Department of Primary Industries
primefact

Botulism in cattle

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Animal Biosecurity and Welfare, NSW DPI

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.

When do botulism 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 phosphorus deficient soils. 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 are 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 do botulism toxins cause paralysis?

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

What are the symptoms of botulism toxicity?

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.

The first affected animals tend to die quickly (12-24 hours) after they develop signs. Animals affected later in the outbreak may 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 based on the symptoms, the history and the exclusion of an alternate diagnosis by laboratory tests. As animals are very sensitive to the toxin, it may be difficult to detect the small quantity of toxin in feeds or animal tissues.

What is the treatment?

Botulism antitoxins are not available for use in animals in Australia. There is no specific treatment for animals affected by botulism only supportive treatment. Because the symptoms are due to a toxin rather than a bacteria there is little rationale to the use of antibiotics.

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

Recovery of affected animals

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 many may die.

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 is not found and removed then losses may occur for a much longer period.

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

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

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

Toxin may be present in the milk in exposed animals but clinical cases would not be milked.

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?

A key 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 as the financial consequences for affected producers can be dire, 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. Longer duration vaccines are generally used in endemic areas where botulism is regularly encountered while shorter duration vaccines are favoured where exposure occurs only sporadically.

Once an outbreak has started, vaccination is unlikely to make much of an impact because immunity can take up to 4 -5 weeks to develop. So it is important to vaccinate on a regular basis before you get a problem especially if you are feeding silage.

A second key preventive strategy is to feed high quality foods. As silage is the most frequently implicated source, strict care is required with the production and storage. For further information see https://www.dpi.nsw.gov.au/agriculture/pastures-and-rangelands/silage .

Apart from vaccination, other management practices can help reduce risk factors for botulism.

- 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 dead animals in a botulism outbreak?

General information on options for disposal of carcasses can be found in the Primefact Safe Disposal of large animal carcasses on the NSW DPI website. Your Local Land Services biosecurity officer can provide advice on disposal including siting burial pits.

Animal carcases should be deep buried in clay or plastic-lined pits with at least two metres of soil over the top.

The rumen must be slashed in several places to prevent gas which could cause the carcasses to rise to the surface. A burial pit can only be dug on land where leachate does not enter the water table.

Alternative off farm disposal options include:

- rendering at a rendering plant or knackery, or
- burial in an approved landfill site.

Preventing access to restricted animal material (RAM)

Animal carcasses and chicken litter are examples of what is termed RAM. It is an offence under the *Biosecurity Act 2015* for anyone to feed, cause or permit ruminants to feed on RAM. This legislation was introduced to keep Australia 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 to prevent cattle from accessing litter stores and to remove any bird carcasses prior to spreading the litter on pasture. Cattle must not be allowed to graze the land for at least 30 days after the poultry litter is applied to the pasture.

Details on the safe use of poultry litter on pastures are available from the NSW DPI TSE freedom of assurance webpage (available from: https://www.dpi.nsw.gov.au/biosecurity/animal/stock-feed-control)

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