

Botulism in cattle

Paul Freeman

Regional Animal Health Leader, Animal & Plant Biosecurity, Wollongbar

Phil Bevan

Regional Public Affairs Officer, Public Affairs & Media, Wollongbar

What is Botulism and what causes it?

Botulism is a paralysing disease of animals, birds and humans caused by a potent nerve toxin produced by the bacteria *Clostridium botulinum*.

C botulinum and its spores are widely distributed in the environment in soils, sediments, and in the gastrointestinal tracts of fish and animals. The bacterium exists in two states:

- as dormant spores which are resistant to environmental degradation and
- as a vegetative state when the bacterium is growing under anaerobic conditions.

Toxin is produced when the bacterium is in the vegetative state and is either ingested in the feed or is produced by the botulism bacteria as it grows in the gut or in deep wounds.

Seven types of toxin have been identified, designated A to G. In Australia most botulism outbreaks in cattle and sheep are due to Type C or D toxin although Type B toxin was identified as the cause of an outbreak in dairy cattle in South Australia vaccinated against Type C and D toxin. Botulism has been reported in many species of wild and domestic animals and birds as well as in humans.

Under what conditions do outbreaks occur?

In Australia, outbreaks of botulism in cattle are seen in both extensive and intensive livestock enterprises.

Extensive enterprises

Much of the pastoral areas of Australia have soils that are phosphorus deficient. In these areas botulism occurs quite commonly as cattle chew bones and carrion containing botulism toxin to satisfy their craving for phosphorus and/or protein. Due to the remote locations the affected animals may die unnoticed and only show up as reduced numbers at musters. The carcasses of the botulism affected animals also provide an ongoing risk for further cases of botulism. Transfer of putrid carcass material by vermin such as foxes and crows has been reported overseas as an indirect method of spread between properties.

Intensive production

In recent years, outbreaks of botulism have become more common in the intensive industries. While infrequent, these outbreaks have often caused very high mortalities within herds resulting in severe financial hardship for affected farmers.

Most cases have been due to contamination of the feed or water by rotting organic matter containing the botulism toxin or bacteria. Bodies of small animals such as lizards, snakes, turtles or mice that are inadvertently trapped in grain, hay or silage during the harvesting or storage stage are some of the common types of rotting organic matter that contaminate feed. High moisture feeds such as silage or brewer's grains when allowed to rot rather than ferment can provide an ideal anaerobic environment for botulism growth.

Some of the highest mortalities have occurred where mixing wagons were used in preparing dairy rations and the toxin was evenly distributed throughout the mix. In several other outbreaks botulism toxin produced by rotting organic matter contaminated water sources resulting in deaths in cattle drinking from those contaminated sites.

A recently identified risk that has caused outbreaks overseas is where *chicken litter is used as fertiliser* and cattle ingest the litter before it is broken down. Often carcasses of dead birds are present in



chicken litter. See "Prevention" for details on the safe use of chicken litter as fertilizer on pastures.

How does the toxin cause paralysis?

Once it is absorbed the toxin travels via the bloodstream to the nerve endings and blocks the transmission of nerve impulses to muscles resulting in paralysis.

What are the symptoms?

Botulism causes a progressive paralysis and animals die of respiratory failure from paralysis of the breathing muscles. Affected cattle tend to have a stiff gait and saliva drools from their mouth. They are usually found sitting down, unable to rise and their breathing becomes progressively more laboured. Frequently they extend their hind legs behind them in a frog legged position to make breathing easier. Some animals have tongues that hang out and do not retract when pulled.

Animals affected early in the outbreak tend to have a short clinical course (12-24 hours) and die quickly but later in the outbreak they can have a longer clinical course and some may even survive. Losses can be seen for up to 17 days after ingestion of a contaminated feed.

Botulism can be confused with hypocalcaemia or milk fever. Milk fever generally occurs in recently-calved older cows and the response to calcium injection is usually rapid. Botulism usually involves multiple cases, has no association with calving and does not respond to calcium injections. Ephemeral fever (3 day sickness) can also resemble botulism but affected animals usually have a fever and are usually down for only a few days. They often improve with calcium injections and cases tend to be seasonal affecting many herds within a region.

Diagnosis

The diagnosis of botulism is difficult early in an outbreak when losses are not great. Laboratory tests are often falsely negative and there are no specific lesions seen at autopsy. In extensive areas, bones may be found in the stomach indicating bone chewing. Usually the diagnosis is a clinical one based on the symptoms, the history and the exclusion of an alternate diagnosis by laboratory tests. Toxin detection in feeds or animal tissues is usually unrewarding.

What is the treatment?

There is no specific treatment for animals affected by botulism only supportive treatment. Antitoxins are not available for use in animals in Australia. Because the symptoms are due to a toxin rather

than a bacteria there is little rationale to the use of antibiotics.

Animals should be given shade. They may not be able to eat or drink if paralysis is advanced. Suspect feeds or water should be removed and replaced.

What is the prognosis?

Once animals cannot stand they are unlikely to recover and may need to be euthanased. Depending on the feeding system large numbers of animals may be exposed to toxin and heavy mortalities may result. In intensive industries the highest mortalities are usually seen in the first week of the outbreak but losses can continue for nearly three weeks after the source of contamination is removed. If the source of the toxin has not been determined then losses may occur for a much longer period.

How safe is meat and milk from farms suffering botulism outbreaks?

Meat from clinically-normal animals in herds affected by a botulism outbreak is safe for human consumption. Clinically affected animals would not be fit for slaughter and therefore would not enter the food chain.

While toxin may be present in the milk in exposed animals, clinical cases would not be milked and any toxin in animals infected but not yet showing clinical signs would be diluted by the large number of normal cows and provide very low risk to consumers.

Type C and D toxins which are the main causes of cattle botulism in Australia has not been incriminated in human botulism cases.

If botulism is suspected or confirmed on a dairy farm, producers should contact their milk processor as soon as possible.

How can you prevent botulism?

The main preventative strategy is to **vaccinate** the herd.

In the pastoral areas where botulism is endemic vaccination is widely adopted and it provides good protection. In the intensive industries botulism is still uncommon but for individual producers the financial consequences can be dire and vaccination is recommended for all producers who are feeding cattle silage, grain, by-products or mixed rations.

Single dose and two dose vaccines are available and it is recommended that producers talk to their animal health advisor to get assistance in choosing

the appropriate vaccination program for their particular situation.

Once an outbreak has started, vaccination is unlikely to make much of an impact, so it is important to vaccinate on a regular basis before you get a problem.

Apart from vaccination, other management practices can reduce risk factors for botulism, they are:

- Preventing stock access to animal carcasses. (See section below on preventing animal access to Restricted Animal Material).
- Controlling vermin and pest animals to reduce the risk of spread of putrid material.
- Providing nutritional supplements of protein and phosphorus to reduce bone chewing among pastoral-zone cattle
- Taking care with the harvesting and storage of feeds to reduce the possibility of small animals contaminating feeds
- Checking water sources for organic matter contamination.

How do you dispose of the dead animals in a botulism outbreak?

Animal carcasses should be deep buried in clay or plastic-lined pits with at least three metres of soil over the top. The rumens need to be slashed in several places to prevent gaseous distension which could cause the carcasses to rise to the surface. The site of the burial pit should be such that leachate does not enter the water table. Your DPI livestock officer is able to provide further details on siting burial pits. Off farm rendering is an alternate possibility.

Preventing access to Restricted Animal Material (RAM)

Animal carcasses and chicken litter are examples of what is termed **Restricted Animal Material (RAM)** and it is an offence under the Stock Diseases Act for anyone to feed, cause or permit stock to feed on RAM. This legislation was introduced as part of Australia's response to keeping the country free of BSE or "mad cow disease" and is required by our export markets if we want to retain our BSE-free status.

Animal carcasses should either be buried, or burnt and buried, or fenced off so that cattle are unable to access the burial area. This will also reduce the risk of a botulism outbreak if cattle were to chew on carrion or bones.

Poultry litter is used as fertiliser on many farms. It is important that litter stores are not accessible to cattle and that any bird carcasses are removed

prior to spreading on pasture and cattle are withheld from grazing for at least 21 days after application of poultry litter on to pastures. Details on the safe use of poultry litter on pastures are available from the pasture management area of the NSW DPI website.

www.agric.nsw.gov.au/reader/past-management

© State of New South Wales through NSW Department of Primary Industries 2007. You may copy, distribute and otherwise freely deal with this publication for any purpose, provided that you attribute NSW Department of Primary Industries as the owner.

ISSN 1832-6668

Check for updates of this Primefact at:

www.dpi.nsw.gov.au/primefacts

Disclaimer: The information contained in this publication is based on knowledge and understanding at the time of writing (April 2007). However, because of advances in knowledge, users are reminded of the need to ensure that information upon which they rely is up to date and to check currency of the information with the appropriate officer of New South Wales Department of Primary Industries or the user's independent adviser.

Job number 7690