar to red water disease in that the bacteria prefer to colonize the liver, where liver damage initiates activation of the spores. The differences are that a diet high in grain seems to be the culprit for liver damage instead of flukes and that the toxin released causes further liver damage instead of damage to red blood cells. Although flukes are not thought to be a primary cause, a fluke infestation may create a desirable environment for this disease to occur.

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 often do not show clinical signs and die before treatment can be considered. Vaccination is the best method for preventing black disease.

Enterotoxemia

Enterotoxemia is an often fatal disease in young calves caused by *Clostridium perfringens* type C. It is usually seen in newly born calves less than 30 days old. Although *Clostridium perfringens* type C is a normal inhabitant of the gastrointestinal tract, these bacteria can cause severe disease under certain circumstances. The clinical signs associated with enterotoxemia are due to the release of endotoxins. 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 sudden increase in the calf’s dietary intake seems to be the most important contributing factor in the formation of the disease. When calves overconsume milk, they disturb the delicate balance of bacteria in the gut, which allows for clostridial bacteria to grow unchecked and secrete toxin. 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.”

Calves with this disease need immediate treatment with intravenous fluid therapy with electrolytes to correct dehydration and acid-base imbalance. Antitoxins and a broad-spectrum antibiotic are usually given in addition to fluid therapy. Despite treatment, calves can die from this disease. Prevention is achieved through consistent control of the calf’s diet and herd vaccination. Cows should be vaccinated initially at 60 and 30 days before calving and then once annually.

Overeating Disease

Overeating disease is caused by *Clostridium perfringens* type D. These bacteria are also normally found in the gastrointestinal tract. 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. Although overeating disease can occur in cattle, it is more common in sheep. Ingestion of excessive amounts of feed or grain can hasten the disease. Clinical signs may include decreased appetite, weakness, incoordination, diarrhea and nervous signs. Death may occur very quickly even before signs of illness occur. Treatment and prevention are the same as with type C.

Botulism

Botulism is caused by *Clostridium botulinum* and occurs very rarely in cattle in the United States. The disease tends to be associated with the ingestion of feed contaminated with preformed botulinum toxin, which is a neurotoxin. The use of poultry litter in cattle feed has been linked to sporadic outbreaks of botulism in cattle. Clinical signs include ascending paralysis that 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 bacteria can be found in the environment as resistant spores or in the gastrointestinal tracts of animals as a normal inhabitant. Diseases caused by these bacteria are very difficult to treat because the toxins act quickly. Immunization through vaccination is the best way to prevent the horrible diseases associated with these organisms. Many of these vaccines are marketed in a combined manner (7-way), which allows the producer to protect against several diseases with one vaccine. The vaccine

label should always be read carefully as vaccines can differ drastically from manufacturer to manufacturer. Following the label exactly will allow for proper use of the product which will decrease the chance of vaccine failure. Injections should always be administered subcutaneously in the neck area of the animal to avoid damaging expensive carcass cuts. Producers should work closely with a veterinarian to develop an overall herd plan and to quickly address any outbreak of disease. Timely diagnosis of a specific disease can decrease the likelihood of more death loss in the herd.

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