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Clostridial diseases in cattle

Dr Sarah Robson

Regional Animal Health Leader, Animal & Plant Biosecurity, Wagga Wagga

Introduction

Clostridial diseases are caused by bacteria of the genus *Clostridium*. Clostridia are widespread in the environment and are normally found in soil and faeces. They form highly resistant spores that can survive in the environment for very long periods. They are also present in the gastrointestinal tract and as spores in tissues of healthy animals. Not all species of clostridia cause disease, but those that do are usually fatal. They include the following:

Clostridium	Disease caused
C. tetani	Tetanus
C. septicum	Malignant oedema
C. chauvoei	Blackleg
C. perfringens type D	Enterotoxaemia (pulpy kidney)
C. novyi	Black disease
C. botulinum	Botulism

Disease occurs when these bacteria enter the body (via cuts, abrasions or ingestion) and conditions in the body allow multiplication of the bacteria and/or toxin production.

Tetanus

Tetanus usually results from contamination of deep puncture wounds. Castration and dehorning wounds are another risk, as are wounds from calving trauma.

Clostridium tetani organisms remain at the site of entry, multiply, and produce a toxin that affects the nervous system, causing stimulation and contraction of the skeletal muscles. The affected animal will appear stiff, the tail is held out, the head and neck stretched out, the third eyelid comes across the eye, and the nostrils are flared. Bloat is common. As the disease progresses, a 'sawhorse' stance is adopted, and 'lockjaw' develops. Eventually the animal will not be able to stand and goes into 'tetanic' convulsions. Respiratory failure ends in death.

Calf with tetanus following castration. Note the rigid limbs due to muscle spasm.
Photo: Belinda Walker

Malignant oedema

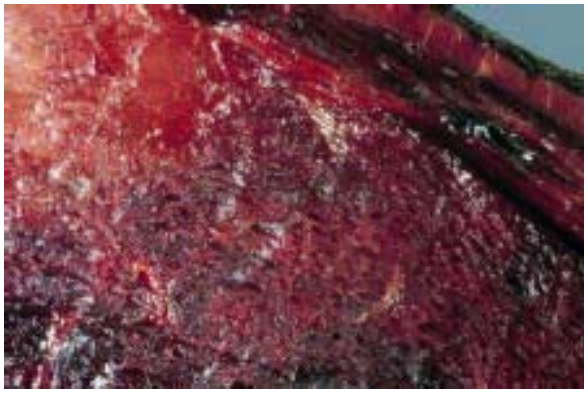
Clostridium septicum, along with *C. chauvoei*, *C. perfringens*, *C. sordellii* and *C. novyi*, are the clostridia that produce malignant oedema. Malignant oedema results from wound contamination by soil, allowing entry of the clostridia. Deep puncture wounds, castration wounds and calving injuries are high risk. Infection can also occur via the umbilicus

(navel) in newborn calves and following injections if proper aseptic technique is not used. Toxins are produced at the entry site. This causes extensive swelling, with accumulation of bloody or clear fluid, and tissue death followed by gangrene. The affected area is extremely painful. Toxins are absorbed into the bloodstream, causing fever, weakness, trembling, and then death.

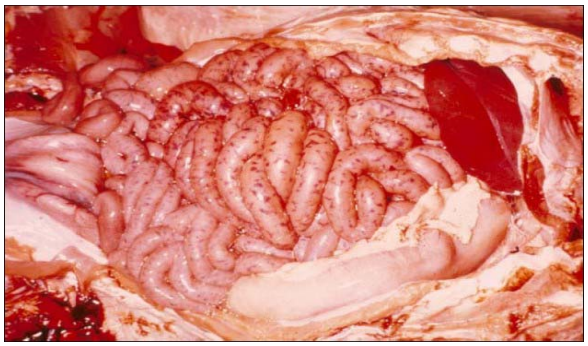
Blackleg

Blackleg tends to be a disease of young cattle from 6 months to 2 years old. It occurs more often in rapidly growing animals on a high plane of nutrition. It is thought that spores of *Clostridium chauvoei* lie dormant in the muscles of healthy animals. Blackleg occurs when the spores are stimulated to multiply because of trauma or bruising. The toxin produced causes severe muscle damage. The affected area is hot, swollen and painful. Gas builds up in the muscle. There is rapid progression to gangrene. In most cases a limb is affected and the animal is severely lame. Occasionally the heart muscle, tongue or udder can be affected. The toxin is absorbed into the bloodstream and results in fever, weakness and death.

Further information on blackleg is available in a separate Primefact 433 *Blackleg in cattle*.



Diseased muscle from a heifer that died suddenly from blackleg. The muscle tissue is dark red and has a dry appearance due to gas formation.



Haemorrhages in the intestines of a calf that died from enterotoxaemia.
Photos: Roger Cook & University of Sydney

Enterotoxaemia (pulpy kidney)

Enterotoxaemia is caused by proliferation of *Clostridium perfringens* type D, with toxin production, in the intestine. A number of toxins are produced, but the most important toxin damages blood vessels and the nervous system. The disease tends to occur in young, rapidly growing animals in good condition and on a high plane of nutrition (lush growing pasture, young cereal crops and grain). A disruption in digestion is necessary for the disease to occur: a change in feed is usually involved.

Signs of disease include diarrhoea, bellowing, mania or dullness, blindness, convulsions and death. Animals may just be found dead. Further information is available in a separate Primefact on enterotoxaemia called Primefact 418 *Enterotoxaemia in cattle*.

Black disease

Black disease is thought to occur when there is damage to the liver – such as occurs with migrating liver fluke – that allows *Clostridium novyi* to multiply and produce toxin. The toxin causes severe liver damage and death.

Botulism

Clostridium botulinum is present in decomposing animal and plant material. Toxins are produced by *Clostridium botulinum* in the decaying material. Animals get botulism by ingesting the toxin. The most common source of toxin for cattle is feed contaminated by carcases such as those of mice or birds, or chewing on bones (behaviour initiated by phosphorus deficiency).

Botulinum toxin causes a flaccid (floppy) paralysis, which starts at the hindquarters and progresses forwards to the forequarters, neck and head. In some cases the tongue is paralysed and hangs from the mouth. The animal cannot chew or swallow and will drool saliva. Paralysis of the respiratory muscles results in death.

An animal with botulism exhibiting paralysis and excess salivation due to impaired swallowing.
Photo: John Gibson (QLD DPI)

Preventing clostridial diseases apart from botulism

5 in 1 vaccine

5 in 1 is a vaccine containing antigens of *C. perfringens* type D, *C. tetani*, *C. septicum*, *C. novyi* and *C. chauvoei*. It protects against the five more common clostridial diseases, but not against botulism. A separate vaccine is available to protect against botulism (see below).

It takes approximately 10 days for stock to develop immunity to the clostridial diseases after vaccination, and immunity is short-lived unless a booster is given. A booster is necessary 4 to 6 weeks after the first vaccination to ensure adequate immunity. A single dose at marking is **not** effective.

Vaccine storage

Refrigerate the vaccine and protect it from light before use. Keep vaccine in an esky with cooler bricks in the yards until you are ready to inject the cattle.

An example of tongue paralysis due to botulism Photo: John Gibson (QLD DPI)

Administration

Keep the vaccine mixed before and during use. As far as possible, avoid injecting animals in wet weather or under dusty conditions.

Use sterile syringes and needles. Needles must be sharp, so they need to be replaced frequently. Take care to prevent contamination of the needle and vaccine by contact with non-sterile surfaces and hands.

Read the label for directions on dosage. The vaccine is injected under the skin on the side of the neck in cattle. For information on the correct vaccination technique see Primefact 431 *Beef cattle vaccines*.

Vaccination program

Vaccinate calves from 6 weeks of age. Give a booster 4 to 6 weeks after the first vaccination. It is best to give the first dose 6 weeks before marking and the second dose at marking.

Previously unvaccinated adult stock should receive two doses 4 to 6 weeks apart.

A booster 12 months after the initial two shots should give lifelong immunity against tetanus and blackleg.

To maintain immunity against black disease, annual boosters are required.

Immunity against enterotoxaemia lasts approximately 3 months, so boosters may be needed for young stock (up to 2 years old) at appropriate intervals, depending on local and seasonal conditions. If there are likely to be digestive disturbances from a change in diet (such as commencement of grain feeding), give a booster shot.

The other aspect of prevention is hygiene when castrating and dehorning cattle. Ensure that all equipment used is clean. Remove blood, hair, soil and other organic matter from instruments by washing, before soaking the instruments in a disinfectant solution.

Avoid soil and faecal contamination of the surgical wounds. Avoid castrating cattle or doing other surgical operations under wet, muddy conditions or hot, dusty conditions, or at times when fly numbers are high. Application of a wound dressing will help to prevent infection with other bacteria.

Preventing botulism

Stock are at risk of botulism when they suffer from protein and phosphorus deficiency, as this results in the chewing of bones and decaying material, which may carry *Clostridium botulinum.* Correct nutritional management is the key to preventing botulism.

Accidental cases can occur when feed contaminated with rodent, bird or reptile carcases is fed out. If you notice this contamination, don't use this feed. In situations where it is impossible to supply an adequate diet or suitable fodder, vaccination is a way of preventing botulism. In cattle, botulinum vaccine is injected under the skin, high on the neck. Localised swelling may occur and may take several months to resolve.

There are two types of vaccine available to prevent botulism: a conventional vaccine that requires a booster 4 to 6 weeks after the first dose, and a single-dose type that does not require the initial booster. However, both types require an annual booster, as protection only lasts for about 12 months.

The time taken to achieve maximum immunity varies (4 weeks to 6 months), so read the label to

calculate when to vaccinate to achieve maximum protection at times of high risk.

Further information

For further information contact your local NSW DPI veterinary officer or your Rural Lands Protection Board district veterinarian.

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