

# Sheep diseases directory





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## Introduction

Large amounts of time and money are spent on firefighting disease outbreaks on farms. Drawing up a bespoke flock health (protection) plan with your vet is a valuable investment. Proactively planning ahead with your vet to ensure optimum flock health, preventing disease entry onto the farm and using vaccines to protect where appropriate will pay back any costs.

Co-designed with industry as part of the Government's Sustainable Farming Incentive (SFI), the Animal Health and Welfare Pathway will allow sheep farmers in England to access new funds to support valuable flock health and welfare planning with their vet. There are four steps.

### Step 1: The annual health and welfare review

From February 2023, farmers in England with more than 20 sheep and eligible for the Basic Payment Scheme will be able to apply for a fully funded annual farm visit from their own vet for up to three years. The annual payment of up to £436 includes testing for priority diseases as agreed between the vet and farmer.

### Step 2: Capital grants

From the end of 2022, farmers will be able to agree with their vet on the most appropriate investments for their farm and apply for co-funding in the form of smaller grants, where farmers can select from a list of equipment and technology items, and larger grants, for bespoke infrastructure projects such as new housing, building upgrades and pasture improvements.

### Step 3: Disease eradication control programmes

In 2023, a financial support package will be available for farmers to prevent and reduce priority diseases.

### Step 4: Payment-by-results

To reward farmers who demonstrate high health and welfare outcomes in flocks. Trials likely in 2023, with national rollout in 2025.

Further details are available on the government website at [gov.uk/government/publications/animal-health-and-welfare-pathway/animal-health-and-welfare-pathway](https://www.gov.uk/government/publications/animal-health-and-welfare-pathway/animal-health-and-welfare-pathway)



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See the latest news and information at [ahdb.org.uk/beef-lamb](https://ahdb.org.uk/beef-lamb)

And sign-up to receive updates from AHDB at [ahdb.org.uk/keeping-in-touch](https://ahdb.org.uk/keeping-in-touch)





## Flock health and management

### Flock protection plan

Bringing in diseases, such as new strains of lameness, anthelmintic resistant worms, fluke, *Haemonchus*, and sheep scab, will cost large sums of money to treat, control and manage. Spending time and investing money in a flock protection plan specific to your flock will prevent disease entry onto the farm. Sitting down with your vet to discuss your flock's needs, identify risks and priorities, and agree on a tailored plan with the latest guidance from your vet will be an important investment for the flock. An example flock health plan is in Table 2.

Table 1. Key vaccinations for sheep flocks

	Vaccination	Class of sheep	Number of doses	Importance of using this vaccination on farm
Category 1	Clostridial	All sheep on farm	2 doses + annual booster	Very important to consider in all flocks and provide justification if decided not to use
	Pasteurellosis	All sheep on farm	2 doses + annual booster	
	Toxoplasmosis	All breeding ewes	1 dose (lasts approx. 3 years)	
	Enzootic Abortion of Ewes (EAE)	All breeding ewes	1 dose (lasts approx. 3 years)	
	Footrot	All adult sheep	1 or 2 doses and booster before time of high risk	
Category 2	Orf	Ewes and lambs	1 dose for lambs or ewes at least 7 weeks before lambing	Vaccine needed only if Orf is present on farm
	Ovine Johnes disease (OJD)	Lambs to be kept for breeding	1 dose	Vaccine needed only if OJD is present on farm

Adapted from NOAH, 2022, with thanks to Fiona Lovatt.

A flock health (protection) plan is an investment and will pay back any costs.

### Vaccination

Vaccines are an essential part of the flock protection plan. Alongside good biosecurity, nutrition and breeding, they are part of the toolkit to prevent and control disease on farm. Farmers are encouraged to vaccinate their sheep flock against all category one diseases unless the vet and farmer working together identify clear justifications for not doing so. Any justification for not using a category one vaccine should be reviewed regularly.

Correct administration route, dose and storage of vaccines are vital to vaccine effectiveness. For more information, see **AHDB Vaccine use in livestock** and **NOAH Livestock Vaccination Guideline for dairy, beef, and sheep**

Table 2. Example flock health plan

Time of year (approximate)	Ewe and ram health	Lamb health
January	Take pooled faecal samples from thin untreated ewes to look for liver fluke eggs	
February	Consider blood sample to check energy status pre-lambing Consider Orf vaccination (>7 weeks pre-lambing) Clostridial vaccine booster (4 weeks pre-lambing)	
March	When worming ewes at lambing always leave some untreated Consider fluke treatment (to kill adult fluke only) before turnout	Consider lamb navel treatment, colostrum and Orf vaccination Record lambing data to monitor lamb losses
April	Check ewes closely for mastitis	Coccidiosis risk to 4–8-week-old lambs
May	Fly risk increases when warm and humid, even if sheep are clipped	Check Nematodirus forecast and treat 6–12-week-old lambs strategically Clostridial vaccine first dose (3 months old or earlier to cover for Pasteurella)
June		Clostridial vaccine second dose 4–6 weeks after first dose
July	At weaning, body condition score ewes Be aware of <i>Haemonchus</i> worm. Check flock throughout summer for egg counts and anaemia	Follow SCOPS guidelines, take faecal samples and monitor growth rates throughout summer and treat roundworms as necessary
August	Give tups a full examination, fertility test and consider Supplementation Abortion vaccination more than 4 weeks pre-tupping Consider quarantine treatments for all bought-in sheep	Sample the grazing platform to check the mineral status
September	Body condition score ewes and change nutrition if needed Follow SCOPS guidelines for worming	Lamb blood samples for liver fluke exposure Pasteurella vaccination booster to cover the Autumn risk period
October	Consider fluke treatment (to kill immature fluke) Minimise stress for 6 weeks post-tupping during implantation of embryos	Consider fluke treatment (to kill immature fluke) with care of product withdrawal periods
November	Consider ectoparasite control (especially scab) throughout winter. Blood sample 12 sheep to show need to treat	Follow SCOPS guidelines, take faecal samples and monitor growth rates and treat roundworms as necessary
December	Consider fluke treatment (to kill immature fluke)	
Throughout the year	Use Five Point Plan for lameness. Consider foot rot vaccination and act quickly to diagnose and treat individual lame sheep Record all losses and disease Treat all dogs with Praziquantel for tapeworm every 6 weeks	Act quickly to diagnose and treat individual lame sheep Record all losses and disease

Note: This summary of a flock health plan gives suggested health considerations. All farmers are encouraged to work to their individual flock health plan, which has been developed in consultation with the farm's private veterinary surgeon.

## Buying new sheep

When purchasing new sheep, compare the health status of your flock with those for sale. If you are Maedi Visna (MV) accredited or Enzootic abortion (EAE)-free, check the status closely. Ensure that you ask some questions regarding the health status.

For private sales, look at the rest of the flock, not just those for sale, and ask questions about their health status performance. See the box below for questions to ask when buying sheep. Through markets, it is more difficult to check the health status of the flock but try to talk to the vendor and ask the same questions. If the vendors are aware of the potential diseases and are monitoring for some of the iceberg diseases (Border disease, CLA, MV, OPA and Johnes) (see pages 31–34 for more information), this shows some awareness and should not dissuade you from buying. Many vendors are either unaware of the diseases or not monitoring for them.

Some sheep are sold with health warranties, such as treatment for scab, but you will not know if the vendor administered the treatments correctly. Ensure you discuss the risks with your vet and treat appropriately.

### Questions to ask when buying sheep

- What vaccinations have these sheep received?
- Does this flock monitor cull ewes for Johnes disease, MV, OPA, CLA or Border disease?
- Is Contagious ovine digital dermatitis (CODD) diagnosed on this farm?
- Do you know which anthelmintics (wormers) work on your farm?
- Have you recently tested or treated for skin parasites such as scab?

### Five steps for preventing disease when buying sheep

1. Ask the seller some questions about health status.
2. If buying a ram, get into the pen and check his reproductive organs – ensure he has two testicles of even size, not too soft and with no lumps or bumps.
3. Where possible, move sheep using your own transport, and ensure your vehicle is properly cleaned and disinfected. Avoid sharing transport and mixing stock from different sources.
4. Keeping replacement ewes separate from the rest of the flock until after lambing will offer the greatest protection in preventing abortion from being introduced, along with other diseases. Where this is not possible, keep bought-in stock separate from the existing flock for at least three weeks.
5. Quarantine bought-in and incoming sheep by isolating for at least three weeks and carrying out a treatment plan that is specific to your flock.

Keep bought-in stock separate from the existing flock for at least three weeks.

### Quarantine of incoming sheep

Being over-cautious is not a bad thing to protect your own flock's health status. Ideally, purchase all replacements from an individual flock and transport them directly from the origin to the new premises. This prevents diseases from being picked up. Discuss a flock protection plan with your vet or advisor that is specific to your flock. Be prepared to adapt it based on disease risks and buying-in policy. Example treatments for incoming sheep include:

- Treat for internal parasites as soon as possible with two different wormers, including a 4-AD or 5-SI wormer. Current SCOPS advice is to yard or house





sheep – do not put them directly onto pasture or in contact with other sheep. Quarantine treatment to prevent the incursion of drug-resistant liver fluke is discussed in the liver fluke section on page 23

- Treat to prevent sheep scab – discuss with your vet/advisor
- Footbath sheep on arrival and again during the quarantine period. Inspect feet and inspect and treat any lame ewes with an injectable antibiotic. Do not mix with other sheep until they are sound and the infection is visually cleared
- After 24–48 hours of arrival, turn out onto pasture that has carried sheep in the current season and keep isolated from the resident flock for at least three weeks

See [scops.org.uk](http://scops.org.uk) for more information and up-to-date guidance.

### *Be aware of the risks of buying sheep*

- Sheep scab\*
- Resistant worms\*
- Different strains of footrot\*
- Fluke#
- Lice#
- CODD#
- Flock-level production-limiting (iceberg) diseases#

\* Any purchased sheep must be considered at risk

# Sheep may be at risk, based on risk assessment

## Biosecurity – plan, prevent and protect

Biosecurity is the first line of defence against all diseases. If you can stop the disease from getting into your flock in the first place, you will not need to spend time, effort or money treating and controlling the disease. Important biosecurity measures include (but are not limited to):

- Not sharing staff, equipment, and vehicles between farms. If this cannot be avoided, thoroughly clean and disinfect with a Defra-approved disinfectant between farms
- Minimising your sheep having contact with those on neighbouring farms by maintaining fences. Double fencing can be particularly valuable where there is a risk of respiratory diseases and sheep scab
- Keeping a closed flock by breeding your own replacements, or only buying stock from trusted or accredited sources
- Disposing of fallen stock promptly and properly – for more information, see [gov.uk/guidance/fallen-stock](http://gov.uk/guidance/fallen-stock)

- Storing feed securely and in a dry place to prevent spoilage and vermin
- Having a flock health plan, including vaccination and parasite control plans

Is your disinfectant providing the protection you need on your farm? A list of approved disinfectants is available at [disinfectants.defra.gov.uk/DisinfectantsExternal](http://disinfectants.defra.gov.uk/DisinfectantsExternal)



Plan ahead, prevent disease and protect your flock.

Further useful information on biosecurity can be found at [gov.uk/guidance/disease-prevention-for-livestock-farmers](http://gov.uk/guidance/disease-prevention-for-livestock-farmers)



# Pre-lambing

## Ewe management

Ewe body condition and appropriate nutrition are essential to sheep production. Further information is available at [ahdb.org.uk](http://ahdb.org.uk) in the **Managing ewes manual**.

Incorporating grass and forage analysis into your flock health plan is a useful tool to prevent disease from nutritional deficiencies and ensure lambs receive the best start in life through good quality colostrum. The flock's energy, protein and mineral demands, particularly during pregnancy, can be adjusted as needed by matching supply with demand allowing you and your vet/advisor to calculate any required supplementary feed. See the **AHDB Feed and Forage calculator** to calculate feed demand and available feed supply.

## Metabolic disease

Metabolic diseases involve abnormal changes in the body due to deficiencies in minerals and energy. These mainly occur around lambing time and during lactation when the metabolic demands upon the ewe are at their greatest, and imbalances lead to subclinical and clinical disease.

Low levels of calcium or magnesium (along with other mineral interactions) cause metabolic disease. Changes in the energy balance, where the demand exceeds the supply, lead to a breakdown of body reserves and an increase in circulating ketones, causing pregnancy toxemia (twin lamb disease).

## Hypocalcaemia

Calcium deficiency occurs in late pregnancy/early lactation when large demands are made upon body reserves, and the skeletal system cannot release calcium to match these demands. The skeletal system needs to be stimulated to be able to release calcium in late pregnancy. This may not occur in ewes that are older, too fat, on lush calcium-rich pasture, or a high calcium diet. Sudden change in diet, adverse weather or stress from excessive handling/transport close to lambing can also predispose to hypocalcaemia.

### Early signs of hypocalcaemia

- Ewes may go down and be unsteady on their feet
- Ewes may stop eating
- Ewes may show nervous signs
- Bloat is common, with constipated faeces and low temperature
- In later stages, rumen contents and froth may appear from the nose
- A clinical examination by a vet and blood samples will show low levels of calcium

### Preventing and treating hypocalcaemia

Avoid any sources of unnecessary or excessive stress close to lambing. The pre-lambing diet, including forage, may need to be analysed alongside other management factors. High levels of magnesium should be avoided in the diet, and calcium at approximately 0.9% in the concentrate feed should be fed. Discuss with your vet to decide on the optimum treatment plan.

Treatment of affected ewes will require an intravenous injection of calcium borogluconate plus injections under the skin until the ewe has recovered.



## Hypomagnesaemia (grass staggers)

Ruminants require a daily supply of magnesium as it is not stored in the body. This demand increases during lactation, and low blood magnesium occurs when supply does not match demand.

Pastures (and some silages) may be low in magnesium levels – particularly rapidly growing spring grass. These forages may also be high in potassium levels which will further reduce the availability of magnesium and lead to the onset of clinical signs.

### Early signs of hypomagnesaemia

Ewes may be found away from the flock with a high head carriage and high stepping gait. They may also be found dead or down and twitching or trembling uncontrollably. Samples taken by your vet from the blood (of a live ewe) or the eye (of a dead one) will show low levels of magnesium.

### Preventing and treating hypomagnesaemia

Seek advice from your vet before treatment, as rapid administration of magnesium is required to prevent death. Assess the diet and ensure that roughage/buffer feed is available during rapid grass growth to slow down rumen transit time. Avoid stressful handling and provide rock salts or magnesium supplements during any occurrences of hypomagnesaemia.

## Pregnancy toxaemia (twin lamb disease)

Twin lamb disease can result from a mismatch in the energy supply and demands of a ewe during late pregnancy. If the ewe is unable to gain sufficient energy during the last few weeks of pregnancy, she will start to metabolise her body reserves to match the demand from the rapidly growing foetus and developing udder. The result of this process is an increase in circulating levels of blood ketone bodies and low levels of blood glucose.

### Early signs of twin lamb disease

Ewes will separate off from the flock and may be noticed at feeding or moving, where they will appear blind. They will stop eating and progress to becoming down and unable to get up. Ewes at high risk for twin lamb disease include thin and fat ewes and other ewes who fail to feed properly during the last few weeks of pregnancy – including lame ewes, ewes with sheep scab or another disease, and shy feeders. Risk can also be increased when there has been a sudden change in diet with poor transition onto the new diet.

### Preventing and treating twin lamb disease

Blood samples from affected ewes will show high levels of ketone bodies. Your vet can check these levels as part of a metabolic profile for pre-lambing ewes. This will help prevent disease and assess the adequacy of the pre-lambing diet.

Affected ewes need to be encouraged to eat good quality forage. A drench containing propylene glycol will help restore glucose levels, and your vet may suggest

an intravenous glucose injection. This is a disease where prevention is much better than cure because treatment often has a poor success rate, and it may be necessary to induce lambing by using corticosteroids. Discuss this with your vet before lambing.

## The down ewe

Ewes that are recumbent (lying down for long periods) need regular attention and moving to maintain circulation in the leg muscles and prevent skin damage from urine scalding. In some cases, the reason the ewe went down has been corrected, but she then fails to recover due to muscle and nerve damage in her legs due to compression.



### Looking after the down ewe

Careful nursing is the main factor which determines whether a down ewe stands again. They need to be regularly turned from side to side, have their legs gently moved and be carefully lifted to encourage weight bearing that will aid her recovery. Ensuring there is fresh water and forage within reach whilst she is down will encourage a return to health.

## Abortion

It has been estimated that every abortion costs the flock at least £85. Following an abortion within the flock, it is important to follow a strict protocol until you have determined the cause. Most cases of abortion in sheep are caused by infectious agents, including Chlamydia, Toxoplasma, Campylobacter and Border disease virus. Listeria, Salmonella, *E. coli*, Bluetongue virus, and Schmallenberg virus also cause abortion and stillbirths in sheep.

The aim is to limit any potential spread of infection as contaminations may cause an outbreak leading to more abortions within the same period or even the following year.

Every one abortion costs your flock over £85.



Table 3. Major causes of sheep abortion in the UK

	Source of infection	Clinical signs	Prevention and control
Enzootic Abortion of Ewes (EAE)	A ewe shedding at the previous lambing time	Aborted foetuses in the last 2 weeks of pregnancy Intercotyledonary thickening and brownish discharge	Vaccination 4 weeks before tupping. Isolate aborting ewe and strict hygiene is very important. Difficult to control unless vaccination was initiated before it is introduced to the flock Difficult to control – causes approx. 50% of abortions
Toxoplasmosis	Cat faeces from a young or immunocompromised cat	Reabsorption of foetuses Mummified and aborted foetuses Weak lambs born White dots on cotyledons	Vaccination 3 weeks before tupping Causes 25% of abortions
Campylobacteriosis	Carrier sheep in the flock, transmission/ movement of bacteria by birds or vermin	Abortion in the last 6 weeks of pregnancy Weak lambs May get grey areas of necrosis on foetal livers	Isolate aborting ewe and strict hygiene is very important. An unauthorised vaccine may be imported under a special licence
Salmonellosis	Carrier sheep in the flock and transmission by wild birds	Varied signs Often metritis and scour in ewes Aborted foetuses Weak lambs	Isolate aborting ewe and strict hygiene is very important
Border disease virus (BDV)	Persistently infected lamb (or possibly calf as ~20% BDV cases are cattle BDV)	Reabsorption of foetuses Mummified and aborted foetuses or stillbirths Hairy shaker lambs	Once BDV is in a flock, control is only possible if ewes come into contact with the disease when they are not pregnant. It may be possible to identify PI lambs by blood test but the cost of this may be prohibitive Cattle BVD vaccines have not been shown to be effective in sheep



## Steps to take after any abortion

- If you have more than two abortions over two days, contact your vet immediately before disposing of any abortion material
- Your vet will likely recommend samples of the lambs and placentas are sent to a laboratory for testing
- Dispose of dead lambs, placentas and heavily contaminated material (such as bedding) as promptly and effectively as possible – preferably through incineration, as they are a danger to other sheep and humans
- Isolate the aborted ewes until the discharge has cleared up, but ideally for six weeks
- Clean and disinfect lambing pens
- Do not use antibiotics unless specifically advised by a vet in the face of an outbreak

## Chlamydial abortion (Enzootic abortion of ewes – EAE)

Infectious abortion is a major flock health problem. Chlamydial abortion, accounting for about half of all infectious abortions, is caused by highly specialised bacteria called *Chlamydia abortus*, which can lead to the birth of large numbers of weak or dead lambs.

Chlamydial abortion is a zoonotic infection (it can be transmitted to humans). Infection can cause severe illness in pregnant women and can result in miscarriage. Therefore, pregnant women should avoid all direct or indirect contact with lambing ewes.

### Early signs

The first sign is usually stillborn or weak lambs one or two weeks before the expected due date. Infected ewes can have one dead lamb and one live (weak or healthy) lamb. Aborted lambs may look normal but can sometimes look pot-bellied.

The placenta typically appears thickened and dark red and often has a dirty yellow material sticking to the membranes between the cotyledons (buttons).

Ewes generally seem healthy but may have a discharge.

### How is infection spread?

Vaginal discharge, dead lambs and placentas from infected ewes are heavily contaminated with the bacteria, which can spread infection to other ewes in the flock and to newborn female lambs. Infected ewes carry the infection without showing any clinical signs and then abort in their next pregnancy.

Some ewes that abort due to chlamydial abortion retain the organism in their bodies and excrete it during the lambing period the following year. The level of abortion can therefore build up in a flock over a period of years after initial infection. However, most ewes that have aborted due to chlamydial abortion will not usually abort from this same cause again and will build immunity to the bacteria.

Ewes that have been exposed to the bacteria or ewe lambs born to affected dams at one lambing are likely to abort the following year. This long delay from infection to abortion and the lack of clinical signs in carrier animals are why this abortion is difficult to control. The bacteria start to damage the placenta from around 90 days of pregnancy, regardless of when the infection was picked up, and abortion nearly always occurs within two weeks of the expected lambing date.

### Preventing infection

Management practices must be adopted in flocks free from infection to prevent exposure. It may be possible to purchase replacement sheep from EAE-accredited flocks. Always ensure that replacement ewes are kept as a separate group until after their first lambing.

There are effective enzootic abortion vaccines available. For protection with most EAE vaccines, vaccination must take place four weeks before the tupping period.

All flocks that have sheep neighbours or that buy in replacement ewes will benefit from vaccinating replacement ewes as they enter the flock. Often, it is only necessary to vaccinate a ewe once in her lifetime. If ewes are latently infected at the time of vaccination, they may still go on to abort, although the risk of this is reduced by vaccination. For flocks that breed their own replacements, you should identify and cull ewes that abort due to chlamydial infection as they may continue to shed *Chlamydia* every lambing. Ewe lambs should not be fostered onto ewes that have aborted as they will abort themselves at their first lambing.



## Toxoplasmosis

Toxoplasmosis is caused by infection with the parasite *Toxoplasma gondii*. It is present worldwide and can affect a range of warm-blooded animals, including sheep and humans. It is the second-most diagnosed cause of infectious abortion in ewes, accounting for about a quarter of cases.

Toxoplasma can cause serious disease in pregnant women and immunocompromised people. Accidental exposure of the vaccine to humans can also cause infection.

### Early signs

If ewes become infected with toxoplasmosis in early pregnancy, foetal reabsorption occurs, and ewes can appear barren. Infection between days 50 and 120 of pregnancy results in the premature birth of stillborn or weak lambs or mummified foetuses. Sheep infected with toxoplasma parasites, when not pregnant, develop strong natural immunity and are unlikely to abort due to toxoplasmosis in the future.

To diagnose toxoplasmosis, submit dead lambs with their placenta to a veterinary laboratory. An infected placenta has a 'frosted strawberry' appearance, with white spots on the cotyledons of the placenta. Tests can confirm the infectious agent so that the correct action can be taken.

### How is the infection spread?

Young or immunocompromised cats become infected by eating the parasite within cysts in the muscles of their prey – usually small rodents. The *Toxoplasma* parasite then multiplies in the intestine lining of the cat's gut to produce millions of oocysts (eggs) that pass

out in the faeces for a short time and can contaminate food stores, pasture and water supplies. The oocysts can survive in the environment for up to 17 months if conditions are favourable (moist and warm).

### Preventing infection

You cannot protect your flock from toxoplasmosis by keeping a closed flock, as sheep become infected from eating oocysts in the environment. Vaccination is the most effective method of preventing *T. gondii* infection and produces long-lasting protection through a single injection. Vaccination must be conducted at least three weeks before tupping, and never vaccinate pregnant ewes. It is a live vaccine, so handle it with care.

## Campylobacter

Abortion due to the bacteria *Campylobacter fetus* and *Campylobacter jejuni* are significant within UK flocks. Infection in naive flocks can result in high levels of abortion (up to 30%). This can cause significant production losses in affected flocks.

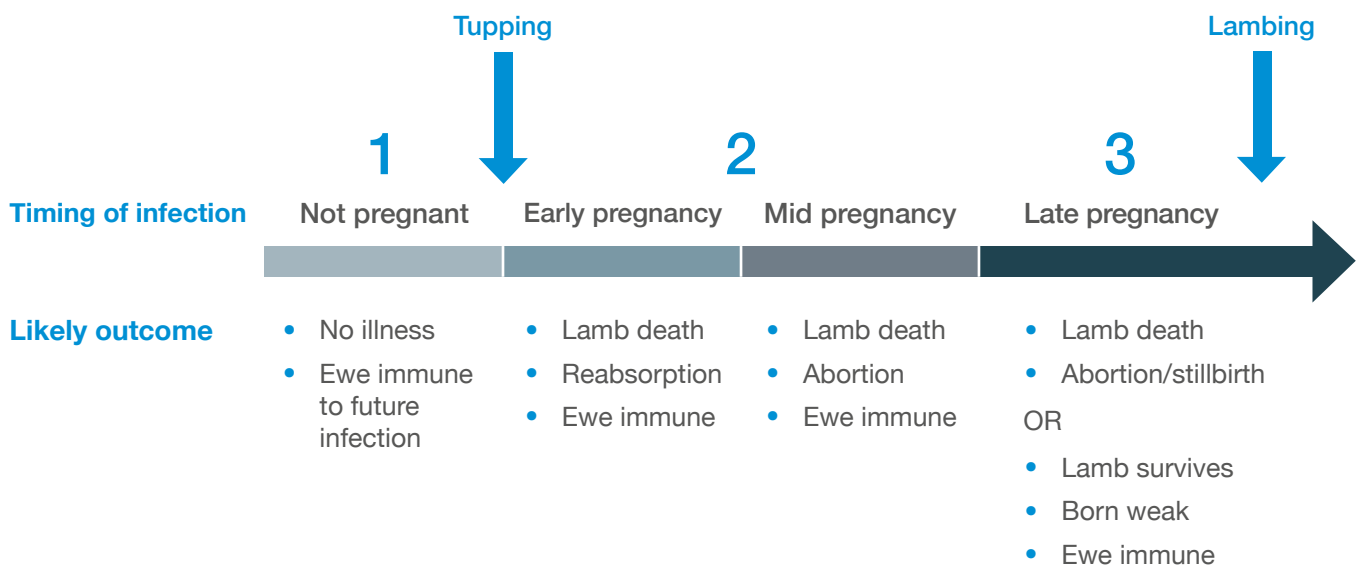
### Early signs

Abortions typically occur within one to three weeks after infection, usually in the last few weeks of pregnancy and lead to aborted lambs or the birth of full-term, weak lambs. Ewes lambing later can pick up an infection from early abortions and go on to abort as they approach their lambing period.

### How is the infection spread?

The bacteria usually enter the flock via carrier sheep and spread in faeces and vaginal secretions. Wildlife (especially carrion) can also act as carriers onto a farm. The infection is then maintained in ewes which develop carrier status.

### Timing of toxoplasma infection







### Preventing infection

Control during an outbreak is difficult due to the speed of spread through the flock. Antibiotics offer limited benefits in reducing abortions. *Campylobacter* abortion will spread rapidly to ewes kept in intensive conditions, i.e. housed or on root crops in late pregnancy.

It is important that sheep are managed in clean environments, particularly in late gestation. Ensure that feeding troughs and areas are hygienic.

Once ewes have aborted, they will develop a good immunity that protects them from further infection. Abortion from this disease tends to cycle through flocks every three to four years as ewes are replaced and flock immunity wanes.

Purchased replacement sheep should be managed and kept separately until after their first lambing to prevent the entry of *campylobacter* into the main flock. There is no vaccine authorised in the UK though some vets will import a vaccine from Australia under a special import license.

### Schmallenberg Virus

Schmallenberg virus is spread by midges and can affect all ruminant species, including sheep. It is found periodically in England, and outbreaks may be associated with warmer weather, which increases midge survival. The infection produces virtually no clinical signs in adult sheep, but if ewes are infected while pregnant, it can cause abortions and severe malformations of lambs.

There is currently no vaccine available. Options to reduce infection include:

- Postponing tugging until midge activity has reduced
- Using products to repel or control midges and other biting insects in early pregnancy
- Carrying out blood tests to determine previous exposure (and therefore likely susceptibility) of your flock

Further information is available at [sheepvetsoc.org.uk/knowledge-hub/possible-actions-to-reduce-the-impact-of-schmallenberg-virus-in-sheep-flocks](https://sheepvetsoc.org.uk/knowledge-hub/possible-actions-to-reduce-the-impact-of-schmallenberg-virus-in-sheep-flocks)

### Bluetongue virus

Bluetongue is a notifiable disease. For more information about notifiable diseases and how to report suspicion of them, see page 38.

Bluetongue is a virus spread by midges. It is not currently circulating in England, but outbreaks become more likely with warmer weather, which increases midge survival. It can also be spread via contaminated needles, so hygiene is paramount when vaccinating or injecting susceptible animals. You can vaccinate against certain strains of bluetongue.

#### Signs of bluetongue in sheep

- Ulcers in the mouth
- Mucus discharge from the mouth and nose
- Swelling of the mouth, head, neck and coronary band
- Abortion, stillbirth and mummification of foetuses





## At lambing

### Maximising lamb survival

Lamb losses around lambing time account for approximately 50% of all lamb losses, with abortion accounting for a further 30% of total lamb losses. A study funded by AHDB, HCC and QMS carried out in 2019–2020 involving 130 farms showed the average lamb mortality in the first 21 days of life to be 8.2% (6% in the top quartile). The vast majority of lamb deaths, over 98%, occurred within the first seven days. Some losses are unavoidable in any flock, but high levels can be avoided if preventative planning, sound husbandry, health measures and skilled shepherding are practised.

Reasons for lamb losses:

- Abortion
- Infectious disease
- Hypothermia, mismothering and starvation
- Predators
- Difficult lambing
- Genetic defects

Early lamb losses tend to occur in the first 72 hours of birth. They may be classed as lamb losses before or after turnout for indoor lambing flocks. Early signs may be in the form of abortions occurring around two weeks before the start of lambing to excessive lamb losses at any stage of the lambing period.

There are a variety of causes that can lead to abortion (see pages 10–13). During pregnancy, optimum placenta growth is crucial to lamb survival and development. Hormones, pre-lambing nutrition, body condition score and ewe disease status affect colostrum and mothering ability of the ewe. Correct energy and protein balance

#### *Plan*

##### **Quality colostrum = lambing success**

- ✓ Analyse forage and arrange quality diet
- ✓ Sort care of newborn
- ✓ Maximise colostrum quality
- ✓ Minimise stress
- ✓ Keep good records

#### *Prevent*

##### **Hygiene appropriate = lamb survival**

- ✓ Sufficient shelter outside
- ✓ Clean, dry, draught-free bedding
- ✓ Good hygiene
- ✓ Clean and disinfect equipment

#### *Protect*

##### **Fit and well-fed ewes = quality colostrum**

- ✓ Correct body condition
- ✓ Quality balanced diet
- ✓ Fully vaccinated
- ✓ Sound in foot
- ✓ Dagged and clean



from good quality forage/grass and supplementary feed are vital to ensure good lamb birth weight, colostrum quality and volume and plentiful milk supply. Mortality from infectious diseases occurs when these factors have not been achieved.

## Infectious diseases

### Watery mouth

Affected lambs typically stop feeding, show signs of abdominal pain and are wet around the mouth. Lambs pick up *E. coli* infection via the mouth from the environment, dirty fleece/udder and soiled bedding and it rapidly multiplies in the neonatal abomasum. Inadequate colostrum intake and poor hygiene is usually the underlying cause. *E. coli* can also cause diarrhoea in newborn lambs, with severely virulent strains causing high numbers of deaths. A timely supply of sufficient quantities of good quality colostrum will prevent issues with watery mouth.

### Lamb dysentery

Lamb dysentery is caused by a clostridial toxin produced by clostridia bacteria, which are found in the environment. Severe intestinal gut damage and subsequent poisoning of the bloodstream cause severe and sudden signs of disease in newborn lambs, including sudden death, severe watery bloody diarrhoea, and severe abdominal pain. Appropriate vaccination of the ewe and sufficient quality colostrum for the lamb will prevent lamb dysentery.

### Joint ill

Joint ill is caused by an infection that usually enters the body through the navel in very young lambs or through tagging, docking or castration wounds in slightly older lambs. Affected lambs are usually dull, with one or more swollen, painful joints. Infection can also occur in the spine, resulting in paralysis of either the hindlimbs only or all the limbs. Lameness usually appears a few days after infection, at around 5–10 days old.

## Colostrum

Ensure all lambs receive adequate colostrum (at least 50 ml per kg body weight), i.e. a 4 kg lamb needs 200 ml immediately after birth. They then need 210 ml/kg in total in the first 24 hours (~850 ml for a 4 kg lamb). Lambs also need their navels treated with strong 10% iodine as soon as possible after birth and again within six hours.

Colostrum quality can be assessed easily with a handheld Brix refractometer. Many farmers and shepherds now use these to quickly check colostrum quality if they suspect a ewe is producing poor quality colostrum or before they harvest colostrum from a ewe. A reading of 26.5% or above indicates good quality colostrum. Lambs may be supplemented with good-quality colostrum from another ewe or pooled cattle colostrum. Colostrum replacer powder should be used as a last resort. Seek advice from your vet to investigate the causes of poor-quality colostrum.

## Mismothering and starvation

Lambs born inside and outside can be mismothered, which leads to a delay in colostrum intake or no colostrum intake in the crucial first few hours. These lambs may then become hypothermic or succumb to disease and starvation. Lambs will be found abandoned or hunched up, looking cold and hungry or dead.

If you are facing too many lamb deaths, speak to your vet immediately for advice on the cause of the losses and to develop a plan. Quick intervention early in the course of disease is crucial to reduce further losses and the impact of the disease.

An effective treatment plan can be started once the likely cause of illness or mortality has been established. This may involve rehydration, antibiotic therapy and reassessment of hygiene, colostrum management and husbandry procedures.

## Hypothermia

Hypothermia occurs when the lambs' body temperature falls below 39°C. Lambs are born with a supply of energy in the form of brown fat and circulating glucose, which lasts for up to five hours, but if the lamb does not feed in this time, it will run out of energy and become hypothermic. Chilling due to wind and rain also causes hypothermia, especially in lambs that have not been fed adequately. The speed at which colostrum is consumed and the amount is vital. In lambs that are severely hypothermic (body temperature less than 37°C), treatment should follow the lamb survival plan.

### Lamb survival plan

When a very cold lamb is picked up, the course of action depends on its temperature and the time since birth.

- 39–40°C Normal healthy lamb
- 37–39°C Moderately hypothermic but still follows dam and sucks
- <37°C Severely hypothermic – flat, unable to lift head, comatose

If less than 5 hours old – dry with a towel, warm to >37°C, then give colostrum (50 ml/kg), then warm to 39°C and return to dam.

If over 5 hours old – treat the hypoglycaemia first by passing a stomach tube and delivering colostrum. If not conscious enough to pass stomach tube, give 10 ml/kg 20% glucose solution through a syringe and needle into the abdomen. Hold the lamb by its front legs and inject the needle one inch to the side and one inch below the navel directed towards tail. Then dry and warm the lamb.



## Growing lambs

### Mastitis

Mastitis is an inflammation of the mammary gland, usually caused by bacterial infection. It frequently results in the loss of the affected half of the udder and, consequently, the culling and replacement of the ewe. There are two forms of mastitis: acute and chronic. Acute mastitis is a very painful disease.



The swollen and painful udder of a ewe with mastitis

It is thought that infection occurs through the teat canal or teat sores, allowing bacteria to infect the udder. It is caused by a range of bacteria, including *Staphylococcus aureus*, which lives on the skin of the ewe and *Mannheimia haemolytica*, which is plentiful in the throat of healthy lambs and *E.Coli*, a ubiquitous environmental pathogen. The shape of the udder and teats have a big effect on the chances of mastitis occurring. It is useful to take samples from the affected quarter into a sterile container before any treatments. These samples can be put in the freezer to be later sent to the lab for identification of the causative bacteria to inform the development of future control and preventative measures.

### Acute (sudden) mastitis

Acute mastitis is usually seen in the first weeks after lambing and can rapidly progress to cause the death of the ewe. The ewe may stop the lambs suckling, and her udder may become hot, red, swollen and extremely painful. Infected ewes have no milk in the affected udder but instead a watery liquid that may contain pus or blood. If the ewe survives, the udder often becomes cold and clammy, and the dead tissue falls away.

Mastitis can result in:

- The loss of udder function
- Reduced milk yield and quality
- Death
- Reduced lamb growth due to the reduced milk yield and quality
- The culling of affected ewes



## Signs of acute (sudden) mastitis

- Hungry lambs
- High temperature
- Loss of appetite
- Hindlimb 'lameness' or altered gait caused by the painful udder
- Hot, hard, swollen udder
- Behavioural changes such as reduced activity or increased vocalisation due to pain

## Chronic (ongoing) mastitis

Chronic mastitis can occur during lactation or at weaning. A ewe may not appear ill, and changes to the udder can be barely detectable, but milk yield reduces. It is more easily detected at the pre-tupping check when the udder is not full of milk, and the affected area may appear enlarged, hard or lumpy.

### Prevention

Hygiene in the lambing sheds and pens will reduce the risk of mastitis caused by environmental organisms such as *E. Coli*. Take care to wear gloves, wash hands regularly (and always before handling udders), change bedding frequently and keep conditions clean and dry. For outside lambers, it is important to consider good shelter for the ewes and avoid dirty lying areas as bacteria may spread between ewes. Consider vaccinating against Orf to avoid teat lesions and ensure

good fly control. Select replacement ewes with neat udders and teats placed at the 'twenty to four' position.

### How to reduce udder damage

- Ensure ewes are at optimum body condition score at lambing time
- Check the type and amount of protein in the diet at late pregnancy and the energy/protein balance.
- Ensure ewes are well fed in early lactation to improve milk yield – hungry lambs damage teats
- Do not expect a ewe to rear triplets
- Check your weaning policy – put ewes on a reduced diet away from the sight and sound of lambs but always provide water

### Treatment

Antibiotics and fluid therapy can help save an infected ewe's life but do not help save the affected half of the udder. Non-steroidal anti-inflammatory drugs given at the same time as antibiotics will help reduce the pain and swelling to improve the welfare of the ewe significantly.

There is a vaccine specifically available to use for protection against mastitis caused by the *Staphylococcus aureus* bacteria.

Once ewes with mastitis are identified, ensure their numbers are recorded so they can be culled before the following tupping.

Mastitis in lowland flocks is one of the main reasons for culling.



Hygiene is an important part of reducing the spread of bacteria that cause mastitis. If you are handling udders with mastitis, take care to wear gloves or wash hands regularly, especially before handling other ewes

## Orf

Orf is a highly contagious viral skin condition mainly affecting young animals in their first year of life. It can spread to the udder during suckling and predispose affected ewes to mastitis.

Other skin conditions can be confused with Orf, and Orf can increase the risk of secondary infections. The more serious outbreaks are generally associated with intensive sheep husbandry, where there is a build-up of infection in the buildings.

Orf is a painful and debilitating condition that prevents affected lambs from feeding/suckling properly and will significantly affect growth and survival rates in some cases.

Orf is zoonotic and can also infect humans, leading to localised swollen, red areas, which can be painful and, on occasion, provoke severe systemic reactions. Therefore gloves should be worn, or hands immediately washed after handling affected sheep.

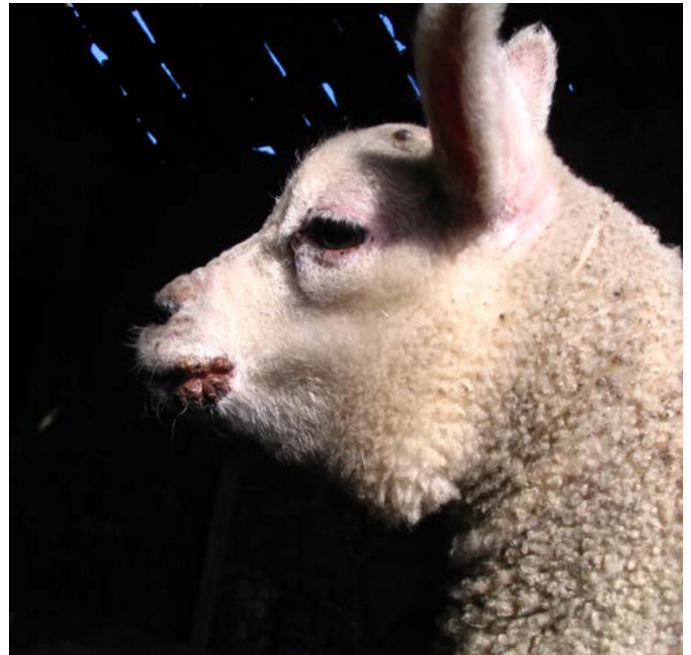
### Early signs

An infection will only establish where the skin or gums have already been damaged. Thus, rough food or pasture full of thistles may make sheep more prone to infection.

The typical symptom of Orf is scabby lesions around the mouth and nostrils of lambs. The lesions start like blisters and progress to bleeding, scabbed over areas of damaged skin. Secondary bacterial infection is very common and increases the recovery time from the Orf virus. The lesions are typically found around the lip margins but can also be present on the gums and around the eyes and ears.



Orf infection on a ewes udder, which can then lead to mastitis. Ensure gloves are worn when handling affected sheep as Orf is zoonotic and can infect humans



Orf infection affecting a lamb, which can prevent the lamb from suckling properly and so affect survival and growth

Orf can also affect other parts of the body, particularly the teats of ewes and the lower legs of lambs. Ewes with infected udders may refuse to let lambs suckle and have an increased risk of developing mastitis. Infection normally runs a course of four to six weeks and is associated with poor growth during that period.

### Prevention and treatment

There is no practical method of killing the virus once it has infected the animal. The immune system will work to reduce the clinical signs whilst extra care to ensure the skin can heal and the animal can feed will improve the recovery time. The use of topical antibiotic spray and injection in severe cases will minimise the risk of affected animals developing secondary bacterial infections. Attention to feeding may prevent weight loss in lambs having difficulty sucking, and pain relief should be provided to severely affected lambs.

The virus can survive outside through winter and indoors where scabs have been deposited and the area contaminated. They can survive for years in areas that are under cover or otherwise kept dry. Cleaning and disinfecting buildings, especially wooden structures, is important in controlling Orf as it can persist in buildings for many years.

There is an effective vaccine available consisting of a live virus. This vaccine must only be used in flocks that have had Orf diagnosed, as the formed scabs can contaminate the environment. The vaccine should be applied to ewes eight weeks before lambing, and the ewes should be kept away from the lambing area until the scabs are shed. Vaccinated ewes do not pass immunity on to their lambs, so lambs should be vaccinated shortly after birth, usually as they are turned out. Discuss with your vet when deciding how, when and which groups of sheep to vaccinate.



## Trace element deficiencies

All age groups within a flock can be affected by trace element deficiencies throughout the production cycle. The demands vary depending upon the class of sheep, such as whether they are growing lambs, lactating ewes, dry ewes or rams. Trace elements (including selenium, cobalt, iodine, copper, zinc and manganese) are required to sustain growth, health and performance. Trace elements are present in the soil, plant and animal at varying levels, and their availability relies upon a series of complex interactions between other trace elements and soil conditions.

### Impact of deficiencies

Deficiencies in any of the trace elements will affect the health and production of the flock and may affect growth rate targets, fertility, body condition, sperm viability and clinical disease. Failing to supplement where necessary will have implications for flock performance. However, unnecessary supplementation will be wasteful and may lead to toxicity. It is important to establish the status of the farm and any likely deficiencies or oversupply.

Trace element supplementation is a fine balance – undersupply can cause deficiency, and oversupply can cause toxicity.

### Early signs

Clinical signs may vary depending on the severity of the deficiency and related disease. Table 4 shows some common signs seen with the different trace element deficiencies.

## Investigating trace element deficiencies

The trace element status can be very specific to your farm. Forage samples can be analysed from the grazing areas and conserved forage to assess the levels of trace elements in the diet. Together with the other components of the diet, a picture of the suspected deficiencies can be used to determine the need to supplement with extra minerals. Soil samples are difficult to interpret, so it is usually more useful to assess the grazing or forage.

Discuss with your vet or advisor the relevant samples to take. Harvesting liver tissues from post-mortem or culled animals is an accurate way of determining the levels of trace elements and may be more useful than blood samples. There are a variety of supplementations, including drenches, boluses, licks and injections. All methods supply different amounts that last for variable lengths of time, and this must be considered when developing a plan.



Ewe showing signs of jaundice as a result of copper poisoning

Over-supplementation can cause toxicities. Selenium toxicity may lead to dullness, weakness, inappetence, poor fertility, difficulty breathing and death in some cases. Copper toxicity will lead to severe liver damage and renal failure, almost always causing death in acute cases.

Table 4. Common trace element deficiencies in sheep

Trace element	Common clinical signs of deficiency	
	Lambs	Ewes
Cobalt	Poor growth rates Open fleece Lack of appetite Crusting of eyes and ears	Lower body condition Reduced fertility
Selenium	Reduced growth rates White muscle disease (stiff gait, painful movement, heart failure)	Poor body condition Poor fertility Reduced embryo survival rate
Iodine	Goitre – enlarged thyroid gland (particularly when on brassicas) Poor growth and performance	Poor scanning results Birth of weak lambs that are more susceptible to hypothermia
Copper	Reduced growth rates and poor fleece Swayback in young lambs	Poor growth, poor fleece and anaemia

For more information, see the AHDB **Feeding the ewe** guide.

## Internal parasites

### including protozoal parasites, worms and fluke

#### Protozoal parasites

##### Cryptosporidiosis

*Cryptosporidium parvum* is a protozoal parasite that may cause diarrhoea in young lambs. Affected lambs are usually less than 10 days of age, and cryptosporidiosis is mainly an issue for pet lambs. Animals are infected by ingesting oocysts (eggs), which are passed in the faeces of infected animals and persist in the environment for long periods of time. They are resistant to many commonly used disinfectants.

Clinical signs include diarrhoea, inappetence, abdominal pain and mild pyrexia (fever) or milder infections that cause reduced growth rates and general poor performance.

Cryptosporidiosis can be diagnosed using faecal samples. Control strategies should involve maintaining good hygiene, preventing faecal contamination of water and feed troughs and ensuring adequate colostrum intake, especially in pet lambs.

##### Coccidiosis

Coccidiosis is caused by a protozoan parasite called *Eimeria*, of which there are many species, but only two, *E. ovinoidallis* and *E. crandallis*, cause disease in sheep. They are host-specific, which means they only affect sheep and not other animals. *Coccidia* oocysts (eggs) are ingested from the environment and hatch inside the gut. They penetrate the intestinal cells lining the gut and multiply there, causing severe damage. Adult ewes shed very low levels of oocysts, but lambs shed very high levels that contaminate the environment.

Oocysts are difficult to kill and can survive in buildings and on pasture from the previous years' lambs. High levels of oocysts tend to accumulate where there are high stocking densities or poor hygiene, although it can affect both indoor and outdoor reared lambs. Lambs will usually be able to avoid clinical coccidiosis if they have been previously exposed to a low level of oocysts in the first few days of life.

##### Early signs

Damage to the gut lining causes straining and abdominal pain with diarrhoea or scour that may contain mucus and blood. Dehydration and death can occur in severe cases, with significant mortality rates in young lambs exposed to a high challenge.

Animals that survive the infection, as well as those lambs that were sub-clinically affected, can be unthrifty, with poor growth rates. It is important to get a diagnosis by contacting your vet if young lambs in your flock suffer from diarrhoea or poor growth rates.

Ideally, samples from several lambs in the group should be pooled for cocci speciation. Concurrent infection with *Nematodirus battus* may occur and can exacerbate clinical signs.

##### How is the infection spread?

Lambs of four to eight weeks are most at risk from infection. Coccidiosis will be seen when naïve lambs are exposed to large numbers of infective oocysts. This may occur if different age groups of lambs are mixed (as older lambs can amplify oocyst numbers which then infect younger ones), with intensively stocked systems, or if there is faecal contamination of feed and water troughs.

##### Preventing infection

Treatment and control are farm-specific, with different groups of lambs at varying risks, depending on their age and management. Treatment should be targeted, and control plans reassessed each year.

The aim is to ensure that lambs are exposed to develop good immunity but not challenged too much so that they are overwhelmed by disease. Oral treatments are available to facilitate this but discuss with your vet as the timing of treatment can be problematic.

Raising feed and water troughs may help to prevent faecal contamination. Alternatively, move troughs regularly to prevent the build-up of oocysts in one area. Grazing later-born lambs in fields where there have not previously been earlier-born lambs is useful. It is important to discuss a strategic plan with your vet to reduce the risk of inappropriate or incorrect timing of treatments.

#### Gut worms

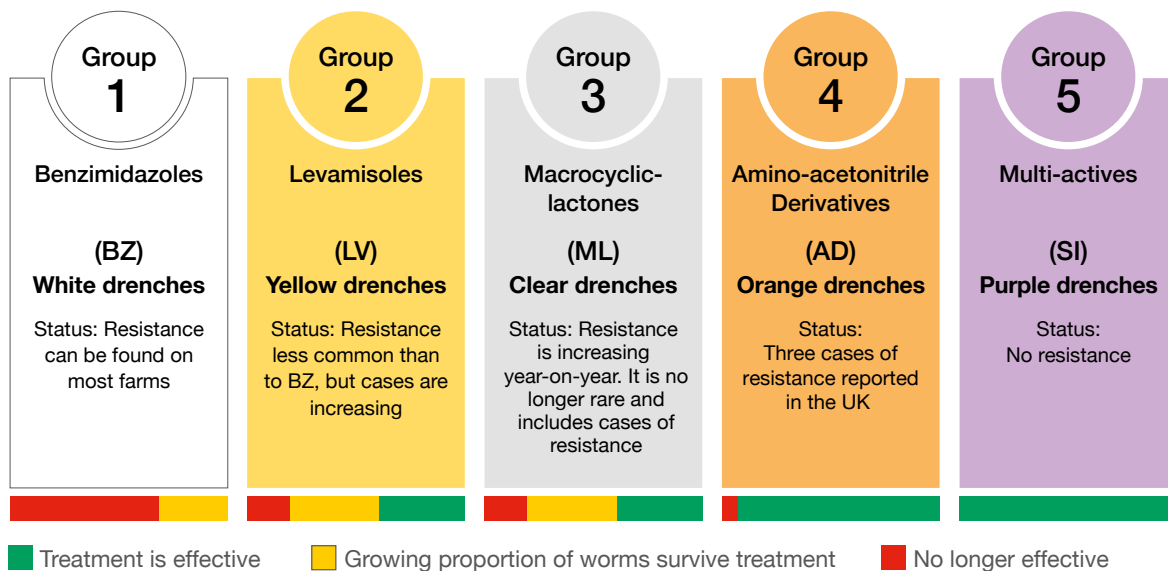
Worms are a major threat to the performance and health of lambs and have been estimated to cost UK sheep producers £42.2m per year. Controlling worms is a vital part of any management programme. As the industry intensifies, effective worm control has become increasingly dependent on anthelmintics (drugs that expel parasitic worms from the body by either stunning or killing them). Worm resistance to the anthelmintic groups 1–BZ, 2–LV and 3–ML is now widespread in the UK.

#### Remember

- Only worm ewe lambs and thin ewes pre-tupping
- When worming lambs, retain lambs on the original pasture for 48 hours to dilute the effect of any resistance. Do not worm and move directly to clean pasture. Alternatively, 10–20% of the stronger lambs showing no evidence of scour should be left un-dosed







## Choosing a wormer

The number of farms with resistant worms is increasing. Be aware that the shift to resistance is irreversible and threatens all farms. There are two relatively new anthelmintic groups, 4–AD and 5–SI, available in the UK. SCOPS advises that these new wormers are integrated into current worm control programmes to help extend the efficacy of existing products, for example, in quarantine protocols or for end-of-season use.

### *The right approach – follow the 5 Rs*

- The right product for the type of worm
- The right animal
- The right time
- The right dose rate
- Administered in the right way

### *The two rules for reducing resistance*

1. Good drenching practice – always use anthelmintics properly, killing the maximum number of worms from every drench used and choosing the correct product at the right time, at the appropriate dose rate.
2. Reducing selection pressure – use anthelmintics less often and avoid practices that select rapidly for resistance, such as drenching and then putting treated sheep straight onto clean pasture.

## Using faecal egg counts

Faecal egg counts (FEC) can be used to decide whether or not an individual or group of animals requires worming. This can reduce wormer use, and so reduce resistance developing. Sampling should begin when lambs are around 6 weeks old and continue every 3–4 weeks over the summer.

Exceptions to this are following a drought or in the control of *Nematodirus battus*, which can cause disease in sheep before an increase in FEC. Worming to control *Nematodirus battus* should be done based on forecasts and pasture risk (pasture that was grazed by lambs the previous year is high risk). FEC can also be done after worming to check a wormers efficacy. This is called a drench test.

### Drench test

1. Take a dung sample before the lambs are drenched and establish the initial egg count by having a faecal egg count (FEC) test completed on the sample.
2. Treat all the lambs in the group, taking extra care to ensure the dose rate and administration technique are correct. If the dose rate and technique are not correct, the test results will be misleading.
3. Wait for seven days (for Group 2–LV products) or 14 days (for Group 1–BZ or Group 3–ML products) and re-sample the same group of treated lambs to establish if the treatment was effective and the FEC has reduced.

Other measures to avoid resistance developing on your farm include:

- The effective quarantine of all sheep brought onto the farm (see page 6)
- Administering the drench correctly. Drenching guns should be checked for dosing accuracy, and sheep weighed to ensure the correct amount of drench is given for the weight of the sheep
- Using faecal egg counts to check ewes and lambs worm status and only drenching if required
- Using targeted selective treatment to leave a proportion of a group un-treated
- Using methods other than wormers for parasite control, such as weaning lambs onto low-risk pasture

## Targeted selective treatment

Using targeted selective treatment means not treating a whole group of lambs or ewes. Often worm burdens in a group of sheep vary, with some sheep having much larger burdens than others (it is thought that 80% of worms tend to be in 20% of the sheep). The lambs with the highest burdens will therefore benefit the most from treatment, and by leaving 10–20% of the lambs untreated, the risk of resistance developing is reduced. Deciding which lambs or ewes to treat can be based on growth rate or BCS.

## Developing a control strategy for gut worms

The worm challenge to sheep builds over the season, so a successful control strategy needs to take these dynamics into account (see diagram below).

### Nematodirus

*Nematodirus* tends to be the earliest worm challenge in the season, affecting young lambs 6–12 weeks old. The immature larvae cause damage to the gut, and clinical signs may be seen before FEC are elevated. Therefore, control strategies are based on parasite forecasts and pasture risk assessment. Increasingly on some farms, *Nematodirus* disease is seen in older lambs in the autumn.

### Haemonchus

During the summer months, *Haemonchus contortus* (Barber pole worm) can cause anaemia and ill thrift (rather than scour) and can produce very high FECs in both adults and lambs. It is not present on all farms, so quarantine treatments are important in preventing bringing it into a flock.



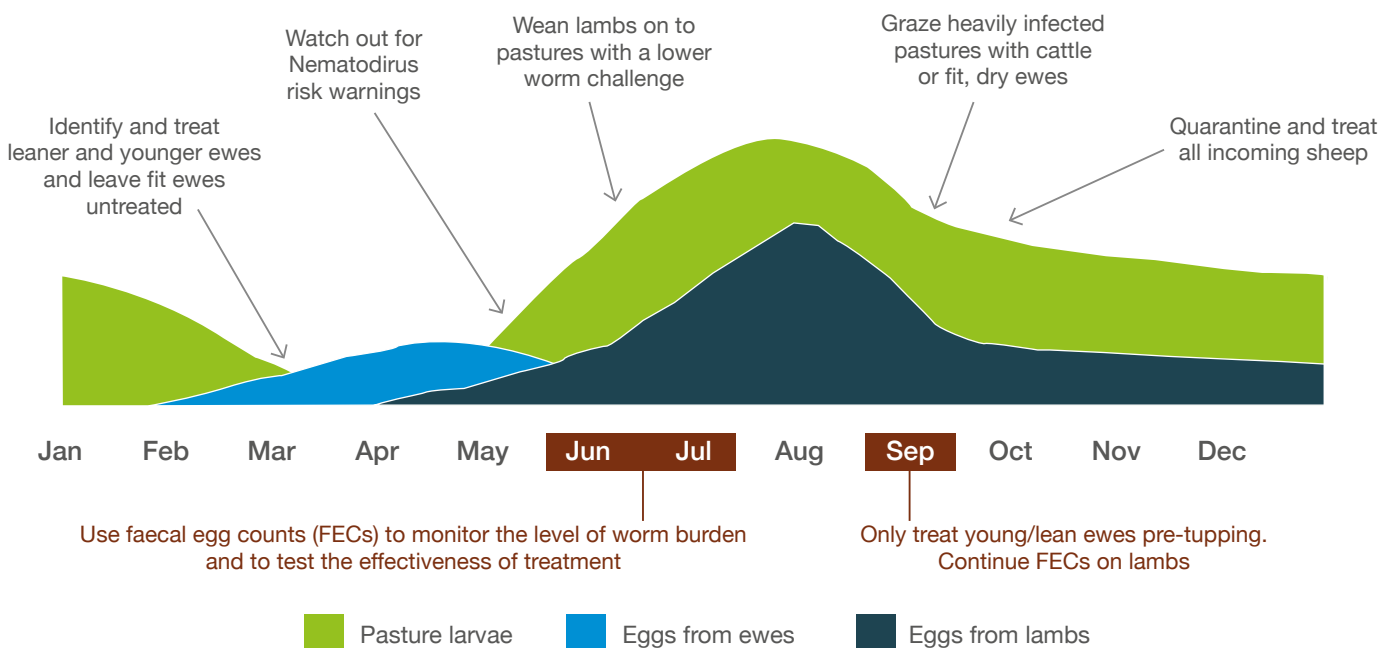
Bottle jaw caused by *Haemonchus* infection

### Trichostrongyles

In the summer/autumn, Trichostrongyles can cause black scour, weight loss and death in poorer lambs, and it is important to continue to carry out FEC into the autumn.

For more detailed information on endoparasites, see Sustainable Control of Parasites in Sheep (SCOPS) at [scops.org.uk](http://scops.org.uk), AHDB **Worm control in sheep**, and the AHDB **Parasite control guide**.

Sheep can pick up tapeworms and the white tape sections in sheep faeces can be obvious and alarming. However, the tapeworms do not attach to the sheep gut lining so the production effects of sheep tapeworms are insignificant compared to the effects of all the other worms mentioned here. It is rarely necessary to treat sheep against tapeworms.

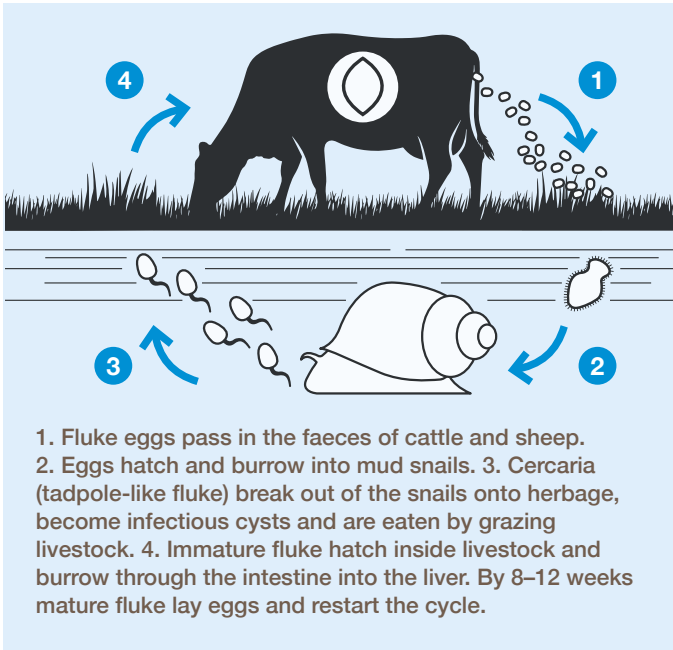


The worm challenge to sheep throughout the season



## Liver fluke

Liver fluke disease, or fasciolosis, is caused by the parasite *Fasciola hepatica*, which can infect all grazing animals but mainly affects sheep and cattle. The incidence of fluke disease is influenced by climate, particularly summer rainfall, because the complex life cycle of the parasite involves two different hosts and several free-living stages (see diagram below).



Liver fluke disease causes significant losses to the UK sheep industry. Severe disease results in death, while milder infections provoke a significant reduction in flock performance, such as reduced lambing percentages and reductions in lamb growth rate.

### How is the infection spread?

Adult fluke are found in the bile ducts of the liver of sheep and cattle. The main intermediate host in the UK is the mud snail, *Galba truncatula*, which is found in wet, muddy conditions and particularly in areas associated with poor drainage, including around water troughs and muddy gateways. Fluke disease can only be maintained in areas that have a suitable habitat for the mud snail. However, fluke disease can also reach drier areas via bought-in animals.

The reported incidence of liver fluke disease in sheep and cattle has increased over recent years. This may be due to changing climate (milder winters and wetter summers) but also because of adaptations within the fluke parasite itself. It is becoming less predictable in terms of location and timing.

### Early signs

The severity of liver fluke infection will depend on the timing, level and duration of the infection.

Signs may include:

- Rapid weight loss
- Anaemia (pale eyelids and membranes)

- Shedding of low numbers of fluke eggs
- Reduction in fertility
- Progressive loss of body condition and weight
- Swelling below the jaw (in severe cases)
- Death (rare in well-nourished sheep)

Acute fasciolosis occurs when sheep ingest massive numbers of infective cysts from herbage over a relatively short period, generally in the autumn/early winter. These develop into young fluke, which move through the liver and cause excessive damage. Sudden death occurs before fluke eggs appear in faeces. Other sheep in the flock will often be anaemic, with the inside of their eyelids pale and their abdomen may be swollen.

Sub-acute fasciolosis occurs when the infection is acquired over a prolonged period. Usually, there is damage to the liver tissue, and adult flukes are visible in the bile ducts. Death is less rapid and usually occurs later in the winter, around November–February.

Chronic fasciolosis is the most common and widespread form, which can occur at any time of year. Moderate numbers of eggs will be present in faeces, and more severe signs, such as swelling below the jaw, may be noticeable.

### Preventing infection

Reducing the areas where mud snails live, through drainage and fencing off wet areas, may help to lower the incidence of disease.

Treatments vary in their ability to kill immature stages of fluke, so product choice will depend on the time of year. The most effective drug against young immature fluke is triclabendazole. Hence, this has been the most frequently used flukicide in the UK. However, resistance to triclabendazole is widespread. It is, therefore, more important than ever to use the correct product at the right time and not overuse any particular drug. Seek advice from your vet to develop a treatment and control plan specific to your farm.

Resistant fluke can be introduced to a farm by bought-in sheep. The quarantine of bought-in sheep should be included in your flock health plan and should involve products other than triclabendazole. Sheep can continue to shed fluke eggs for up to three weeks after treatment, so bought-in sheep should not be grazed on wetland (potential snail areas) for at least three weeks after the quarantine treatment. More information about liver fluke treatments is available in the AHDB Liver fluke control in grazing livestock manual.

**Sheep can continue to shed fluke eggs for up to three weeks after treatment.**

For more information see the AHDB Liver Fluke control for grazing livestock manual and [scops.org.uk](http://scops.org.uk)

## External parasites

There are several external parasites (ectoparasites) that inhabit the skin or fleece of sheep in the UK. These can significantly affect performance by reducing reproductive potential and meat and milk production, in addition to affecting the welfare of the animal – untreated infestations of scab or blowfly can be fatal.

Flock owners have a legal responsibility to prevent or cure infestations, and they cannot move sheep that are visibly affected by scab unless to slaughter or for treatment. Although control can be expensive, labour-intensive and time-consuming, it is paramount to ensure good animal welfare and minimise any financial losses that ectoparasites can cause by reducing flock performance.

Health, safety and environmental laws have strict requirements to follow, and parasites are more likely to develop resistance to treatments that are not effectively administered. The use of jettets, sprays or showers is neither effective nor responsible, with potential legal consequences for anyone who either sells or purchases organophosphates to apply such methods.

If you suspect a problem with ectoparasites, it is vital to get the correct diagnosis from your vet, as more than one type of parasite could be causing a problem at the same time.

The effective control of parasites depends on whether the parasite is permanent (spending its entire life cycle on the sheep) or semi-permanent (at least one stage free-living).

Permanent ectoparasites include:

- Scab mites
- Chewing lice
- Ear mites
- Mange mites
- Sucking lice
- Keds

Semi-permanent ectoparasites include:

- Blowfly strike
- Ticks
- Head flies
- Nasal bot flies

## Preventing ectoparasites

The best protection against ectoparasites is preventing them from coming into your flock

- Secure fencing and double fencing will prevent contact with neighbouring flocks
- Quarantine any incoming stock for at least three weeks (including from shows and sales)

- Look for signs of ectoparasites
- Thoroughly disinfect vehicles and trailers used to transport livestock and remove all wool tags

## Treating ectoparasites

Treatment of external parasites can be through various methods, including injection, plunge dipping or by pour-ons or spot-ons.

Remember, not all treatment methods treat all parasites.

## Pour-ons and spot-on treatment

Pour-ons and spot-ons need to be applied accurately and precisely, as recommended by each manufacturer. For example, those applied centrally, along the back line, must not be applied over to one side or the product will not spread evenly around the body. Use appropriate, calibrated guns that are always cleaned with warm soapy water, rinsed and stored in a safe, dry place.

No pour-on or spot-on is effective against sheep scab, and there are clear differences between products that prevent blow fly infestation and those that more widely treat ectoparasites.

## Plunge dipping

In order to purchase or use organophosphate dip, it is necessary to hold an NPTC Level 2 Award in the Safe Use of Sheep Dip (correct at the time of writing 2022). Organophosphate (OP) dip concentrates are only licensed to be used in a plunge dip – there are no products licensed for use in showers or jettets. There are competent certified mobile sheep dipping contractors available across the UK. When dipping sheep, it is essential to use protective clothing and stick very closely to the manufacturer's instructions. Please note that there are sheep scab mites that have developed resistance to moxidectin injection – dipping in OP is the only effective treatment for these sheep. If you suspect a product not working correctly, contact your vet to investigate.

For more information, see [nptc.org.uk/qualificationschemedetail](http://nptc.org.uk/qualificationschemedetail) and [bimeda.co.uk/mobile-dippers](http://bimeda.co.uk/mobile-dippers) and the AHDB Controlling external parasites manual.



Wool on fencing can indicate that sheep have been rubbing against it to relieve itching



## Sheep scab

Sheep scab (psoroptic mange) occurs on all wool-covered parts of the body, as well as in the ears and produces intense irritation, causing significant welfare issues. The sheep itch their body, the skin becomes damaged, and the wool detaches.

Flock owners have a legal responsibility to prevent or cure infestations of sheep scab – and cannot move sheep that are visibly affected by scab unless to slaughter or for treatment.

### Early signs

Affected sheep will suffer from intense itching. They will likely rub their shoulders and flanks against fencing and attempt to bite at their shoulders. Symptoms are like that of chewing lice, so seek advice from your vet. Starting the incorrect treatment will delay the recovery and risk the spread of sheep scab to the wider flock or surrounding flocks. Often mixed infections with both parasites can exist.

The signs of sheep scab can vary in severity, with some infected sheep showing little or no signs of infection. This is due to the variation in individuals' immune response to the mite. As a result, it can go undetected in flocks until the infection is widespread.

### Diagnosis

Clinical sheep scab can be diagnosed by the presence of live mites scraped off the edge of lesions. Both clinical and sub-clinical sheep scab can be diagnosed by blood ELISA which reliably detects antibodies as quickly as two weeks after exposure. Blood samples from 12 sheep will detect sheep scab at 20% prevalence with 95% confidence – this can be used on any sized flock as long as they are run as one group. Separate flock groups should be tested by taking further groups of 12 samples.

### How is the infection spread?

- The life cycle of the mite is 14 days, and the population doubles every six days
- The mites can live off the sheep, in wool tags, for up to 16 days
- Sheep-to-sheep contact is the main source of disease spread, but contaminated lorries and trailers are also a risk
- Shared equipment, such as shearing, scanning or handling facilities and workers' clothes, can spread mites
- Sheep can be sub-clinically affected with scab for months before any signs are apparent

More information about sheep scab is available at [scops.org.uk](http://scops.org.uk) and [moredun.org.uk/research/diseases/sheep-scab](http://moredun.org.uk/research/diseases/sheep-scab)



Ewe suffering from sheep scab

## Chewing lice

Lice live in the woolly areas of the sheep, feeding on wool and skin debris. They are often found on sheep in poor body condition and can be an indicator of other underlying diseases.

Affected sheep appear irritated due to the itching and will attempt to scratch their shoulders and flanks. Their presence can be detected on examination of the fleece.

## Ticks

Ticks feed on the blood of sheep and are carriers of other diseases. Tick populations are increasing in areas of the UK with tick-borne disease causing abortion in naïve ewes and significant joint ill infections in lambs.

The condition of affected sheep may deteriorate, and they can become very weak due to ticks causing anaemia. Ticks can be seen on the skin through careful examination. They are often found on the areas of the sheep not covered by thick wool, such as the head and legs.

## Blowfly strike

Blowfly strike occurs due to infestations of the larvae (maggots) of the greenbottle or bluebottle fly. They feed on the skin and flesh of the sheep, causing raw and sore exposed areas that attract more flies. They are attracted to faecal-soiled areas and to the odour of foot rot from lame sheep.

Blowfly strike is easily identifiable through observation. Affected sheep will often be seen to be distracted from grazing, sometimes isolate themselves from the group, nibble at wool and will rapidly lose weight. Untreated blowfly strike can be fatal.

# Sudden death

## Clostridial infections

Clostridial bacteria can form exceptionally tough structures known as spores, which allow them to survive for many years. The bacteria and spores are everywhere in the environment and most often in soil. They also exist in small numbers in healthy animals, where they are harmless until another factor causes them to multiply.

Factors which cause bacteria or spores to multiply include:

- Changes in management or diet
- Injuries
- Activity from intestinal worms or liver fluke

There are multiple types of clostridia bacteria, with subtypes of *Clostridium perfringens* and six other clostridium species affecting ruminants. Disease results from an overgrowth of these bacteria in the body and the subsequent release of damaging exotoxins.

### Types of clostridial infections

There are different types of clostridial disease, which fall under three categories depending on the systems or organs involved.

Those affecting the gut and internal organs through the release of toxins include:

- Lamb dysentery
- Struck
- Pulpy kidney
- Braxy
- Black disease
- Bacillary haemoglobinuria
- Abomastitis
- Toxaemia

Those causing muscle damage or gangrene, and the circulation of clostridial toxins in the blood, include:

- Blackleg
- Gangrenous metritis and navel ill
- Big head
- Malignant oedema

Those causing nervous damage include:

- Tetanus
- Botulism
- Focal symmetrical encephalomalacia

## Early signs

Overgrowth of bacteria in the body and the release of damaging exotoxins happens rapidly and affects the tissues of the gastrointestinal tract, liver, muscle and udder. This causes severe inflammation, necrotic tissue damage (death of cells) and systemic toxæmia (presence of toxins within the blood).

Other than a small number of cases involving malignant oedema (Big head), all clostridial diseases usually result in sudden death, despite treatment. In the case of certain infections, such as focal symmetrical encephalomalacia or botulism, the animal may survive for several days. The incidence of botulism in sheep has increased in recent years and is usually linked to contact with poultry litter.



## Preventing infection

Prevention by vaccination is the only practical way to reduce mortality. This is due to the ever-present nature of the bacterial spores in the soil, the speed at which clinical disease develops, and the unpredictability of disease outbreaks.

Cheap and effective vaccines are available. However, deaths due to clostridial diseases remain high, resulting in significant losses to the sheep industry. The vaccines licensed for sheep in the UK are multivalent, which means they protect against several types of clostridial disease. However, the vaccines do vary in the diseases they cover, and the choice of vaccine should be discussed with your vet as part of your flock health plan. Vaccinating purchased stock should be included in your flock protection plan and ideally carried out once on the home farm. This will ensure that the vaccines have been stored, handled and administered correctly.

Post-mortem of any mortalities on farm are useful to assess the cause of death and form part of the prevention plan.



## Pasteurella diseases

Pasteurellosis is the term used to describe a number of disease forms caused by two related bacteria, which are both found in the nose and tonsils of normal, healthy sheep.

1. *Mannheimia haemolytica*, which causes pneumonia in all ages of sheep and septicaemia in young lambs.
2. *Bibersteinia trehalosi*, which causes severe systemic infections (septicaemia) and sudden death in older lambs.

Pasteurellosis affects all ages of sheep and causes significant losses to the sheep industry. The disease is often very acute, with animals found dead. It is one of the most recorded causes of death in all ages of sheep across the UK. Pasteurellosis is often triggered by stressors, some of which will predispose to greater levels of mortality in a flock, despite vaccination in some cases. Stressors include:

- Management activities – dipping, castration, clipping, dosing for worms, gathering in warm weather
- Transportation and mixing of animals
- Presence of underlying diseases such as Maedi Visna, Border disease or OPA
- Climate, particularly warm and still or cold, wet and windy weather
- Abrupt diet changes or poor nutrition
- Reduced immune function
- Trace element deficiencies
- Heavy worm burdens
- Other infectious disease such as viruses, tick-borne fever, and other bacteria

### Early signs

*B. trehalosi* causes severe systemic disease, most seen in hoggs and store lambs from September to December. Typically, a number of sudden deaths occur over a few

days following transportation and/or a change of diet or weather. Frothy fluid may be seen around the mouth and during the terminal stages of pasteurellosis.

*M. haemolytica* causes acute pneumonia in all ages, usually from about two months onwards. Cases can occur either as flock outbreaks or as sporadic cases. In very young lambs, *M. haemolytica* causes septicaemia, and they are usually found dead.

Signs of acute cases:

- High temperature
- Death
- Depression
- Laboured breathing

### Preventing pasteurellosis

Managing the flock to reduce all the trigger factors outlined above is crucial to prevention and control. This includes providing plenty of forage to buffer any diet change.

Vaccination is effective in reducing losses against both types of pasteurellosis. A primary course of two doses is needed to stimulate immunity. Booster doses should then be given prior to periods of high risk. There are combined vaccines that protect against clostridial diseases and pasteurellosis.

While lambs born to vaccinated ewes are protected against clostridial diseases for a couple of months, they are only protected against *Pasteurella* for 2–3 weeks. Producers concerned about pasteurellosis in lambs should give them a full course (two doses) from three weeks old. It may be necessary to give a third dose before the autumn.

Investigate any cases of pasteurellosis with your vet to allow prompt interventions to reduce further losses. There may be underlying issues in the flock that are causing an increase in deaths from *Pasteurella*. Post-mortem examination can show gross clinical signs in the lungs that are highly suggestive of *Pasteurella*.







## All year round

### Lameness

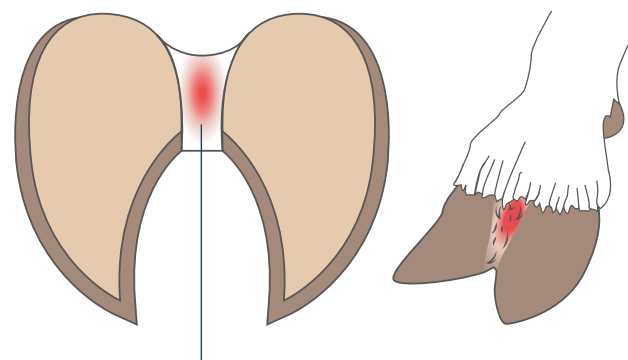
Lameness in sheep flocks is one of the most common and persistent disease problems. Lameness is a costly condition. As well as resulting in significant economic loss, lameness is an important welfare concern. Lamely sheep are less able to graze and compete for feed. This results in reduced performance, lower body condition score, reduced lamb growth rate and premature culling, in addition to the costs of treatment and the labour involved in administering it.

A flock target of less than 2% lame is realistic on farms where a control plan has been discussed with the vet. Flocks with lameness levels above 2% can reduce it effectively with a few changes and a review of lameness management.

#### Early signs

First signs of lameness can be quite subtle, but early identification and prompt treatment of individuals or groups are essential to reduce spread.

Scald is usually characterised by red/pink inflammation in-between toes with a white/grey pasty 'scum' on top, which can smell. It is more likely to occur if stocking rates are high. In adult sheep, scald is early footrot, so prompt treatment as soon as possible is crucial to reduce spread within the flock. Infectious forms of lameness need to be dealt with on both an individual and a 'whole-flock' basis.



Interdigital dermatitis

Hairy skin



In adult sheep, scald is early footrot.



## Footrot

Footrot occurs when there is a separation of the hoof horn, usually starting in the interdigital space. It is most likely to spread during warm, moist conditions. *Dichelobacter nodosus* lives on infected feet and can survive off the foot for 4–40 days, depending upon conditions. The early stages of footrot are when there are the highest number of bacteria and the greatest likelihood of spread. This means early treatment is important.

## CODD

Contagious ovine digital dermatitis (CODD) initially occurs at the top of the hoof (the coronary band). The infection progresses downwards to the toe and can result in the whole horn capsule separating and exposing the very sensitive structures underneath. Outbreaks can be severe, affecting up to 50% of the flock.



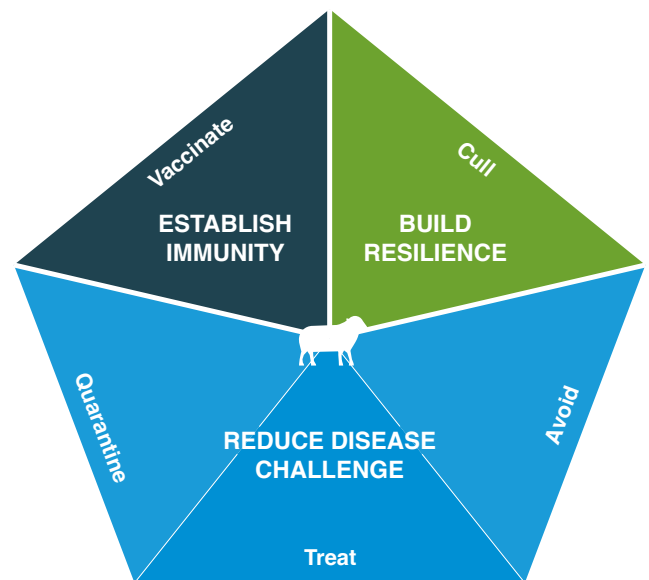
## Treating lameness

Working with your vet to identify the cause of lameness in your flock is crucial to the success of any treatment and control. Often there is more than one infectious cause in the flock. The most common causes of lameness, scald, footrot and CODD are infectious.

Foot trimming should be avoided. Where foot trimming is carried out, care must be taken not to cause bleeding, which is painful and can lead to the formation of granulomas (areas of proud flesh that are difficult to manage and can be very painful).

When lame sheep are identified, it is important that they are isolated and treated appropriately as soon as possible, but ideally within three days. Treating within three days will reduce the spread of infection to other sheep and speed up recovery time. Treatment for adult sheep requires the prompt use of injectable and topical antibiotics alongside anti-inflammatory pain relief to aid with recovery. The procedure for using antibiotics in lame sheep should be discussed with your vet as part of your flock health plan. The infected feet should not be trimmed, as trimming spreads infection and delays healing. Your vet may advise using the five-point plan for lameness. The five-point plan is a recognised industry standard, useful in controlling lameness caused by infections, and helps to prevent new cases.

### Five Point Plan for lameness



1. Avoid the spread of infection (in gateways, at gatherings).
2. Treat lame individuals quickly and effectively.
3. Quarantine bought-in sheep for three weeks.
4. Cull persistently lame sheep.
5. Vaccinate to protect the flock by boosting immunity to footrot bacteria.

(Source: FAI Farms)

Effective measures to prevent lameness are really important once there are lame sheep. Easy-to-use and appropriate handling facilities are necessary to make foot care effective and practical to carry out. Foot health, including shape, horn quality and susceptibility to footrot, may be inherited. Therefore, it is important to select breeding stock with sound feet.

For more detailed information on lameness, see the AHDB **Reducing lameness manual**.

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## Eye diseases

Eye diseases are common in sheep. Infections are often transmitted from sheep to sheep, but can be caused by injury or trauma from a foreign body, or a result of entropion (in-turned eyelids in lambs). Metabolic diseases, such as pregnancy toxemia (twin lambs disease see page 9), toxicity (e.g. Bracken poisoning) or diseases such as listeriosis or Border Disease may also cause issues involving eyes.



### Pink eye (Ovine Infectious Keratoconjunctivitis)

#### Early signs

Bacterial infection (usually *Mycoplasma conjunctivae* or *Chlamydia*) causes this disease. Initially, the affected eyes appear watery and are held closed to minimise the pain. The usual 'white of the eye' (conjunctiva) appears inflamed and bloodshot. Once the eye starts to heal, it is less painful, so it begins to open. However, vision is impaired as there is an opaque white colour to the front of the eye. Some cases will progress to deeper infections with a build up of pus. In these cases the globe is severely damaged and vision reduced.

'Silage eye' is an infection from *Listeria monocytogenes* that causes similar signs of pain and inflammation behind the surface of the eye.

#### How is the infection spread?

Immunity to infection is short lived (approximately three months). Repeated outbreaks occur through the year due to irritation from environmental factors such as dusty dry weather or bright snowy conditions. The irritation affects the ability of the eye to cleanse causing damage to the eye structure and allowing infection to establish.

Outbreaks are also seen following increasing contact with other sheep. For example, when gathered at markets, feeding, in housing, during transport or following the introduction of new sheep into the flock. This may lead to the spread of infectious secretions or head flies. Sheep can develop 'carrier' status where the bacteria exist without the clinical signs and this may be the cause for outbreaks reoccurring.

'Silage eye' is caused by abrasion and transfer of *Listeria monocytogenes* bacteria from contaminated bale silage. Clinical signs appear shortly after being exposed to a contaminated bale.

#### Prevention and treatment

- Quarantine and check the eyes of new stock before mixing
- Treat quickly
- Isolate affected animals from the flock so they can recover and feed. This is especially important with pregnant sheep who need extra attention to ensure feeding is not disrupted in the later stages of pregnancy
- Discuss the diagnosis and most effective form of treatment and control with your vet

#### Entropion

Entropion is hereditary and usually associated with a specific ram. The in-turned eyelids will cause abrasion and damage to the surface of the cornea. This is painful and leads to a reduction in feeding of the lamb with mismothering, starvation or hypothermia likely if untreated. This can be resolved quickly with a subconjunctival injection, physical clips or stitches. Discuss with your vet at your pre-lambing visit.



# Flock-level, production-limiting diseases

## also known as Iceberg diseases

These diseases include Border disease, Maedi Visna, Ovine Johne disease, Ovine Pulmonary Adenocarcinoma (OPA) and Caseous Lymphadenitis (CLA). Their presence in the flock leads to weight loss, poor production and clinically ill individual sheep, resulting in a reduction in productivity, profitability, and flock performance. These diseases are an important welfare concern.

The awareness of these diseases across flocks is varied. It is important to discuss with your vet the risks associated with buying in these diseases and how to manage them cost-effectively and minimise their impact on the flock.

### Border disease

Border disease is caused by a pestivirus which can either be an ovine pestivirus (Border disease virus) or a bovine pestivirus (Bovine viral diarrhoea virus). Flocks across the UK can be exposed to both strains causing clinical Border disease. The effects of some strains are more severe than others, and the signs of infection depend upon the age of the animal and the stage of pregnancy if pregnant.

#### How is the infection spread?

The virus is present in and can be spread by saliva, urine, faeces and semen. The rate of spread can vary, particularly in more extensive grazing systems.

A flock is at risk of Border Disease if pregnant ewes come in contact with a calf or sheep that is persistently infected (PI).

#### Early signs

The Border disease virus mostly causes issues in pregnant sheep. High mortality rates and large numbers of weak lambs can cause significant production losses in affected flocks. Higher barren rates at scanning and at the end of lambing are also associated with Border disease virus circulating in the flock.

Ewes that are infected with Border disease in early pregnancy can lose the embryos and result in high barren rates. When infected further through pregnancy, the disease causes stillbirths, live but weak lambs and persistently infected (PI) 'hairy shaker' lambs that show symptoms of brain damage.

'Hairy shaker' lambs usually appear different, often with a hairy fleece, a smaller, dome-shaped head and spindly legs. These lambs are persistently infected and, if retained in the flock, will act as a source of infection. However, not all PI lambs are easy to spot.

Any animal that has been exposed (unless it is a PI) will then produce antibodies to Border disease virus. The virus is immunosuppressive (which means it makes the

animal less able to fight other diseases), and some animals can be clinically unwell (high temperature, scour) when first exposed. They may also suffer more from concurrent illnesses.

Older lambs and ewes can be blood sampled to look for evidence of persistent infection or to see if they have been exposed to Border disease. Speak to your vet to decide on the most useful investigation plan.

#### Preventing infection

The risk to a naive flock is when pregnant ewes come into contact with either cattle or sheep that are persistently infected (PI). This may be a bought-in store lamb, ewe lamb replacement or a pregnant ewe carrying an infected foetus.

Any bought-in sheep should be kept away from the main ewe flock until after lambing to protect the pregnant ewes. It is important to speak to the vendor about the Border disease status of the flock and assess the risk of buying-in appropriately. Ensure that your vet is involved with this discussion as part of your flock protection plan (see pages 4–5).

Animals can be blood tested to determine if they have been exposed to the disease by showing antibodies or if they are PIs and are virus positive. Suspect 'hairy shakers', weak lambs or identified PIs should not be retained or sold as breeding animals even if apparently recovering.

### Caseous Lymphadenitis (CLA)

Caseous Lymphadenitis (CLA) is a bacterial disease affecting sheep and goats worldwide, causing the formation of abscesses. It is more significant where more intensive husbandry is practised. The first reported case in a sheep in the UK was in 1991, but now CLA is endemic throughout the UK, with commercial and pedigree producers recognising the need for vigilance and control.

CLA causes economic loss due to the premature culling of infected animals and carcass contamination. Sometimes the carcass can be downgraded or condemned. The disease may have an impact on animal condition, milk production and reproductive performance though it mainly affects sales of breeding sheep.

This disease is highly infectious and difficult to eradicate once established in a flock.

#### How is the infection spread?

CLA is a chronic infection of tissue and lymph glands. The bacteria (*Corynebacterium pseudotuberculosis*) can enter through cuts and abrasions and can also be inhaled. The material from ruptured abscesses and lymph nodes is infectious. The bacteria that cause the disease can survive in the environment for several months and are highly infectious. Although instances are rare, the disease can be passed on to humans.



Bacteria that cause CLA are highly infectious and can survive in the environment for several months.

### Early signs

Lesions are seen as external lumps, most commonly affecting the lymph nodes around the head and neck. Abscesses can also be found in the lungs or other internal organs, which lead to respiratory distress and chronic weight loss. The abscesses often contain cheesy pus that is loaded with highly infectious bacteria. The abscesses are usually cold and painless, but in extreme cases, the sheep may become thin and die.

### Preventing infection

Antibiotic treatment is ineffective, and the diagnostic tests for CLA have limitations, so preventing infection is key. A heightened awareness of CLA and prompt veterinary investigation of suspect animals are required. A culture of swabbed material from a ruptured lesion is the definitive method of diagnosis, but it is not advisable to lance abscesses as this will spread disease. Additionally, frequently screening a flock for the presence of CLA antibodies using a blood test can be more appropriate than an individual animal screen. Discuss your options with your vet.

There is a vaccine used widely in the Southern Hemisphere and is imported for use in some UK flocks under a special veterinary import licence. Note that a vaccinated animal will appear positive on an antibody blood test, so it is important for both vendors and sellers to have carefully discussed the implications of vaccination with their veterinary advisor.

Control methods for preventing CLA include:

- Quarantining (of animals and premises)
- Visual inspection of new animals
- Culling infected animals
- Maintaining rigorous hygiene procedures during handling and management tasks – bacteria can survive in sheep dip for 24 hours or more
- Avoid lancing 'abscesses' if unable to thoroughly remove the infectious pus material
- Dipping shearing equipment in strong disinfectant or chlorine bleach before and after use

## Jaagsiekte or Ovine Pulmonary Adenocarcinoma (OPA)

Ovine Pulmonary Adenocarcinoma (OPA) is an infectious lung cancer of sheep caused by a virus known as Jaagsiekte Sheep Retrovirus (JSRV). OPA causes significant losses due to increased mortality, increased culling rate, reduced body condition and performance of ewes. Most cases are seen in adult sheep of two to four years old, but instances have been reported in lambs as young as two months and in sheep as old as 11 years.

### How is the infection spread?

There is a long incubation period between infection and the onset of the disease. Therefore, the number of animals in a flock infected with the virus may be much greater than the number that develop symptoms.

### Early signs

Often flocks that are affected by undetected OPA will notice increased deaths in ewes, and ewes become slower and more difficult to move when gathered. Sheep with OPA will lose body condition and become unthrifty despite improving their nutrition.

The nasal discharge from OPA-infected sheep is highly laden with virus and very infectious to other sheep in the flock.

The symptoms of OPA are those of chronic pneumonia – loss of condition despite good grazing and breathing difficulties. A feature unique to OPA is the over-production of fluid in the lungs, which may be apparent as a watery discharge from the nose, especially if the hind legs are raised up above the head. This discharge is highly infectious and sheep producing discharge should be euthanised for their welfare. However, not all affected sheep show these signs.





Lung of a sheep with OPA. The OPA infection will have caused breathing difficulties and pneumonia, and over-production of fluid in the lungs. Any ewes producing discharge from the lungs should be euthanised for their welfare.

Sheep with OPA are often more likely to succumb to secondary infections such as pasteurellosis. In this case, the course of the disease is shorter and affected sheep are found dead or die within a short time of the disease being noticed. Post-mortem examination of the lungs is advised to confirm the diagnosis.

### Preventing infection

Once clinical symptoms develop, the disease is normally fatal, and there is no treatment available. Any suspect sheep should be isolated from the main flock immediately and reassessed or culled. In affected flocks, regularly inspect adult sheep, then remove and cull any affected animals. It is also recommended to remove the offspring of affected ewes.

Transthoracic ultrasound is increasingly used by vets to identify affected sheep in affected flocks. This may be useful in already infected flocks at strategic points, though there are distinct limitations that are important to fully discuss with your vet. There is still no laboratory test that can confirm diagnosis, although research in this area is ongoing. Post-mortem examination of thin ewes with histology remains the most definitive diagnosis.

When buying replacement stock, ask the vendor if they monitor for OPA in the flock and make a risk-based assessment before purchase. Discuss with your vet and see page 6 for more information.

## Johne's disease (Paratuberculosis)

Johne's disease is a chronic infection affecting the small and large intestines of ruminant animals. The disease is caused by infection with a bacterium called *Mycobacterium avium* subsp. *paratuberculosis* (MAP), a very slow-growing organism that can survive for long periods in the environment.

Infection of Johne's in flocks across the UK is widespread and undiagnosed in many flocks. Johne's disease causes a significant loss in productivity, high numbers of thin ewes despite good nutrition and an increased culling rate of younger ewes. This will impact the replacement rate and ewe longevity in the flock.

The identification of Johne's disease is problematic, and there is no single diagnostic test that can detect all stages of the disease. Sub-clinically infected stock are extremely difficult to diagnose and can test negative. A post-mortem is the most reliable means of diagnosis. Thickened intestines, enlarged intestinal lymph nodes, and an orange pigmentation of the gut can indicate the presence of Johne's. Histological samples will confirm the presence of disease.

### How is the infection spread?

Johne's disease bacteria shed from cattle can infect sheep and vice versa. The bacteria can also pass between wildlife on the farm, such as rabbits and deer, which may be a reservoir of infection.

The disease is spread through ingestion of the bacteria shed in the faeces of infected animals. Infection occurring in this way is more likely to occur in younger animals up to 6–12 months of age as they are more susceptible to infection at this stage. The infection can also be passed on in colostrum or milk and across the placenta to unborn lambs.

Rabbits and other wildlife will carry MAP bacteria, so trying to eradicate the disease can prove very difficult.

### Early signs

Johne's typically has a long incubation period of two to four years, and the animals often show no signs of illness until later in life. Although in some cases, it can present earlier. Sheep that are infected but show no signs of disease are said to be 'sub clinically infected' and act as carriers. Infected animals can shed mycobacteria intermittently and before the disease can be detected in the blood via antibodies.

In sheep, diarrhoea is usually not a symptom, unlike in cattle. They often remain bright with a good appetite but fail to gain condition. The disease is characterised by severe weight loss despite being on good grazing for six weeks or more. 'Bottle jaw' swelling under the jaw may also be present along with poorer fertility and milk production.

### Preventing infection

The early culling of affected animals and their offspring will help to limit the disease. Cull lean sheep in groups where Johne's is suspected and don't keep replacements from suspect animals. An annual screen of older thin ewes using a pooled faecal sample after weaning is a useful screen of the flock. Discuss this option with your vet.

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Vaccination can also be an effective control method for flocks producing breeding ewes or rams. There is a vaccine available for use in the UK that successfully reduces the levels of clinical disease and shedding of infection.

Faecal samples can be used to detect the presence of MAP when it is being shed in the faeces. Blood samples can be examined by your vet for evidence of protein loss (hypoalbuminemia), which will provide useful information in flocks where the disease is suspected. It is also possible to look for Johne's antibodies in the blood. This test has low sensitivity, so there is a high risk of false negative results. Unfortunately, there is currently no way of reliably identifying sub-clinically infected animals, so the risk of introducing infection with bought-in stock remains.

## Maedi Visna (MV)

Maedi Visna is a progressive wasting disease of sheep caused by infection with a Lentivirus. MV is a chronic disease affecting the lungs, udder, body condition and leads to significant production losses within the flock. The prevalence of MV across the UK is increasing, with clinical signs becoming more widely recognised. Affected animals start to show clinical signs from two years of age and older and may leave the flock due to loss of condition.

MV affects the udder and can cause chronic mastitis that may be difficult to detect but results in a noticeable reduction in milk production. Flocks affected by MV have lamb losses due to reduced survival and growth rates in lambs born to affected ewes. Increased death rates are seen in ewes, affecting ewe longevity, increased replacement rates and overall flock productivity.

### How is the infection spread?

The infection is spread orally via infected milk and colostrum and inhaling infected aerosol droplets.

### Early signs

The early signs of infection can be difficult to spot due to the slow progression of the disease. Once clinical signs are noticed within a flock, a large number of sheep will become infected. Clinical signs are often seen in older sheep and include chronic pneumonia with breathing difficulties or exercise intolerance. Ewes will be slower and more difficult to move. Neurological signs such as a 'dragging' hindlimb gait can be seen. Chronic mastitis cases are associated with hungry or poor growing lambs.

The disease can be confirmed on a post-mortem of cull ewes. The lungs are firm when palpated and heavy when removed.

### Preventing infection

There is no vaccine available for MV, and due to the long incubation period of the disease, detection in the live animal can be problematic.

MV can be diagnosed via blood samples once the ewe has formed an antibody response. Testing should

therefore be routinely carried out annually or even more frequently in affected flocks. Positive animals should be culled, and lambs from infected ewes should not be retained for breeding as they may have become infected via the colostrum or milk. A full discussion with your vet will help develop a plan to reduce the impact of MV on your flock.

Identifying whether a commercial flock is affected by MV is best achieved by testing the most likely animals to show disease, including the older, thin, cull ewes. A regular, annual test of 12 cull ewes is being carried out on many flocks as a relatively inexpensive part of the health plan to monitor for disease. It is sensible to source replacement ewes from flocks that routinely screen for MV to reduce the chance of buying in infected animals.

### Accreditation

If you wish to maintain and demonstrate freedom from MV in your flock, you can join the Premium Sheep and Goat Health Scheme (PSGHS). Accreditation requires testing a significant proportion of the flock on a regular basis, as well as strict adherence to biosecurity.





## Neurological conditions

There are many conditions of sheep that can present with neurological signs. Sometimes treatment of individual animals can be unrewarding, but control and prevention at the flock level are often warranted. Some neurological conditions are covered elsewhere in this directory as conditions around lambing (such as pregnancy toxaemia), or mineral imbalances (such as Swayback). This section will cover six specific neurological conditions: Listeriosis, Cerebrocortical Necrosis (CCN), Gid, Louping ill, Scrapie and spinal abscess.

### Listeriosis

Listeriosis is caused by *Listeria monocytogenes*, a bacteria which lives in the soil. It is often (but not always) associated with animals eating poorly stored silage and so is commonly seen in winter or spring. Cases are often sporadic, with individual animals affected, but outbreaks can occur with up to 10% of the flock affected. Outbreaks often occur 10–14 days after consuming contaminated silage.

#### Risk factors

Young sheep (18–24 months old) are more commonly affected, and it is thought that loss of deciduous teeth and eruption of permanent ones may allow bacteria to enter across the gums. The bacteria cause micro-abscesses within the brain, leading to neurological signs and death if they fail to recover. The bacteria can also cause abortion and eye infection or 'silage eye', which is a painful infection and inflammation of the eye.

#### Early signs

The bacteria tend to only infect one side of the brain, and so causes unilateral facial paralysis. This may include a drooping ear, drooping lip, dropping food/saliva from one side of the mouth, a lowered eyelid, or a head tilt/circling to one side.

Affected animals may also be depressed, inappetent and sometimes disorientated. They may stand leaning against walls or with their heads in a corner. Diagnosis is generally made on the basis of clinical signs, although it may be confirmed by post-mortem examination of the brain if necessary.

#### Prevention and treatment

Treatment is more successful if attempted early and involves high doses of antibiotics along with anti-inflammatories, based on advice from your vet.

If silage is suspected as the source of listeria, feeding of that silage should be discontinued if possible. Silage that is poorly consolidated or has been exposed to air is most at risk because the pH rises and listeria bacteria multiply.

Listeriosis is a zoonotic disease, so caution should be taken at lambing time and when handling damaged silage, especially by pregnant women. It causes miscarriages in women and can be life-threatening to anyone with health risks, such as those aged over 65.

## Cerebrocortical necrosis (CCN)

### Risk factors

CCN is associated with low-fibre diets and often follows a change in diet or nutritional upset, which can alter the bacteria in the rumen. It is caused by a lack of thiamine (Vitamin B1) which is required for metabolic processes in the brain. This may be due to a primary deficiency (inadequate amounts being produced by the microflora in the rumen or absorbed by the animal) or excess thiaminase (an enzyme that breaks down thiamine, sometimes produced by bacteria in the rumen, but also found in bracken fern and horsetail).

CCN is a condition most commonly seen in young, fast-growing sheep (around 4–8 months old), and cattle.

### Early signs

Signs include staggering, high head carriage, stargazing and blindness. Sheep may separate themselves from the flock and seem to wander aimlessly. They may be hyperreactive to noises and, as the condition progresses, develop muscle tremors, convulsions and paralysis. This will be followed by death in 1–4 days if not treated. Diagnosis is based on clinical signs but can be confirmed by post-mortem examination of the brain if necessary.

### Prevention and treatment

Treatment involves regular administration of high doses of Vitamin B1 intravenously and then intramuscularly for several days, and recovery rates are good if treatment is administered early. Animals should respond positively within 24 hours, but blindness may persist for several days. Increasing the fibre content of their diet and avoiding sudden nutritional changes may also be advised.



Don't forget to worm any farm dogs every 6 weeks, with praziquantel. Farm dogs are likely to be at a higher risk of contracting tapeworms due to their increased access to infected sheep meat (compared to non-farm dogs). It is not possible to treat the sheep, so treating dogs is vital.

## Gid

Gid (*Coenuris cerebralis*) is caused by a tapeworm (*Taenia multiceps*) which causes cysts to form in the central nervous system of sheep. Although some tapeworms can pose a health risk to humans, *T. multiceps* is not associated with human health risks. Tapeworms are flat, parasitic worms, several of which can infect sheep at various stages of their life cycle. The life cycle of *T. multiceps* completes when dogs (or sometimes foxes) ingest sheep brains containing cysts.

Adult tapeworms develop in the intestines of the dog and produce eggs which are then excreted in their faeces. Sheep are infected by ingesting these eggs. Tapeworm larvae develop in the sheep, invade the nervous system and form cysts causing clinical disease.

### Early signs

The onset may be acute or chronic. Acute disease occurs when there is heavy pasture contamination by dog faeces, with death within a few days of the onset of neurological signs. Clinical signs include pyrexia, head pressing, depression, blindness, circling and head tilts. The chronic form is more common in growing sheep (6–18 months old), and signs are slowly progressive, developing a few months after sheep are infected.

### Prevention and treatment

Although surgery can treat affected sheep, it is rarely successful, and euthanasia is usually the best course of action. Control involves breaking the tapeworm life cycle, so worming farm dogs is important, as is preventing dog access to sheep carcasses. All dogs that access sheep fields should be treated with praziquantel every 6–8 weeks.

## Louping ill

Louping ill is a tick-borne viral disease primarily of sheep, but it can also affect many other mammals, including humans (although this is rare). Ticks become infected when they feed on an infected host; they then pass on the virus to their next host. Note that only a percentage of ticks carry the Louping ill virus. Tick numbers and geographical spread are increasing due to factors such as wetter summers and a reduction in sheep dipping, meaning that ticks are becoming a risk for more flocks. The virus affects the central nervous system causing neurological signs. In affected flocks, the mortality rate is around 5–10%.

### Risk factors

Clinical signs are most common in weaned lambs and yearlings. This is because immune sheep will pass on





antibodies to lambs via their colostrum, so young lambs tend to be well protected. Weaned lambs are more susceptible in the autumn when there is increased tick activity, and their maternal antibodies have waned.

### Early signs

The Louping ill virus affects the central nervous system and causes signs such as pyrexia, depression, reduced appetite, trembling, abnormal gait and seizures, leading to paralysis and death. However, this doesn't happen in all sheep. Often, the immune response that is triggered successfully eliminates the virus, and the sheep are immune for life.

### Prevention and treatment

There are several tick control options. These should always be discussed with your vet, as the best strategy will vary depending on specific flock circumstances. Control options include:

- **Plunge dips** – kill ticks immediately and control other ectoparasites such as sheep scab and blowflies, but are associated with some environmental and operator safety issues (see pages 24–25)
- **Pour-on treatments** – often have a longer duration of effect and may control other ectoparasites such as blowflies and lice, but don't provide immediate kill of ticks
- **Vaccination** – this may be another control option in the future (a previously available vaccine is no longer produced, but research is ongoing into an alternative)
- **Exposing lambs to ticks** in the spring, when they still have some protection from antibodies in colostrum, they will then generate immunity which will protect them in later life

### Spinal abscess

Spinal abscesses are a rare cause of paralysis in sheep. Hindlimbs are more commonly affected, resulting in sheep adopting a 'dog-sitting' posture. In lambs, this may be a result of infection following tail docking.

In adults, the cause of the abscess is more likely to be poor injection technique (e.g. injection site located too close to the spine and use of dirty needles).

Treatment is often unrewarding, although treatment with antibiotics and anti-inflammatories may be attempted. If multiple cases are seen, tail docking and injection techniques should be reviewed.

Anything that breaks the skin, such as an injection or a rubber ring, can allow the introduction of bacteria into the blood stream and cause spinal abscess.

### Scrapie

Scrapie is a prion disease caused by a contagious misfolded protein that causes fatal neurological disease. It has a very long incubation period, and signs are not usually seen until affected animals are two to five years old. It is highly contagious and difficult to kill and can be spread via milk and colostrum, contaminated bedding, buildings, equipment, vehicles and pastures where infected animals have grazed or lambed. Scrapie is a notifiable disease. Scrapie cannot be treated, so prevention is essential. Preventative measures can include strict biosecurity, buying replacement milk or colostrum from scrapie-free flocks and breeding for genetic resistance.

### Signs of scrapie

- Excitability, nervousness or aggression
- Trembling
- Strange high-stepping gait
- Lack of coordination
- Signs associated with intense itching
- Severe weight loss

## Notifiable disease

Notifiable diseases are diseases you are legally obliged to report to the Animal Plant Health Agency (APHA), even if you only suspect an animal is affected.

A list of notifiable diseases and their clinical signs can be found at [gov.uk/government/collections/notifiable-diseases-in-animals](https://www.gov.uk/government/collections/notifiable-diseases-in-animals)

If you suspect an animal on your farm is affected by a notifiable disease, you must call the Defra Rural Services helpline on 03000 200 301. This is a 24/7 service. Failure to report a suspect notifiable disease is an offence.

### What happens if a suspect notifiable disease is reported?

- APHA vets will investigate – they will visit the farm and place temporary restrictions on your premises while they investigate the suspicion
- If the APHA vet suspects a notifiable disease, they may take samples for testing, which may involve euthanasia of the suspected animal. Depending on the disease suspected, additional restrictions may be implemented, e.g. the introduction of a temporary control zone
- If a notifiable disease is confirmed, further statutory restrictions may be brought into force while the disease is eradicated

- Generally, you will be entitled to compensation for healthy animals that have to be culled as part of any strategy to control disease

## Foot-and-mouth disease

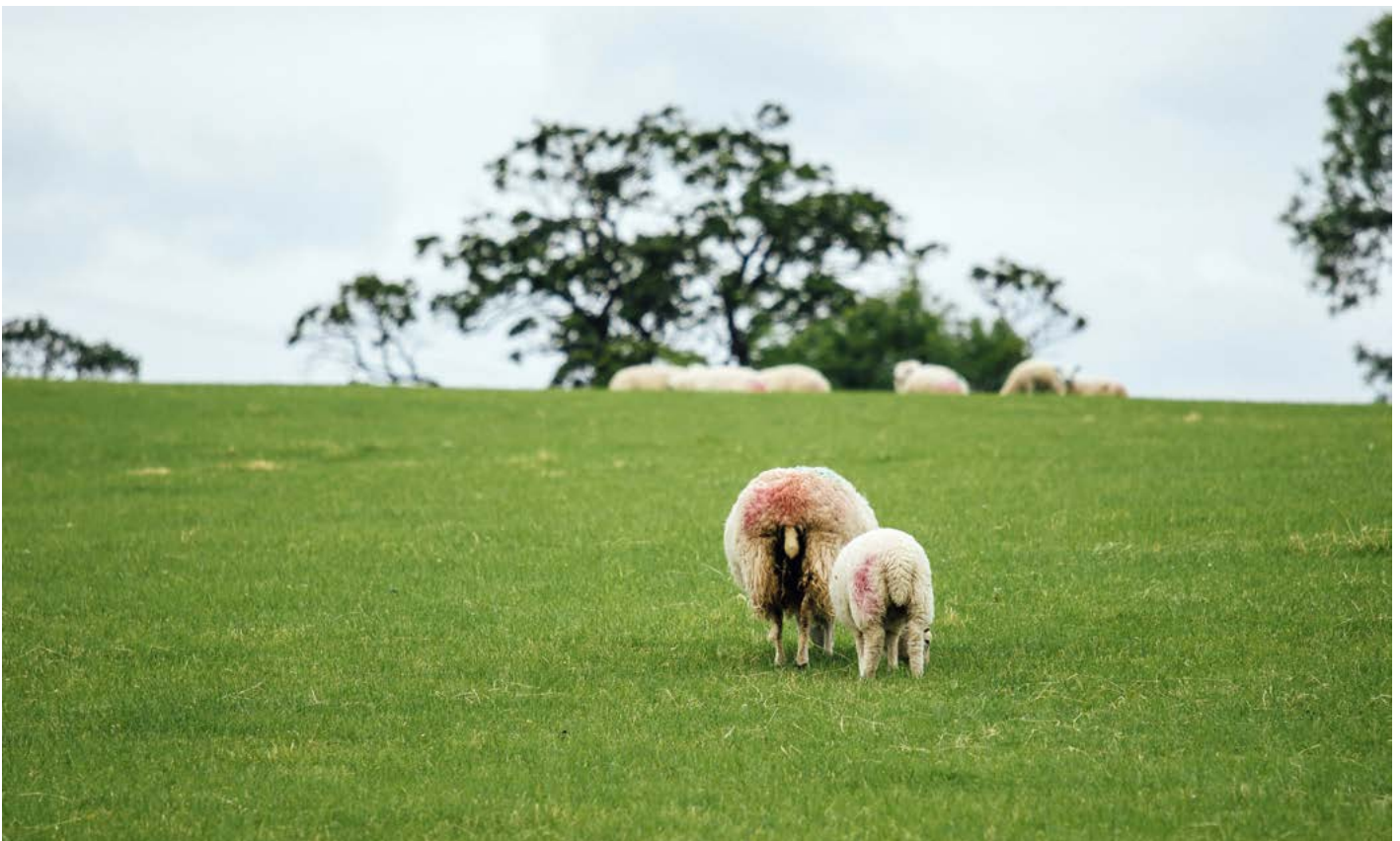
Foot-and-mouth disease is a highly contagious viral disease that affects all cloven-hoofed animals. It is a notifiable disease that causes painful blisters in the mouth and on the hoof or coronary band. It can be passed on through direct contact between infected animals but also by equipment, people, vehicles, clothing, bedding and anything else that has come into contact with an infected animal.

There is no vaccine or treatment for foot-and-mouth disease. Affected animals and other susceptible animals on affected premises are culled for humane reasons and to prevent the further spread of the disease.

### Signs of foot-and-mouth disease

- Sudden and severe lameness that spreads rapidly through the flock
- Tendency to lie down more than usual and reluctance to stand
- High numbers of stillbirths, abortions and lambs dying soon after birth
- Ewes reluctant to allow lambs to suckle

Sheep rarely develop blisters in their mouths. Blisters on the hooves are much more common but are usually very small and difficult to see.





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