



Botulism in farmed ruminants

November 2018

This document is a source of information for veterinary surgeons who may be involved with the investigation of suspect botulism outbreaks in farmed ruminants. It can be used to assist in the provision of advice to their farming clients. There are links from the contents page to relevant sections of the document.

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Introduction: Botulism

Botulism is a paralysing disease which kills most affected animals. It is caused by a highly lethal toxin which is produced by *Clostridium botulinum*, a bacterium found in soil, which multiplies in rotting vegetation or carcasses. Since 2003 there has been a marked increase in the number of outbreaks of botulism in cattle and sheep in the UK.

Sources of the bacterium, *Clostridium botulinum*

In UK ruminants the disease is often caused by animals coming into contact with the litter of broiler chickens especially if it contains any carcass material. There are also more sporadic but very large outbreaks due to feeding forage that has been contaminated with carcass material, including carcasses that have been ensiled during grass cutting. If there are outbreaks of diseases in wildlife on a farm, for example myxomatosis in rabbits, the risk of botulism in livestock may be increased because dead wildlife carcasses may be present in the grass fields that are to be cut for silage. There is also a risk if game shoots leave carcasses behind on farms.

Chicken litter is usually brought onto farmland as a source of fertiliser. Animals have become affected through direct access to litter when it has been heaped or spread in the field where they are grazing, and indirectly from litter on a neighbour's premises, possibly as the result of carcass movement by scavenging birds and animals. Windy weather is also thought to be implicated in some outbreaks by spreading contaminated dust. Occasional cases have also occurred in animals fed silage made from fields fertilised with broiler litter.



Broiler manure on field awaiting spreading



Chicken carcass remains found in broiler manure

Clinical signs in affected animals

The clinical signs in affected animals vary from sudden deaths, to animals becoming stiff, wobbly, and going down before dying. Some animals have slowly become weaker developing flaccid paralysis and are unable to eat or drink, necessitating euthanasia on welfare grounds. Very few animals survive once they develop the disease. The onset of

clinical signs is variable and can be within 24 hours of exposure but can be delayed by up to two to three weeks, with the majority affected within the first seven days.



Holstein-Friesian heifer in sternal recumbency



Botulism affected ewe in sternal recumbency

The effect of the disease on farms

The main costs to the farmer are the deaths of animals and the purchase of replacements. The loss of livestock may range from a few animals to large numbers of livestock. There are also costs of veterinary visits, supportive treatments that may be given to affected animals, and the cost of post mortem examinations. There may also be the cost of vaccination if the farmer decides to vaccinate. In addition to economic losses there will inevitably be an emotional impact and associated stress.

Food safety

With botulism outbreaks no clinically affected animals or their produce should enter the food chain. This means that meat and milk from clinically affected animals may not be used for human consumption. If there are any recovering animals these should be restricted for 18 days following withdrawal from the suspected source and cessation of clinical signs.

Diagnosis

At the start of an outbreak it is recommended to seek specialist advice from a Veterinary Investigation Officer (VIO) at a Veterinary Investigation Centre (VIC). The diagnosis of botulism is based on the history, clinical examination, and ruling out other conditions that may result in ataxia and recumbent animals. Although there are no specific findings on post mortem examination (PME) of affected animals, PME is useful because other differential diagnoses can be ruled out. With suspect botulism outbreaks affecting several animals PME examination at a VIC is recommended. Samples for possible toxicological examination can be collected. For cattle, sheep, and goat carcasses submitted for PME to VICs where botulism is suspected or cannot be ruled out approximately 2 x 50 ml of small intestine contents, 50 grams faeces, a blood (serum) sample and 50 grams of liver are collected from each animal. When further laboratory testing is required to enable a diagnosis to be reached, APHA currently send samples overseas to Wageningen

Bioveterinary Research (WUR), which is based in Europe. Other samples are stored at - 20° C.

Where the outbreak is thought to be feed-related (other than contamination of the feed by poultry carcasses) a sample of feed (approximately 5 kg) should be collected and stored at - 20°C. This may be tested if specific criteria are met.

When samples from a suspect outbreak are tested they are initially examined for botulinum toxins. To date, confirmed disease in ruminants in the UK has been caused only by the C and D forms of the botulinum toxin. Positive results are reported as toxin type C, D, or C/D (where C/D is the chimeric botulinum toxin). If no toxin is found on direct examination, samples are tested by PCR for the bacterium. The PCR is not usually carried out if toxin is found on direct examination, but with some outbreaks tests for the identification of botulinum toxins and detection of the bacterium may be performed.

Risk to humans

Although botulism is occasionally identified in people, the risk to humans from affected ruminants is considered to be very low, because the C and D forms of the botulinum toxin very rarely affect humans.

Examples of some botulism outbreaks investigated over recent years

Botulism outbreaks investigated by the Animal and Plant Health Agency (APHA) over the last few years include cases associated with broiler litter, suspected random carcass material on pasture land, and those associated with carcasses contaminating feed, in particular silage. A few botulism outbreaks are commented on below.

Cases associated with broiler litter

In 2006, on eight premises in Devon, a total of 52 of 378 (around 14%) cattle at risk died of botulism. This was through direct and indirect contact with broiler litter from a single source farm.

In 2008, whilst grazing fields in Herefordshire, 150 of 500 ewes died. This was through direct contact with broiler litter.

In 2015 a severe outbreak of botulism was diagnosed in a group of approximately 600 one-year-old lambs which were destined for slaughter into the food chain. Around three-and-half weeks before the outbreak the lambs were put in one field which had a large amount of poultry litter stacked in it. Most of this broiler litter was fenced off from the sheep however two trailer loads were not. On the first day of the outbreak 70 lambs were found dead and 30 others showed clinical signs of weakness and flaccid paralysis. The group

were immediately moved out of the field but new cases continued to occur over the following two weeks. In total 230 lambs died.

Cases associated with carcase material contaminating feed

There can be high numbers of deaths associated with feeding contaminated feeds. There is frequently only one carcase / remnant of carcase confined to one area of feed, however the use of feed mixers / wagons can disseminate *C. botulinum* and botulism toxins.

In 2015 botulism was diagnosed in a beef suckler herd consisting of 38 animals. In total 8 heifers were affected and 5 heifers died. The animals were housed in a straw yard when the outbreak occurred. The suspected source was a goose carcase within the silage being fed. PME was carried out on one heifer. No other causes of death were found. *C. botulinum* type C/D toxin was detected in intestinal content. Following the initial cases the group were turned out to grass and no further cases occurred.



Botulism affected Limousin bullock in lateral recumbency



Depressed ewe in sternal recumbency

In 2017 botulism was diagnosed in a group of 39 housed high yielding dairy cows which were fed on a silage-based total mixed ration. On the first day of the outbreak there were four cases with the four affected cattle showing weakness and flaccid paralysis. They all died within six hours. Over the next four days there were further losses including animals with severe signs that were euthanased on welfare grounds. A total of 38 high yielders died. Two cows were submitted for PME. Botulinum toxin testing confirmed the presence of toxin type C/D in intestinal content, and the presence of *C. botulinum* type DC bacteria was confirmed by PCR.

The prevention of botulism

Information for farmers:

- Maintain a tidy farm. Clear up any dead carcasses promptly. Take measures to prevent introduced carcase material from entering feed.
- Ensure that feed (silage, other forages, concentrates) that are fed to livestock are of good quality with no spoilage or contamination.
- Have a rodent control programme in place.

- Be alert to potential diseases in wildlife on farms and thus dead carcasses.

Broiler litter is a useful source of nitrogenous fertiliser but there is the potential for botulism occurring in animals which come into contact with the fertiliser:

- Broiler litter containing visible carcass material must not be used as fertiliser (Animal By-Products Order).
- Heap litter in fields well away from livestock.
- Store litter securely well away from livestock and prevent access to birds and other scavengers.
- Ideally, only use the litter on arable land.
- It is illegal to use poultry litter as bedding material for other livestock.
- Cattle and sheep can be vaccinated against botulism
 - Farmers should seek veterinary advice first.

What to do if botulism is suspected

Information for farmers and veterinary surgeons:

- Farmers should seek advice from their veterinary surgeon.
- Livestock should be immediately prevented from having access to the suspect source.
- Farmers should immediately prevent animals from accessing broiler litter by moving them to fresh pasture or at least fence off any heaped manure.
- A diagnosis of botulism may require the examination of affected animals. For further information a local APHA Veterinary Investigation Centre should be contacted by the farm's veterinary surgeon. VIOs are happy to assist with the investigation of suspect botulism cases. As there are potential implications for the safety of the food chain the APHA prefers to be contacted early in the outbreak so that risk assessments can be carried out and so that essential advice can be given. All investigations performed by VIOs are done through the farmer's private veterinary surgeon.
- In botulism cases that are due to broiler litter - dispose of contaminated manure / broiler litter by deep ploughing it into arable land as soon as possible.
- In cases associated with contaminated feed – do not use the problem feed. A sample may be sent for testing. Advice should be sought on the safe disposal of contaminated feed.
- Vaccination may be considered. There is not a licensed vaccine that is available in the UK, however through the private veterinary surgeon an overseas vaccine can be obtained with a Special Treatment Certificate via the Veterinary Medicines Directorate. Farmers should seek further advice from their veterinary surgeon.

Further information

For more information, farmers should contact their private veterinary surgeon. Private veterinary surgeons should contact their local APHA Veterinary Investigation Centre. APHA VICs in England and Wales:

<http://apha.defra.gov.uk/vet-gateway/surveillance/diagnostic/national-network.htm>

Risk assessment links:

https://acmsf.food.gov.uk/sites/default/files/mnt/drupal_data/sources/files/multimedia/pdfs/botulismincattlereport1206.pdf

https://acmsf.food.gov.uk/sites/default/files/mnt/drupal_data/sources/files/multimedia/pdfs/botulisminsheepgoats.pdf

Animal By-Products links:

<https://www.gov.uk/government/collections/guidance-for-the-animal-by-product-industry>

<https://www.gov.uk/guidance/how-to-use-store-or-move-manure-guano-and-digestive-tract-content>



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