Practical approach to sudden death in cattle

Sudden or unexpected death of cattle can be a challenging investigation for the large animal veterinary surgeon. Many cases will involve an insurance claim, so accurate record keeping is imperative.

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Lee-Anne graduated from the University of Edinburgh Royal (Dick) School of Veterinary Studies in 2007. Having worked in predominantly farm animal practice for five years, Lee-Anne joined SAC Consulting Veterinary Services in 2013 as a veterinary investigation officer.

In mid-2014, Lee-Anne returned to farm animal practice at Scott Mitchell Associates in Northumberland where she is now a partner. She achieved advanced practitioner status in cattle health and production in January 2016, as well as a certificate in advanced veterinary practice in sheep in August 2018.

*Suggested Personal & Professional Development (PPD)

SUDDEN DEATH

Although the death appears to be sudden, it is largely dependent on the frequency that the cattle are checked by the stockman and the level of stockmanship. There may have been clinical signs for several hours before death that had gone unnoticed. **Table 1** lists some of the common causes of unexpected death; categorised into traumatic, infectious, toxic (including nutritional), metabolic, and miscellaneous.

Irrespective of the cause of death, the same principles of investigation can be followed. Any sudden or unaccountable death in farm stock should always raise suspicion of anthrax unless an alternative diagnosis is made (APHA, 2019). When the farmer initially informs their veterinary surgeon of a bovine sudden death, the vet – official veterinarian (OV) or not – needs to establish if anthrax can be reasonably ruled out. The questions in **Figure 1** can be used to help decide if anthrax remains a differential diagnosis. If there is any doubt, there is an obligation for the private veterinary surgeon to notify the duty vet at their Animal and Plant Health Agency (APHA) regional office under Article 4 of The Anthrax Order (1991).

- age of the animal – is the animal young and therefore more likely to have died from other causes?
- has the animal been ill in the last few days, or has it been losing condition and weight over a long period – suggesting an acute (but not peracute) or chronic illness?
- has the animal been visibly bloated over the last few hours – suggestive of bloat?
- is there evidence of convulsions during a period of grazing on lush pasture – suggestive of hypomagnesaemia?
- is there evidence that the animal has been in parturition, for example, is a dead foetus partly visible – suggestive of dystocia?
- is there evidence suggestive of poisoning as the likely cause, for example, ingestion of yew or water dropwort?
- are there other animals recumbent with flaccid paralysis, others that may have died and a recent history of spreading of poultry litter – suggestive of botulism?
- was the body found directly under a tree that has signs of being struck by lightning, or beside a metal fence or object, or are there scorch marks visible on the carcase – suggestive of lightning strike?
- have milking cows died suddenly in a parlour – suggestive of electrocution?

Figure 1. *Questions suggested by APHA to conclude on the likelihood of anthrax as the cause of death (APHA, 2019).*

Other findings that may be suggestive of anthrax are: a history of anthrax on the premises, recent ditching or soil exposure, or

Table 1. Common causes of unexpected death in cattle

Category	Examples
Traumatic	dystocia, uterine prolapse, injury, lightening strike, stray electric current, traumatic reticulitis, haemorrhage, gut torsion
Infectious	clostridial disease, acute pneumonia, mastitis, metritis, acute fasciolosis
Toxic/nutritional	plant poisoning, lead poisoning, acidosis, 'fog fever', 'white muscle disease'
Metabolic	hypomagnesaemia, hypocalcaemia
Miscellaneous	jejunal haemorrhage syndrome

"Any sudden or unaccountable death in farm stock should always raise suspicion of anthrax unless an alternative diagnosis is made"

multiple unexplained deaths. Unopened anthrax-infected carcasses are described as swollen – with blood oozing from the nostrils or other natural openings of the body. However, this is not always the case, as these signs are not specific to anthrax and are not, therefore, necessarily helpful in deciding if anthrax may be involved.

If an anthrax enquiry is initiated, the keeper of the animal should be advised to keep other livestock away from the carcass; as well as any area where the carcass has been, or where discharges from the carcass are present. Drainage ways in the vicinity of the carcass should be blocked, and the carcass must not be moved from its location or the premises. Disinfection must take place on any surfaces that the carcass has had contact with.

Carcasses suspected of, or known to be infected, must not be opened. Doing so is likely to result in an increase in the number of anthrax spores formed – resulting in greater environmental contamination. More information is available from the APHA website.

Once anthrax has been ruled out, further investigation is required to identify the cause of death. A thorough history is vital, and some of the questions in **Figure 1** will have helped to establish possible diagnosis. However, further information may be required:

- when was the animal last seen alive?
- what is the animal's vaccination history?
- is the animal purchased or home-bred?
- what is its reproductive status?
- has the animal been recently handled?
- what recent treatment has been administered?
- has there been any dietary change?
- has there been any dumping of waste in the field?
- has the pasture been grazed by animals before?

The animal's ear tag should be recorded in cases of litigation or potential insurance claims. Photographs of the carcass and identification marks, as well as where the carcass was found, are also useful. A careful external examination of the carcass can often provide further information (**Figure 2**):

- haemorrhage, fractures and wounds may be clearly visible – suggestive of trauma
- the degree of autolysis should be noted – autolysis can often be rapid in cases of clostridial disease
- scorch marks on the legs are sometimes present in cases of lightening strike
- aqueous or vitreous humour can be easily sampled to diagnose hypomagnesaemia, hypocalcaemia and nitrite poisoning
- urea levels within ocular fluid can give an indication of renal disease – a common finding in oak poisoning – and Beta-hydroxybutyrate (BOHB) concentrations correlate strongly with BOHB in serum (Edwards and Foster, 2009).

A post-mortem examination (PME) may be required as part of the investigation. This may be carried out by the practitioner *in situ,* with adherence to current Animal By-Product (ABP) and Health and Safety at Work and Control of Substances Hazardous to Health (COSHH) legislation. There should be adequate light drainage, as well as wash down and disinfection of facilities. Alternatively, the carcass may be referred to a local disease surveillance centre.

Figure 2. *Carcass of a dairy heifer for external examination.*

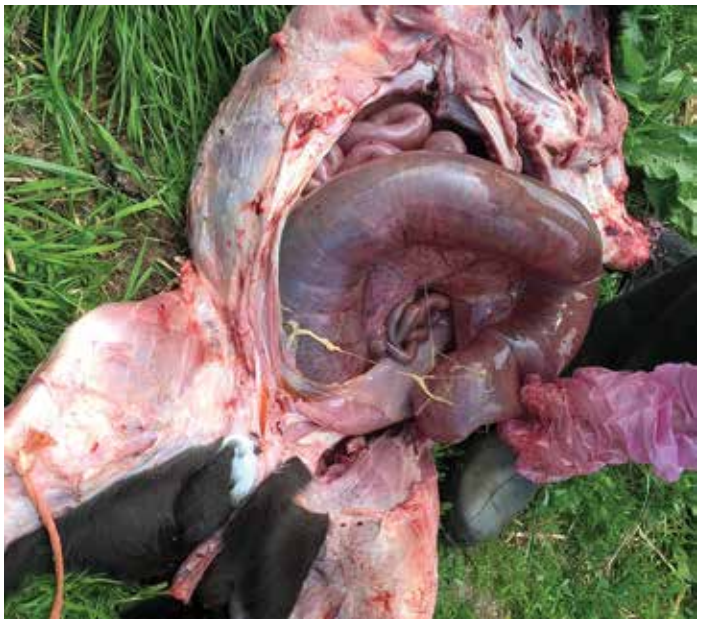

Figure 3. *Mesenteric torsion.*

It is beyond the scope of this article to describe a PME in full; alternative texts should therefore be consulted (Otter and Davies, 2015). Gross examination alone may provide a diagnosis. For example: traumatic reticulitis, mesenteric/intestinal torsion (**Figure 3**), organ rupture, internal haemorrhage, metritis, mastitis, plant poisonings, acute fasciolosis, dosing gun injuries, acidosis (**Figure 4**), and pneumonia can all be diagnosed from gross pathology.

Where a diagnosis cannot be reached from gross examination alone, appropriate sample collection may be required for further laboratory analysis. Before commencing a PME, it is

essential to have appropriate sampling equipment present:
- sample pots (preferably wide-top)
- formalin to fix tissues for histopathology
- evacuated blood tubes
- 21-gauge vacuum tube needles and mount
- permanent marker to identify samples.

In cases of suspected lead toxicity, biochemical analysis of the liver and kidney are required. Liver selenium and vitamin E levels can be useful, along with histopathology of active muscles (heart, diaphragm, intercostal, skeletal) to confirm a diagnosis of white muscle disease.

Making a diagnosis of clostridial disease can be challenging on gross pathology alone. Tetanus and botulism diagnosis are often made from the clinical presentation.

Clostridium perfringens type D causes 'pulpy kidney' and demonstrates a combination of the following at PME:
- marked autolysis of the kidney in comparison with the rest of the carcass
- fibrinous pericarditis
- glucose urea detectable on urine dipstick
- *C. perfringens* detected on anaerobic cultures of the small intestine
- epsilon and alpha toxins detected in the small intestinal contents or peritoneal or pericardial fluid
- brain may fluoresce under ultraviolet light
- focal symmetrical encephalomalacia: a large amount of perivascular leakage in the white matter cores, as well as the meninges, detected on histopathological examination of the brain.

Other clostridial conditions include:
- 'blackleg' caused by *Clostridium chauvoei* – lesions can be found associated with the diaphragm, heart, and tongue, and are not always easy to find
- 'black disease' caused by *Clostridium novyi* presents as a distinctive lesion in the liver. A pale yellowish circular area up to six centimetres in diameter surrounded by a zone of congested tissue. 'Black disease' can be associated with fascioliasis
- bacillary haemoglobinuria caused by *Clostridium haemolyticum* has distinct gross pathological findings: red urine, single or multiple necrotic infarcts in the liver extending up to 20 centimetres and a jaundiced carcass
- abomasitis caused by *Clostridium sordelli* in calves presents as an oedematous emphysematous hyperaemic abomasal lining.

A diagnosis of 'blackleg', 'black disease', bacillary haemoglobinuria, and *C. sordelli* abomasitis can all be confirmed by a combination of culture, fluorescent antibody test, and histopathology of the lesions.

Figure 4. *Large amount of grain in the rumen suggestive of acidosis.*

Conclusion

A logical approach can be applied to investigating sudden death, starting with a comprehensive history and followed by an external examination, PME and laboratory analysis. The process may take time and action may need to be taken during interim periods to prevent further losses. For example, if the deaths are suspected to be owing to feeding mismanagement, such as in cases of acidosis. ■

PPD Questions

1. Which toxins are detectable in the small intestinal contents at PME in a case of pulpy kidney?
2. Which four tissues can be samples for histopathological examination if white muscle disease is suspected?
3. List three things that a stock keeper should be advised to do if anthrax is suspected in a carcass before an anthrax enquiry is carried out?
4. What bacteria causes 'blackleg'?

Answers
1. epsilon and alpha toxins
2. intercostal, skeletal, heart and diaphragm
3. keep other livestock away from the carcass and any areas where the carcass has been, or where discharges from the carcass are present; block any drainage ways in the vicinity of the carcass; do not move the carcass; and disinfect where the carcass has been
4. *Clostridium chauvoei.*

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