SUDDEN DEATH IN CATTLE AND SHEEP

How can it be prevented?

Managing the threat of clostridial diseases and pasteurellosis

MSD
Animal Health

Contents

An Ever Present Threat to Livestock

It is an unfortunate farming reality that unexplained sudden deaths of both cattle and sheep are a costly and all-too-often occupational hazard for livestock producers.

- In 2007, an independent survey of over 500 UK dairy and beef farmers revealed that half the interviewees had experienced calves or adult cattle dying for no apparent reason. Farmer respondents valued the livestock loss at anywhere between £505 and £1243 per animal.
- According to the Veterinary Laboratories Agency (VLA), around one in eight beef or dairy animals die unexpectedly each year.
- A survey of 35 cattle vets at the 2008 BCVA Congress revealed that, on average, practitioners think 46% of their cattle clients have suffered one or more unexplained sudden deaths in their herd in the last year.

Clostridial disease – the prime suspect

A significantly under-estimated cause of sudden deaths on UK livestock farms is clostridial disease – despite there being a range of highly cost-effective vaccines available to prevent these livestock casualties.

Clostridial infections of sheep and cattle have been recognised for over 200 years. They are caused by a group of bacteria that share the same environment as livestock. These bacteria are ever-present – existing in soil, on pasture, within buildings and even in the tissues and intestines of cattle and sheep. Consequently, improved farm biosecurity measures will be of no benefit in controlling this group of diseases.

For much of the time, clostridial bacteria remain dormant and effectively harmless in the form of highly resistant spores that can survive for many years in the environment. But when certain commonly-occurring trigger factors (ranging from changes in management and feeding, through to parasitic activity or trauma) stimulate the bacteria to multiply, then toxins are released that initially cause damage at a local site in the body (eg. muscle in the case of blackleg) or the liver (eg black disease). Rapid local bacterial multiplication then results in increased toxin production that spreads around the body via the bloodstream, eventually causing major organ failure and rapid death, often within 24 hours. Quite often, the cause of these sudden deaths is put down erroneously to something else, such as staggers or other mineral deficiency, or lightning strike or poisoning.

Vet view:

"A massively underestimated cause of sudden deaths is one of the oldest bacteria of them all – clostridia. They are spread throughout the world and take the lives of cattle and sheep on a daily basis."
Charlie Lambert MRCVS, Lambert, Leonard and May, Cheshire

"We have a significant number of sudden livestock deaths and it is more than likely that clostridial disease is the cause in many of these."
David Black MRCVS, Paragon Veterinary Group, Cumbria

"Unfortunately, it's all too easy to dismiss these livestock deaths as a metabolic disorder, but often a careful post-mortem examination will identify an opportunistic clostridial organism such as *C.sordellii*, *C.chauvoei, C.novyi* or *C.perfringens* as the culprit."
Douglas Gray MRCVS, SAC Veterinary Services

Pasteurellosis

In sheep, pasteurellosis is another significant and widespread disease responsible for many unnecessary and costly livestock deaths. It is widely regarded as the most important bacterial disease of sheep in the UK.

NADIS surveillance data – which monitors over 400,000 ewes on 800 farms – suggest that around 50% of flocks, seen by monitoring vets, have reported pasteurellosis in the past year.

Pasteurella are a group of bacteria, with *Mannhaemia haemolytica* (formerly *Pasteurella haemolytica*) and *Bibersteinia trehalosi* (formerly *Pasteurella trehalosi*) being the most important types to cause disease in sheep. Seventeen different serotypes of these bacteria are known to cause pneumonia and septicaemia in sheep. Around 80-90% of healthy sheep carry the bacteria on their tonsils and in their lungs, where they usually do no harm. However, if a trigger factor such as weaning, bad weather or a change of food occurs, the bacteria can suddenly multiply rapidly to produce toxins that cause septicaemia and often death.


Clostridial Diseases in Cattle

There are a number of clostridial diseases that kill mainly calves and young cattle with little or no warning. Veterinary researchers now believe there are at least 10 major clostridial bacteria responsible for causing disease in beef and dairy herds.

Blackleg

Disease symptoms

Typically affects muscles of the leg and back, although any muscle mass including the tongue may be affected. Within 48 hours there is a high fever and if limbs are involved there is often a noticeable swelling (commonly cold to the touch) and the animal becomes stiff and unwilling to move. Death usually follows in 12-24 hours after a period of poor appetite, profound depression and coma. Cardiac blackleg involving heart muscle has been reported where death is often rapid with no obvious clinical signs.

Causative bacteria

C.chauvoei.

Disease threat

C.chauvoei is found everywhere in the soil wherever cattle are farmed. Individual farms and often individual fields can carry particularly heavy infection.

Animals affected

Mostly youngstock between six months and two years of age with most cases occurring at grass.

Risk period

All year round.

Trigger factors

Unknown, but cases often follow damage to a muscle mass through handling eg. in a cattle crush, or even muscle damage from bulling.

Malignant oedema (gas gangrene or False Blackleg)

Disease symptoms

Clinical signs appear within 48 hours of infection. Severe swelling appears at the site of infection and the skin may become darkened. High fever develops and death usually occurs within 24-36 hours.

Causative bacteria

C.septicum, C.novyi, C.chauvoei, C.sordellii – often a mixed presence.

Animals affected

All cattle.

Risk period

All year round.

Trigger factors

Acute wound infection, especially deep puncture wounds (eg. following the use of a dirty injection). Outbreaks may occur after an event that has caused bruising or wounds (eg. penning for a short period).

Black disease

Disease symptoms

Most cattle that contract black disease are found dead, but illness may last for up to 48 hours in some animals. Affected animals become depressed, feverish and reluctant to move.

Causative bacteria

C.novyi type B.

Disease threat

Widely distributed in the soil and frequently present in small numbers in the liver.

Animals affected

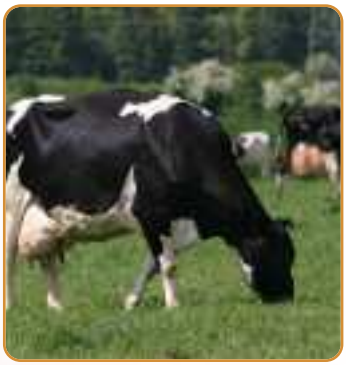
All cattle.

Risk period

Autumn and winter.

Trigger factors

Liver fluke infection at the same time. Fluke migration causes damage to the liver tissue, which causes a suitable environment for *C.novyi* type B to multiply producing powerful toxins.



Tetanus

Disease symptoms

Incubation period varies from three days to several months. After initial stiffness the animal develops a fine muscle tremor. The affected animal usually dies from respiratory failure – often following bloat – three to four days after the onset of clinical signs.

Causative bacteria

C.tetani.

Disease threat

Although not common, it is a sporadic problem and some farms are more susceptible. Commonly found in the soil and buildings and can live for up to 80 years in spore form.

Animals affected

All cattle, but mainly youngstock.

Risk period

All year round.

Trigger factors

Infection can potentially develop after spores from the environment gain access to a deep puncture wound. There is a theoretical risk of infection even after a difficult calving or following surgery, such as castration. Outbreaks occasionally occur as a result of tetanus spores multiplying in the rumen with toxin passing through the rumen wall to the bloodstream. This condition is referred to as idiopathic (unexplained) tetanus.

Botulism

Disease symptoms

Incubation period varies from a few hours to two weeks. Symptoms include restlessness, inco-ordination and difficulty swallowing. Muscle weakness and paralysis leads to a failure to be able to stand with early cases often mistaken as milk fever. Most cattle will die, although slaughter on humane grounds is often required.

Causative bacteria

C.botulinum type C and D toxins.

Disease threat

Toxins produced in foodstuff that is then eaten. Almost all the recent cases identified in the UK have been associated with access to broiler litter, in which toxin has multiplied in poultry carcase material that may have been overlooked.

Animals affected

All cattle.

Risk period

All year round.

Trigger factors

Contact with broiler litter currently appears to be the main risk factor in the UK. Big bale silage and vegetable waste are theoretical risks as is contact with infected carcase material, such as dead rats/mice/birds in feed.

'Sudden death syndrome' (*C.sordellii* infection)

Disease symptoms

Moderate to large swellings on limbs with accompanying lameness within 18-20 hours. Reluctance to move with death usually occurring within 24-48 hours. This same bacteria can be associated with a mixed infection in the condition referred to as Malignant oedema (see page 7). The VLA has recently identified sporadic cases of abomasitis in young calves in which this bacteria appears to be the primary pathogen.

Causative bacteria

C.sordellii.

Disease threat

Occurs sporadically and may be under diagnosed.

Animals affected

All ages, but particularly one to two year old cattle.

Risk period

Autumn and winter.

Trigger factors

Sudden change of diet, trauma and muscle/tissue damage. Has been associated with feeding of soil-contaminated root crops.

Bacterial redwater (*Bacilliary haemoglobinuria*)

Disease symptoms

Feeding, rumination and the passing of faeces stop. Cows in lactation may suffer a dramatic drop in milk yield and present a high fever. Other signs include anaemia (pale gums), rapid breathing and dark red urine. Death occurs rapidly.

Causative bacteria

C.haemolyticum

Disease threat

Soil borne, especially on wet swampy land likely to harbour the host snail of the liver fluke.

Animals affected

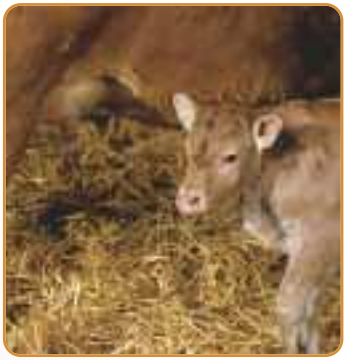
All cattle, but especially youngstock.

Risk period

Summer and autumn.

Trigger factors

Commonest is pre-existing liver fluke infection or other liver damage.



Enterotoxaemia

Disease symptoms

Sudden death although a severe, often blood-stained diarrhoea is a feature in the early stages.

Causative bacteria

C.perfringens type D (occasionally type A, rarely types B and C). *C.sordellii* has been cited as another possible cause. These bacteria are present in the gut of many young animals, only causing disease if trigger factors lead to rapid multiplication.

Animals affected

Young calves to yearlings and more likely to occur in artificially reared calves.

Risk period

All year round.

Trigger factors

Change of diet or greedy feeders. Dirty feeding equipment (eg. buckets), lack of colostrum and other pre-existing diseases of the intestine.

Control of Clostridial Diseases in Cattle

With sudden death generally being the outcome of clostridial infection, treatment of these diseases – except in the very early stages – is disappointing and rarely effective.

However, clostridial diseases in cattle are perfect targets for vaccination. The fact that the bacteria and spores are everywhere – including their presence in normal healthy animals and the speed and unpredictability with which disease develops – means vaccination is the only practical control option. Good management will help to reduce the impact of the trigger factors, but good management alone will never be enough.

Vet view:

"Treatment options for these diseases are extremely limited, highly costly and have very limited success rates. And because of the rapid onset of clostridial diseases – and tissue damage before symptoms are visible – broad-spectrum vaccination is the only control option."
David Harwood MRCVS, Veterinary Laboratories Agency (VLA), Winchester

Recent developments in vaccine technology have led to the introduction of new 10-way clostridial vaccines that deliver potent protection in an exceptionally small dose. For cattle producers this product represents a reliable risk control strategy and seems to make good commercial sense. You have to look at the low cost of regular vaccination and compare that with how many cattle may be lost over time. And saving just one replacement heifer worth £2000 would save you enough to vaccinate the replacement heifers required for a 100 cow herd for 30 years!
Charlie Lambert MRCVS, Lambert, Leonard and May, Cheshire

"By the time I left commercial practice every one of my suckler producer cattle clients were using a broad-spectrum clostridial disease vaccine. As a result, mysterious sudden deaths became a dim and distant memory for these far-sighted farmers."
Chris Lewis MRCVS, independent veterinary surgeon

Clostridial Diseases in Sheep

Sheep losses due to clostridial diseases are impossible to estimate accurately because the majority of casualties will go undiagnosed. But based on diagnosed incidents alone, clostridial diseases are consistently one of the biggest causes of fatality in UK flocks. The various clostridial infections progress rapidly and many affected sheep will be found dead or dying.

There are 12 recognised disease syndromes caused by 10 different clostridia bacteria.

Lamb Dysentery

Disease symptoms

Lambs lose appetite, lie away from their mothers and may develop a blood stained scour. Death occurs between two hours and three days from onset of symptoms.

Causative bacteria

C.perfringens type B.

Disease threat

The causal bacteria is commonly found in the lambing environment and is ingested by the sucking lamb from contaminated teats. Good hygiene practices will reduce the threat of infection.

Animals affected

Lambs from a few days old up to three weeks of age.

Risk period

January to May.

Trigger factors

Over-sucking and distended bellies will trigger the bacteria to multiply and produce toxins, and hence losses are most likely to occur in single lambs from good milking ewes.

Struck

Disease symptoms

Abdominal pain, lethargy, convulsions. Animal usually found dead.

Causative bacteria

C.perfringens type C.

Disease threat

Classically associated with Romney Marsh, Yorkshire and Suffolk, where the causal bacteria is commonly found in the environment.

Animals affected

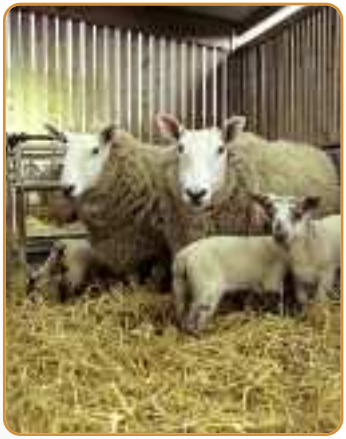
Young adults one or two years old at pasture. Recently seen in 6-8 month old finishing lambs. May be associated with fluke infestation at the same time.

Risk period

February to May. Autumn in lambs.

Trigger factors

Sudden change of diet, nearly always as a result of a switch from poor to lush grazing causing the bacteria to multiply and release toxins.



Pulpy Kidney

Disease symptoms

Ataxia (staggering), collapse, convulsions. Sudden death usually within two hours of onset. Losses can be extensive.

Causative bacteria

C.perfringens type D.

Disease threat

Commonly found in its dormant state on pasture and in the gut of sheep. All sheep are at risk. The disease is widespread and the most common clostridial disease seen in sheep.

Animals affected

Any age of sheep, but usually lambs six weeks to one year old.

Risk period

All year round.

Trigger factors

Sudden change of diet, such as turning sheep onto significantly better pasture or the introduction of high levels of concentrate feed.

Braxy (Bradshot)

Disease symptoms

Lethargy, separation form the flock, collapse, coma, sudden death.

Causative bacteria

C.septicum.

Disease threat

Commonly found in the gut of sheep and in the soil, particularly where autumn crops are sown.

Animals affected

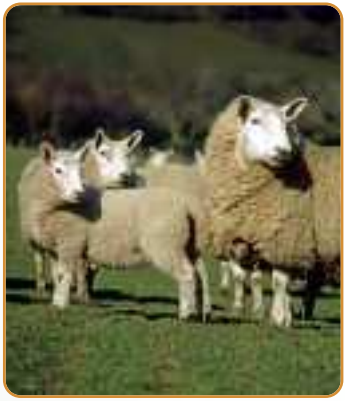
Typically young sheep in their first autumn and winter.

Risk period

September to December.

Trigger factors

Associated with eating frosted forage or roots. The frozen forage then causes inflammation of the stomach (abomasitis).



Black disease

Disease symptoms

Lethargy, failure to get up, rapid breathing, sudden 'quiet' death. Darkened areas of skin develop rapidly after death giving the disease its name.

Causative bacteria

C.novyi type B.

Disease threat

Bacteria are often present in the liver of sheep.

Animals affected

Adult sheep and older lambs.

Risk period

August to March.

Trigger factors

Commonest trigger is fluke infestation at the same time. Liver damage may be chronic and unknown in purchased sheep, but still trigger black disease.

Bacterial redwater (*Bacilliary haemoglobinuria*)

Disease symptoms

Discoloured urine, leading to staining of the fleece. Death usually occurs within 48 hours.

Causative bacteria

C.haemolyticum

Disease threat

Associated mainly with upland farms and sporadic in nature. Easily eaten by sheep and the bacteria are found in normal livers.

Animals affected

Adult sheep.

Risk period

August to March.

Trigger factors

Include fluke infestation and other parasites migrating through the liver.

Abomasitis and toxaemia

Disease symptoms

Abomasitis (inflammation of the stomach) usually occurs in lambs and toxaemia (blood poisoning) in older animals.

Causative bacteria

C.sordellii.

Disease threat

Now recognised as a widespread cause of sudden death in all ages of sheep. Often mistaken for either calcium or magnesium deficiency around the time of lambing.

Animals affected

All age groups.

Risk period

All year.

Trigger factors

Particularly associated with intensive feeding of lambs and sudden changes in the diet of older animals.

Blackleg

Disease symptoms

Symptoms vary depending on the site of infection. When damaged muscle is invaded, weakness is followed by rapid death.

Causative bacteria

C.chauvoei.

Disease threat

C.chauvoei is everywhere in the soil wherever cattle or sheep are farmed. Associated with shearing wounds and exposure to bacterial spores in soil and contaminated forage.

Animals affected

All age groups.

Risk period

All year.

Trigger factors

Unknown, but includes shearing wounds, bruised vulvas after manual lambing and undressed navels in lambs. Also occurs when any damaged tissues are invaded by bacteria, which them multiply quickly producing lethal toxins.

Gangrenous metritis and navel ill

Disease symptoms

Bloodstained vulval discharge, anorexia, failure to stand and death. Rapid death in lambs. Invasion of the uterine wall, usually after a difficult lambing, results in a foul smelling discharge just before death.

Causative bacteria

C.chauvoei.

Disease threat

Associated with poor hygiene or assisted lambings, and not treating lamb navels with iodine.

Animals affected

Ewes and lambs shortly after lambing.

Risk period

Lambing time.

Trigger factors

Poor hygiene.

Big head or malignant oedema

Disease symptoms

Initial swelling under the eyes followed by swelling of the head and upper neck, fever, lethargy, anorexia (loss of appetite) and rapid death.

Causative bacteria

C.septicum, C.novyi type A, *C.perfringens* type A, *C.chauvoei, C.sordellii*.

Animals affected

All age groups, but especially rams.

Trigger factors

Infected fight wounds and deep intramuscular injections given using contaminated needles.

Tetanus

Disease symptoms

Incubation period varies from three days to several months. After initial stiffness the animal develops a fine muscle tremor. The affected animal usually dies from respiratory failure – often following bloat – three to four days after the onset of clinical signs.

Causative bacteria

C.tetani.

Disease threat

Commonly found in the soil and buildings. Bacteria can survive for up to 80 years in spore form.

Animals affected

All age groups, but mainly sucking lambs.

Risk period

All year round.

Trigger factors

Associated with infected tailing, castration (including rubber rings) and shearing wounds. Older animals may develop infection from deep, penetrating wounds.

Botulism

Disease symptoms

Stiffness, ataxia (staggering/inco-ordination) excitability, and 'head-bobbing' followed by salivation, nasal discharge, breathing difficulties and rapid death. Affected sheep will often develop an arched back with a drooping tail, head and neck in the early stages.

Causative bacteria

C.botulinum type C and D.

Disease threat

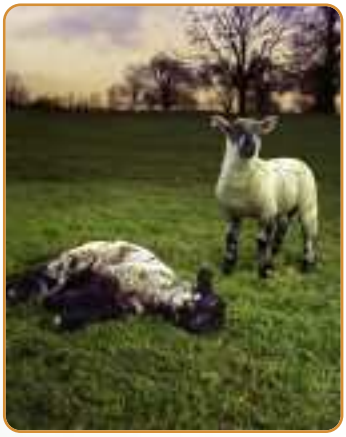
Toxins produced in a foodstuff, which is then eaten.

Animals affected

All age groups.

Trigger factors

Associated with grazing animals on pastures that have been top dressed with poultry litter, and feeding of rodent-contaminated, poorly fermented big bale silage. May also occur in drought conditions where sheep are forced to forage on bare pastures.



Control of Clostridial Diseases in Sheep

Wherever sheep are farmed it's important to consider the risk of clostridial infection and disease. Unfortunately, the rapid onset of these diseases means that intensive treatment using antibiotics is rarely effective.

However, protection can be achieved by using a broad-spectrum vaccine to provide animals with the necessary antibodies to combat all strains of clostridia.

Expert view:

"No sheep should die from a clostridial disease. Any loss is an entirely avoidable loss and in an era when highly efficacious and inexpensive, increasingly broad-spectrum vaccines are becoming available, it makes no sense at all to compromise on clostridial vaccination. Unchecked, these diseases will ravage a flock, further contaminate pastures with long-living clostridial spores and cause serious financial losses few farmers can stand."
David Kennedy, Head of Bioservices, Moredun Research Institute

"Despite many sheep farmers using clostridial vaccines there are still disease problems occurring because of unrealistic expectations and questionable vaccination procedures. We recently conducted a survey of 100 sheep producers and common errors were failing to complete recommended initial vaccination courses, vaccinating lambs too early, failing to store products in the fridge and even re-using part opened packs that have been on the farm for months. Vaccination is known to be effective against clostridial diseases but only if the products are used correctly. Data sheet recommendations must be followed to ensure the best protection possible."
Anne Gibbs MRCVS, MacArthur, Barstow and Gibbs, Worcestershire

Pasteurellosis in Sheep

Pasteurellosis in sheep occurs as two main syndromes:

1. **As a sudden onset pneumonia caused by the bacterium *Mannheimia haemolytica* (previously *Pasteurella haemolytica*), which is frequently fatal.**

2. **As a generalised disease caused by the bacterium *Bibersteinia trehalosi* (previously *Pasteurella trehalosi*), which is sudden and usually fatal in store lambs in the autumn.**

Both bacteria are found on the tonsils and in the lungs of many healthy sheep. On average, eight out of every ten sheep harbours these bacteria, rising to 95% in some flocks. As with clostridia, under normal circumstances the pasteurella bacteria do not cause disease unless a trigger factor causes them to multiply rapidly, spread round the body and release toxins.

Pasteurella pneumonia

Disease symptoms

In the early stages animals exhibit usual pneumonia signs. Closer inspection will show that other sheep have the occasional cough and light eye and nasal discharges. Number of animals infected and deaths vary, but up to 10% of the flock may be affected.

Causative bacteria

M.haemolytica.

Disease threat

Most outbreaks occur in the spring. Flock outbreaks usually start with sudden deaths, often in very young lambs, but occurrence can also be sporadic in individual sheep.

Animals affected

Both ewes and lambs.

Trigger factors

Some outbreaks are linked to previously stressful situations such as extremes of temperature, wet weather, castration or dipping. Disease challenge from other respiratory viruses and lungworm can also predispose animals to infection.

Pasteurella septicaemia

Disease symptoms

First indication is usually the sudden death of several sheep. Affected sheep are extremely dull, stay lying down, have difficulty breathing and will froth at the mouth. There is a marked fever unless near death when body temperature is likely to below normal.

Causative bacteria

B.trehalosi.

Disease threat

Typically seen in any lambs kept over the autumn/winter.

Animals affected

All ages of sheep.

Trigger factors

Moving to lowland pastures particularly or introducing better quality feed, as well as any other stress. Deaths begin to occur within a few days of being moved and death rates may be up to 20%.

Control of Pasteurellosis

Managing a flock to reduce all the trigger factors is crucial to the prevention and control of pasteurellosis. As both bacteria are often found in the upper airways of apparently healthy animals, eradicating the bacteria is not an option and biosecurity measures will be limited in preventing its spread.

If pasteurellosis does occur it can be treated with long acting antibiotics. Treatment of all lambs in a flock as soon as possible after the start of an outbreak can prevent a significant number of further cases and be economically justified, but usually still results in some stunted lambs. However, the stress of gathering and injecting lambs can sometimes make the situation worse, so seek veterinary advice beforehand.

Lambs that do recover following treatment often have chronic lung damage, which will affect their subsequent health and growth rates.

Prevention is the best disease control strategy and vaccines against pasteurellosis – containing both M. haemolytica and B. trehalosi components – have been available for many years in the UK.

Expert view:

"Prevention of pasteurellosis is best achieved by the use of specific pasteurella vaccines. But remember that making the most effective use of these vaccines depends on using them in the correct way, at the right time. Circumstances and systems of management vary from farm to farm and you should consult your veterinary surgeon about a programme."
Professor Willie Donachie, Moredun Research Institute

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Glossary

Abomasitis:
Inflammation of the abomasum (fourth stomach).

Acute disease:
Disease that appears rapidly and either causes death rapidly or can be quickly recovered from.

Anaemia:
A reduction in the number and/or size of red blood cells in the blood. Characterised by pale gums.

Anorexia:
Appetite loss.

Ataxia:
Loss of power governing movements, leading to staggering gait.

Bloat:
Condition of cattle, sheep and goats caused by a build up of gas in the rumen.

Chronic disease:
Long lasting disease which develops slowly.

Clostridial bacteria:
Anaerobic, spore-bearing bacteria of an ovoid, spindle or club shape. They include *C.chauvoei, C.haemolyticum, C.novyi, C.perfringens, C.septicum, C.sordellii* and *C.tetani.*

Clostridial disease:
Diseases caused by clostridial bacteria. Examples include bacterial redwater, black disease, blackleg, botulisim, braxy, eneterotoxaemia lamb dysentery, pulpy kidney and tetanus.

Enterotoxaemia:
An acute disease of calves and lambs caused by the toxins released by clostridial bacteria into the intestines. Often leads to severe diarrhoea and dehydration.

Idiopathic:
Unexplained / cause unknown.

Liver fluke:
Parasitic flatworms that infest the livers of cattle and sheep, causing severe illness and even death.

Malignant:
Rapidly spreading, uncontrollable condition that is resistant to treatment.

Pasteurella:
Small, ovoid, Gram-negative bacteria. They include *Mannhaemia haemolytica* (formerly *Pasteurella haemolytica*) and *Bibersteinia trehalosi* (formerly *Pasteurella trehalosi*).

Pasteurellosis:
Disease caused by pasteurella bacteria

Oedema:
Swelling caused by an accumulation of exudate (fluid) in one or more of the body cavities, or beneath the skin.

SAC:
Scottish Agricultural College.

Septicaemia:
Poisoning caused by bacteria and their toxins circulating in the blood. In most cases, septicaemia leads to death.

Toxaemia:
Toxins in the blood.

VLA:
Veterinary Labarotories Agency. This group of labarotories undertake most farm animal diagnostic work in England & Wales. The SAC perform the same function in Scotland.


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