



The Veterinary Link

by **BOB LARSON**, professor of production medicine, Kansas State University

Clostridial diseases

Most bacteria that can cause disease in cattle are fairly fragile. They will be destroyed by sunshine and by hot, dry or cold weather within a few hours or days. This is very fortunate from an animal health standpoint because cattle cannot commonly contract infectious diseases from the environment for more than short periods of time. Rather, they need to have direct contact with infected cattle.

There are some exceptions, though, and an important exception is the group of diseases caused by bacteria in the clostridia family. Bacteria in this family form very tough spores that can live in the soil for many years and that can survive repeated freezing, thawing, hot winds and sunshine. So, instead of getting blackleg, tetanus and other clostridial diseases directly from other animals, cattle are instead infected after being exposed to soil that was contaminated many months or years ago.

Another important aspect of clostridial bacteria is that they can produce powerful toxins that will

circulate in the bloodstream and cause deadly problems far from the initial wound or site of entry.

Different species of clostridial bacteria tend to cause disease in different ages of cattle. The most common clostridial diseases of young calves are blackleg (*Clostridium chauvoei*), clostridial enterotoxemia (*C. perfringens*), and occasionally tetanus (*C. tetani*).

Adult cattle can also be affected by a number of clostridial diseases, including malignant edema (*C. septicum*) and Black disease, which can occur following liver damage by flukes or other causes (*C. novyi*). Because clostridial diseases have been recognized for centuries, some of the earliest cattle vaccines developed were for this family of bacteria.

Blackleg

The bacteria causing blackleg (*C. chauvoei*) lives in the soil where it can survive for many years. The bacteria enter cattle through the digestive tract and can be found in many tissues of healthy animals. The disease is created when the bacteria multiply rapidly in muscle and

release large quantities of a fatal toxin. Muscle trauma or bruising from handling, trucking or normal animal interactions may be required for the bacteria to have a suitable environment to multiply rapidly, but the exact requirements to start the deadly process are not known.

Cattle that are affected by blackleg are very likely to die. The disease is most common in young calves up to 12 months of age, with animals more than 1 to 2 years of age rarely being affected.

The disease attacks very rapidly, and, in many cases, a dead calf is the first indication of a problem. If detected early enough, the signs of blackleg disease are: depression, lack of interest in eating, reluctance to move because of muscle soreness, and muscle swelling in the affected area. The most commonly affected muscles are those of the legs, tongue, brisket and udder.

Blackleg (like other clostridial diseases) is not considered a contagious disease, in that the disease does not pass directly from one calf to another — rather it is from soil to an animal. An outbreak may appear contagious in that

a number of animals can be affected in a short period of time, usually following a soil disturbance.

Although the blackleg organism is very common in all parts of the United States and most likely present on most farms and ranches, some pastures have a much higher risk than others do. Any event that disturbs the soil, such as flooding, pond repair, bulldozer work, laying water pipe, etc., can initiate an outbreak of blackleg disease in pastures with heavy loads of blackleg organisms. Although vaccination is not 100% successful at protecting calves from blackleg disease (especially in young calves), vaccination will decrease the number of calves that are susceptible to the organism.

Enterotoxemia

C. perfringens or enterotoxemia is typically a disease of young calves. Most commonly, death occurs so rapidly that the first sign of a problem is to find a dead calf. Occasionally calves may be found that have diarrhea and abdominal pain, and possibly seizures. Affected

calves are typically suckling cows with high milk production and are often the healthiest, fastest-growing calves.

There are five known types of *C. perfringens* (A, B, C, D and E); type C is the type that seriously affects calves in North America. *C. perfringens* Type C is normally present in the digestive tracts of cattle and is present in calf intestines shortly after birth. This organism secretes a toxin that can cause a rapid death if the toxin is present in large amounts. The disease is most frequently observed in calves one week of age or less.

Because the germ normally lives in the gut of healthy calves, two things must happen for the organism to multiply rapidly and produce large amounts of the toxin. First, the bacteria need an abundance of carbohydrates (which are present in milk), and secondly, the intestinal tract motility must be at least partially slowed (which occurs following a large meal).

Following a large milk meal, high levels of toxin can be produced and death can occur rapidly. An enzyme produced by the pancreas is able to break down the toxin, but this enzyme (trypsin) is only present in small amounts the first few days of life and then increases to protective levels by a couple of weeks of age.

Tetanus

Tetanus is caused by *C. tetani* and cattle are not as susceptible as many other species — but deaths due to tetanus are occasionally seen. The organism can enter a wound and produce toxins that cause death.

Many commercially available clostridial “blackleg” vaccines do not include a component for protection against tetanus. Vaccines for cattle that provide protection against tetanus are available and are commonly used when cattle are castrated with elastic bands, as this method of castration is associated with some tetanus deaths.

Malignant edema

Malignant edema occurs due to wound contamination by the organism *C. septicum*. Any injury that breaks the skin, or even calving or surgeries such as castration, can provide an opportunity for this clostridial organism to invade.

Cattle affected with malignant edema have a high fever and go off feed. There will be swelling and accumulation of fluid around the infected wound, with almost all affected cattle not surviving.

Black disease

C. novyi, the clostridial organism that causes Black disease (or necrotic hepatitis), multiplies rapidly in damaged liver tissue. A common cause of damage that can lead to this disease is migration of liver flukes through the liver. Regardless of the initial cause of liver damage, this organism releases toxins that damage the liver further

and will lead to death in a short period of time.

Prevention and treatment

Vaccines are available that provide fairly good protection against clostridial disease. Older animals respond best to vaccination by building a protective immune response. Young animals that have been vaccinated may or may not

have developed protection, so deaths from blackleg can occur in vaccinated herds — particularly in younger cattle.

Because the vaccine is fairly effective, a program where calves are initially vaccinated at 2-3 months of age with subsequent revaccination is recommended. During an outbreak of enterotoxemia, antitoxins and antibiotics should be administered to calves that do

not show signs of disease and that are less than 2 weeks of age.

Treatment of clostridial disease cases is not likely to be rewarding. Treatment with antibiotics and supportive treatment (keeping cattle dry, comfortable and hydrated) have been used with minimal success.

