

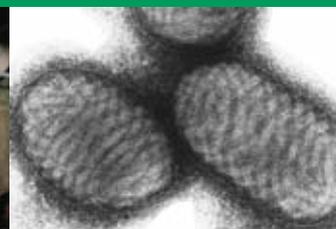


Better Returns  
Programme

# Sheep diseases directory



A producer's guide to keeping sheep healthy and profitable



The technical information in this booklet was supplied by The Moredun Foundation and compiled by Katie Brian, EBLEX Ltd. Technical input was also received from Harriet Fuller BVetMed, Cert SHP, MRCVS. The Moredun Foundation produces technical animal health news sheets for its members every three months. For further information about sheep health or Moredun's membership scheme, visit the Moredun website [www.moredun.org.uk](http://www.moredun.org.uk)

The EBLEX Better Returns Programme is grateful to all those who have commented on and contributed to this production.

Photography: The Moredun Foundation;  
Jenny Poland, RVC; NADIS; Charollais Sheep Society

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(some from originals by Scott Hamilton)

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Diseases in sheep and cattle have made the headlines many times over the last few years. The impact of a disease can range from an annoying set back in production to a devastating infection leading to widespread culling of the flock. What is certain, however, is that every disease contracted by each individual sheep or lamb has an impact on returns.

This directory introduces diseases, gives you some guidance as to what signs to look out for, and signposts you on to the next steps to take. It is intended to provide something of an early warning system for sheep producers. The main message from the Better Returns Programme is that the earlier you develop a control strategy or consult your vet about a potential problem, the less likely it is to have an impact on your productivity.

Many diseases can be prevented through better flock health management. Time spent on some simple bio-security measures is an essential aid to better flock health. We have included some more information on both of these topics at the back of this directory.

I hope you find this publication useful. EBLEX Ltd is always keen to hear your feedback.



David Raine  
Board Member  
EBLEX LTD



## Abortion – Chlamydial (Enzootic)

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 *Chlamydophila abortus* (former name *Chlamydia psittaci*).



### Implications

Chlamydial abortion can be extremely costly as it can lead to the birth of large numbers of weak or dead lambs. It is estimated that the cost of this disease to the UK flock is £23.8 million a year.

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. Ewes can carry the infection without showing any clinical signs and then abort in their next pregnancy. About 20% of 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 following initial infection. However, ewes that have aborted to Chlamydial abortion will not abort due to this cause again.

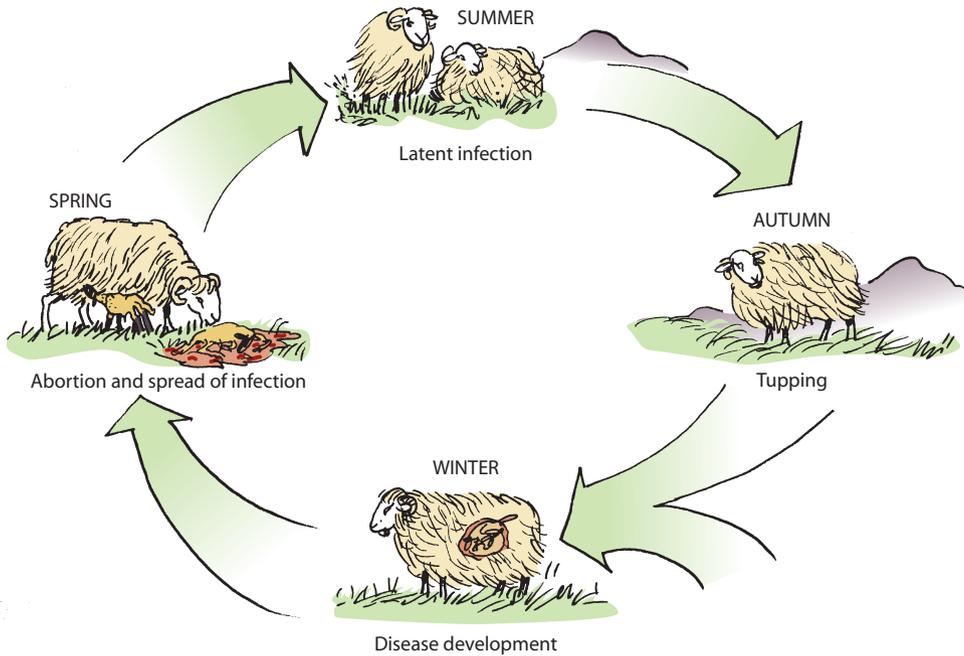
Chlamydial abortion is a zoonotic infection (one which can be transmitted to humans). Infection can cause severe illness in pregnant women and can result in miscarriage. Pregnant women should avoid all contact, either direct or indirect, with lambing ewes.

### Early signs and identification

The first sign is usually stillborn or weak lambs one or two weeks before the expected start date. Infected ewes can have one dead lamb and one live (weak or healthy) lamb. Aborted lambs may look normal or pot-bellied due to a collection of body fluid under the skin.

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

Ewes generally seem healthy, but will have a discharge.



## Next steps

Contact your vet to arrange submission of aborted lambs with their placentas to the local veterinary laboratory. When an abortion outbreak occurs, the aim is to prevent the spread of infection.

- 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
- Treatment of ewes yet to lamb with long acting oxytetracycline may be worthwhile to reduce the severity of infection – contact your vet immediately

Flocks which are free from infection need to adopt management practices to prevent them from exposure. Only purchase replacements from 'EAE accredited' flocks.

There are three vaccines available to control Chlamydial abortion. Flocks which have Chlamydial infection, or buy in replacements of unknown status, will benefit from vaccinating replacement ewes as they enter the flock. Generally 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. Flocks that breed their own replacements should identify and cull ewes that abort due to *Chlamydomphila*. Do not retain for breeding, ewe lambs which have been fostered onto aborting ewes.

# Abortion – 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 commonly diagnosed cause of infectious abortion in ewes, accounting for about a quarter of cases.



Cats become infected through ingestion of 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 in its favoured conditions (moist and warm).

Toxoplasmosis is not directly transmitted between sheep. Sheep are exposed through environmental contamination.

## Implications

It is estimated that abortions due to toxoplasmosis cost the UK sheep industry £12.4 million every year.

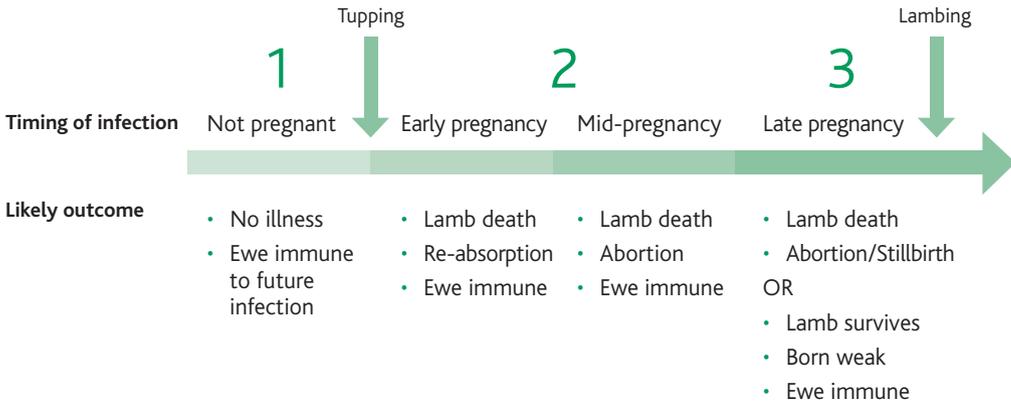
*Toxoplasma* can cause serious disease in pregnant women and immunocompromised people. Accidental exposure of the vaccine to humans can also cause infection.

## Lifecycle



## Early signs and identification

### Timing of Toxoplasma Infection



If ewes become infected with Toxoplasmosis in early pregnancy foetal re-absorption occurs, and ewes can appear barren. Infection between 50 and 120 days presents premature birth of stillborn and weak lambs or mummified foetuses. Sheep infected with Toxoplasma parasites when not pregnant develop a strong natural immunity and are unlikely to abort due to this cause in the future. To diagnose, submit dead lambs with their placenta to a veterinary laboratory. Tests can confirm the infectious agent so the correct action can be taken.

### Next steps

You cannot protect your flock from Toxoplasmosis by keeping a closed flock, as sheep become infected from eating oocysts in the environment. The main control options are vaccination and drug therapy. Vaccination is the most effective method of preventing *T.gondii* infection. It produces long-lasting protection through a single injection. Vaccination must be conducted at least three weeks before topping. Never vaccinate pregnant ewes. It is a live vaccine so handle with care.

Feeding the coccidiostat decoquinate to ewes during the last two thirds of pregnancy can reduce lamb losses due to Toxoplasmosis. It is most effective if being fed at the time the infection is picked up rather than after. This is significantly more costly than vaccination.

# Bluetongue

Bluetongue virus (BTV) affects all ruminants and there are 24 different strains. Sheep are most severely affected but cattle are the main carriers of the virus. Even in sheep, the severity of disease can vary from slight to severe, depending on the strain of the virus and breed of sheep. Infection is spread between animals by biting midges of the *Culicoides* species. Incidence has historically been largely restricted to the tropical and subtropical areas but BTV8 arrived in the UK in September 2007 and is a serious threat to the industry. It changes the mucous lining of the mouth and nose and the coronary band of the foot.

## Implications

Bluetongue is a notifiable disease in the UK and suspected cases must be reported immediately to your local animal health office.

Bluetongue can cause severe losses in the flock both in terms of animals that die and due to the effect on long term performance e.g. chronic ill thrift, impaired fertility. Also, movement restrictions have a significant impact on trade.

## Early signs and identification



and damaged areas can turn blue (hence the name Bluetongue).



The disease causes swelling (oedema) of the face, head and neck. Erosions and ulcers can appear in the mouth. In some rare and severe cases, blood supply fails

Sheep are stiff, often lame and reluctant to move, and they are depressed in appearance. There is reddening of the

mucosa (lining) around the eyes, nose, lips and in the mouth.

## Next steps

In regions of the world where Bluetongue is endemic, vaccination is the main method of disease control. In the UK, movement restrictions have been used to try to contain the disease. However, the aim is for all susceptible livestock to be vaccinated. Sheep require a single initial dose followed by annual boosters.

The longterm aim in the UK is that widespread vaccination will mean BTV8 will die out. However, other strains of BTV are present in Northern Europe and the chances of one of these entering the UK are high. BTV8 vaccine will not protect against other strains.

Strict biosecurity and quarantine of all sheep brought on to the farm is an essential element in the control and prevention of all diseases and Bluetongue is no exception.

EBLEX has produced a leaflet to assist farmers in vaccinating their sheep and cattle. Call 0870 241 8829 for a copy.



# Coccidiosis

The incidence of Coccidiosis has increased since lambing became more intensive. The disease can cause severe growth checks, resulting in lambs finishing later. Infection is caused by a small protozoan parasite (*Eimeria*), which invades the intestinal cells of the sheep. They are host-specific (i.e. those that infect sheep do not infect cattle or goats). There are 11 types of *Eimeria* that infect sheep, but only two cause damage to the intestinal tissue and are therefore important in causing disease. It is the combination of heavy challenge in young animals, or those in which resistance is lowered, that invariably leads to outbreaks of clinical disease.

## Implications

Coccidiosis has severe welfare implications for young livestock, so infections must be monitored.



## Early signs and identification

Lambs ingest coccidial eggs (oocysts) from an environment that has been contaminated with faeces of previously infected ovine stock (feed, troughs, bedding, teats).



Lambs 4–7 weeks of age are most usually affected by the disease. Signs of the disease appear shortly after infection and include

diarrhoea; lambs can strain until blood is seen in faeces. Where challenge is heavy, disease may occur before eggs appear in faeces. Heavy infestations can cause irreversible damage to the gut.

Oocysts can easily be identified in faecal samples.

## Next steps

Prevention is reliant on good hygiene and husbandry. Keep pens and feeding troughs clean and dry. An adequate intake of colostrum will assist the lamb in coping with coccidial infection. Avoid grazing young and older lambs on the same pasture and in particular on the fields, which carried ewes, and lambs within the previous 2–3 weeks. Treatment of ewes with an anticoccidial around lambing will reduce contamination of buildings/pastures with oocysts.

Drugs are available for the control and prevention of coccidial infection and should be administered as soon as a positive diagnosis from lambs scouring is identified. It should be treated as a flock problem rather than on an individual basis. Lambs that show marked scouring may also require supportive rehydration.

# 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 used.

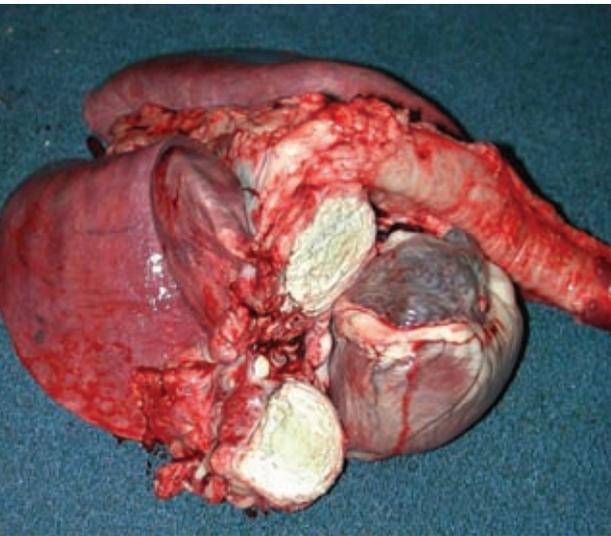
The first reported case in a sheep in the UK was in 1991. It is difficult to estimate the total number of cases as many are not reported.

CLA is a chronic infection of tissue and the lymph glands. Bacteria enter through cuts and abrasions and are sometimes breathed in.



## Implications

CLA causes economic loss due to the culling of infected animals and carcass contamination. Sometimes the carcass can be downgraded or condemned. The disease can affect animal condition, milk production and reproductive performance. It could affect market trading as unsightly abscesses affect sales of breeding sheep. Although instances are rare, humans can catch the disease.



## Early signs and identification

The bacteria that cause the disease can survive in the environment for several months and are highly infectious. Clinically the lesions are seen as external lumps where the surface lymph nodes are affected. Abscesses can also be found in the lungs or other internal organs. The abscesses often contain cheesy pus which is loaded with highly infectious bacteria.

The lymph nodes around the head and neck are the most commonly affected areas. CLA abscesses in internal organs and lungs can also lead to respiratory distress and chronic weight loss.

The abscesses are usually cold and painless, but if too many appear internally and externally the sheep may become thin and die. It is very infectious and therefore hard to eradicate once established.

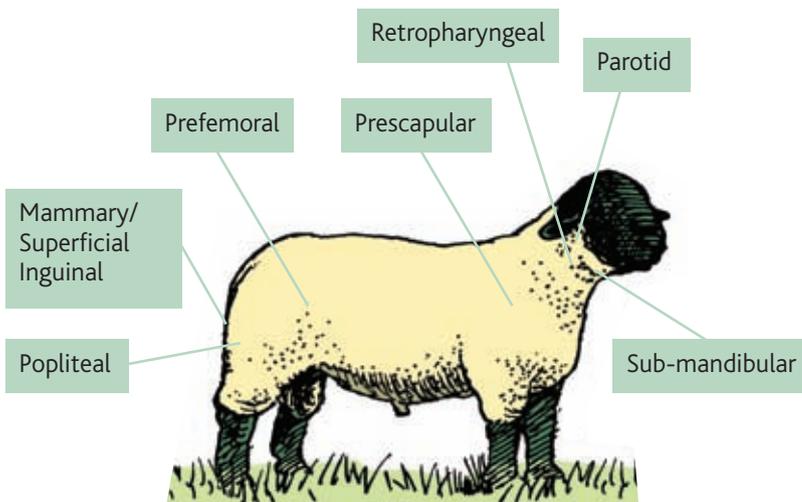
## Next steps

Control measures should include:

- Quarantining (of animals and premises)
- Screening of imported animals
- Culling infected animals
- Rigorous hygiene procedures
- Shearing equipment should be dipped in strong disinfectant or chlorine bleach before and after use

Antibiotic treatment is ineffective. A heightened awareness of CLA and prompt veterinary investigation of suspect animals is required. There is a blood test that allows farmers to screen groups of animals for CLA. This test is available through SAC's CLA-monitored scheme which can reduce the chances of inadvertently introducing the disease into your flock.

## The position of the lymph glands in which caseous lymphadenitis abscesses may be seen or palpated



# Clostridial diseases

Clostridial bacteria have the ability to form exceptionally tough structures known as spores that 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 and produce powerful toxins. These factors include:

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

## Implications

Clostridial diseases often cause sudden death. Despite the availability of cheap, effective vaccines, losses due to clostridial diseases remain high, resulting in significant losses to the sheep industry.



## Early signs and identification

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

- A) Those affecting the alimentary system (parts of the body where food passes) and internal organs through the release of toxins, including:
  - Lamb dysentery
  - Struck
  - Pulpy kidney
  - Braxy
  - Black disease
  - Bacillary haemoglobinuria
  - Abomastitis
  - Toxaemia
- B) Those causing muscle damage or gangrene and the circulation of clostridial toxins in the blood, eg:
  - Blackleg
  - Gangrenous metritis and navel ill
  - Big head
  - Malignant oedema
- C) Those causing nervous damage:
  - Tetanus
  - Botulism
  - Focal symmetrical encephalomalacia

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 associated with contact with poultry litter.



### Next steps

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, prevention by vaccination is the only practical way to reduce mortality from clostridial diseases.

Good management can reduce the onset of disease, but should not be used on its own to prevent it. Most vaccines provide comprehensive protection, but the manufacturers' guidelines need to be followed carefully.

Purchased stock should be included in your essential quarantine management programme to prevent importing and spreading infectious diseases.

Vaccination of ewes in late pregnancy results in antibodies in colostrum, which protect young lambs until 12–16 weeks of age. Boosters should be given to manufacturers instructions.



# Ectoparasites

There are a number of parasites that inhabit the skin or fleece of sheep in the UK. These can significantly affect productivity, reduce reproductive potential, lead to a poor lamb crop, reduce meat and milk production and reduce the quality of leather.

The effective control of parasites depends on whether it 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, and less common ones such as ear mites, mange mites, sucking lice and keds. Semi permanent Ectoparasites include blowfly strike, ticks and less common nasal bot flies and head flies.

## Implications

Ectoparasites can have an effect on the welfare of the animal and untreated infestations of scab or blowfly can be fatal.

Sheep scab alone costs the UK sheep industry £8.3 million every year. Flock-owners have a legal responsibility to prevent or cure infestations.

Control can be expensive, labour intensive and time consuming. Health and safety and environmental laws have strict requirements to follow. In some areas scab and lice have been found to be resistant to synthetic pyrethroids (SPs).

## Early signs and identification

It is vital that flocks suspected to have ectoparasites are inspected by a vet for a definite diagnosis. More than one parasite could be causing a problem at the same time.

If permanent ectoparasites are found on one animal the whole group should be considered infested and therefore treated. If one sheep is missed it might re-infest the whole group.

Get correct identification through consulting your vet.





**Sheep Scab** is the popular name for psoroptic mange. It occurs on all wool-covered parts of the body and in the ears and produces intense irritation. The sheep scratch, skin becomes thickened and even ulcerated, and then the wool becomes detached.

**Chewing lice** live in the woolled areas of the sheep, feeding on wool and skin debris and can cause significant welfare issues. They are often found on sheep in poor body condition and so it can be an indicator of other underlying diseases.

**Blowfly strike** occurs due to infestations of the larvae (maggots) of the greenbottle or bluebottle fly. They feed off the skin and the flesh of the sheep causing the skin to become raw and the wool to fall off.

**Ticks** feed on the blood of sheep and are carriers of other diseases. Tick populations are increasing in the UK and hill grazing farmers have reported 20% loss of lambs from tick-borne diseases.

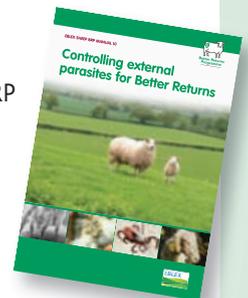
### Next steps

Good biosecurity can prevent the introduction of permanent ectoparasites. Good fencing will also prevent contact with neighbouring flocks and quarantine of incoming stock for at least three weeks. Looking for signs, will help prevention.

Thoroughly disinfect vehicles and trailers used to transport livestock as permanent ectoparasites can survive off the host for a period of time.

All ectoparasite treatments should be administered strictly according to the manufacturer's instructions. Dip baths must be accurately calibrated and where injections or pour-ons are considered sheep should be accurately weighed.

for more information, and consult your vet. Also see BRP manual: *Controlling external parasites for Better Returns*



# Johne's Disease (Paratuberculosis)

Johne's disease is a chronic infection affecting the small and large intestine of ruminant animals.

The disease is caused by infection with a bacterium called *Mycobacterium avium* subsp. *paratuberculosis* (MAP) which is a very slow growing organism that can survive for long periods in the environment.

The disease is spread through the accidental ingestion of faeces from an infected animal. The infection can also be passed on in colostrum or milk and across the placenta to unborn lambs. Young animals are more susceptible to infection than adults. The incubation period is 2–4 years and the animals often show no signs of illness until later in life. Sheep that are infected but show no signs of disease are said to be subclinically infected and act as carriers. The disease is usually introduced to a farm through the purchase of subclinically infected stock.

## Implications

It causes a significant loss in productivity, higher numbers of thin ewes and increased culling.

## Early signs and identification

The identification of Johne's disease is problematic and there is no single diagnostic test that can detect all stages of the disease. Subclinically infected stock are extremely difficult to diagnose and can even test negative. Post mortem is the most reliable means of diagnosis. In sheep diarrhoea is not a symptom, unlike in cattle.

The disease is characterised by:

- Severe weight loss
- Loss of body condition
- Ultimately, death

## Next steps

The early culling of affected animals and their offspring will help to limit the disease. However, vaccination appears to be the most effective method of control. Currently, the only vaccine available in the UK has to be imported, so it is only available through your vet, who must apply for a Special Import Certificate. Unfortunately, there is currently no way of reliably identifying subclinically infected animals, so there is a risk of introducing infection with bought in stock.

Rabbits are carriers of the infection, so trying to eradicate it from a property can be impossible.



# 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). Although it has been known for many years it is still unclear exactly how the disease develops and how it might best be prevented.

There is a very long incubation period between infection and the onset of the disease. The number of animals in a flock that are infected with the virus may therefore be much greater than the number that develop symptoms. Most cases are seen in adult sheep of 2–4 years old, but cases have been reported in lambs as young as two months and in sheep as old as 11 years.

## Implications

Losses are due to increased mortality, increased culling and reduced performance of ewes. It has been estimated at £0.5 million a year to the UK flock.

## Early signs and identification

The symptoms of OPA are similar to those of pneumonia, i.e. general loss of condition and breathing difficulties. However, sheep with OPA do not respond to antibiotics and do not have a raised temperature. A feature unique to OPA is over-production of fluid in the lungs, which may be apparent as a watery discharge from the nose.

Sheep suspected to be infected should be isolated from the flock and a vet contacted immediately. Post mortem examination of the lungs is advised in order to confirm the diagnosis.



The typical symptoms

- Difficulty breathing
- Often marked weight loss
- Over-production of fluid in the lungs (unique to this disease), which may be apparent as a watery discharge from the nose

## Next steps

Protection by vaccination is a long-term goal, but currently animal management methods offer the best approach for control. Once clinical symptoms develop, the disease is normally fatal and there is no treatment available. In flocks affected, regularly inspect adult sheep, remove and cull any affected animals. Removal of offspring of affected ewes is also recommended.

Moredun has developed a blood test which can be used to detect OPA on a flock basis, and it is hoped that this will soon be available commercially. Meanwhile, it is impossible to be sure that bought in stock are not carrying the virus.

# Lameness

Lameness in sheep flocks is one of the most common and persistent disease problems.

It is unrealistic for any flock to expect to never have lame sheep but they should be attended to as soon as practically possible. Infectious forms of lameness need to be dealt with on both an individual sheep and a 'whole flock' basis. Easy to use and appropriate handling facilities plus well maintained equipment are necessary to make foot care practical to carry out and effective.

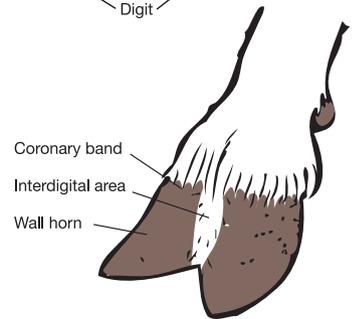
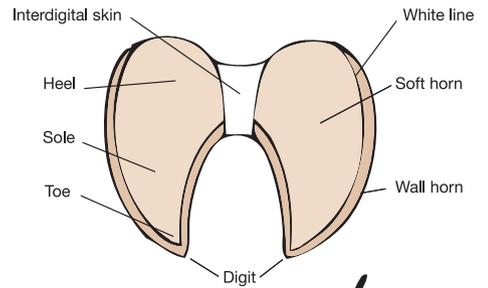
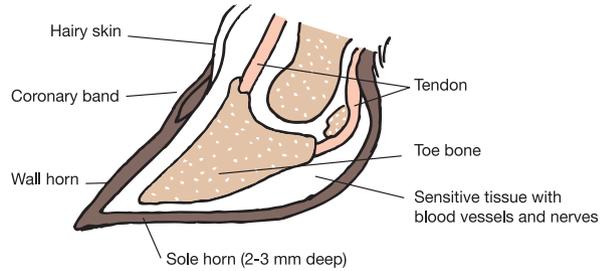
## Implications

As well as resulting in significant economic loss, lameness is an important welfare concern. Lameness costs the industry £24.4 million every year.

## Early signs and identification

Early signs of lameness can be quite subtle but early identification and prompt treatment of individuals or groups as appropriate is essential.

Lame sheep might also lie down a lot and be reluctant to move around.



**Scald**



**Footrot**



**CODD**

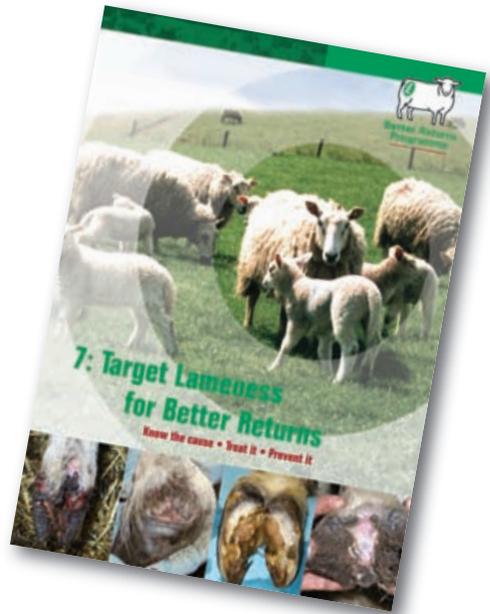
## Next steps

When lame sheep are identified, it is important that they are isolated and treated appropriately as soon as possible. Foot trimming should be kept to a minimum and feet should not be pared too hard; in particular care must be taken not to cause bleeding, which is painful and can lead to formation of granulomas. The most important causes of lameness in the national flock are scald and foot rot. A relatively new but serious infectious disease called contagious ovine digital dermatitis (CODD) is becoming a problem in some flocks and can cause severe lameness.

Infectious forms of lameness can be introduced by buying in sheep. Always quarantine all new stock and treat any problems to prevent introducing a problem to the rest of the flock.

Foot health, including shape, horn quality and susceptibility to foot rot may at least partially be inherited. Therefore it is important to select breeding stock with sound feet.

For more detailed information on lameness see BRP manual number 7: *Target Lameness for Better Returns*.



**Toe granuloma**



**Toe abscess**



**Shelly hoof**

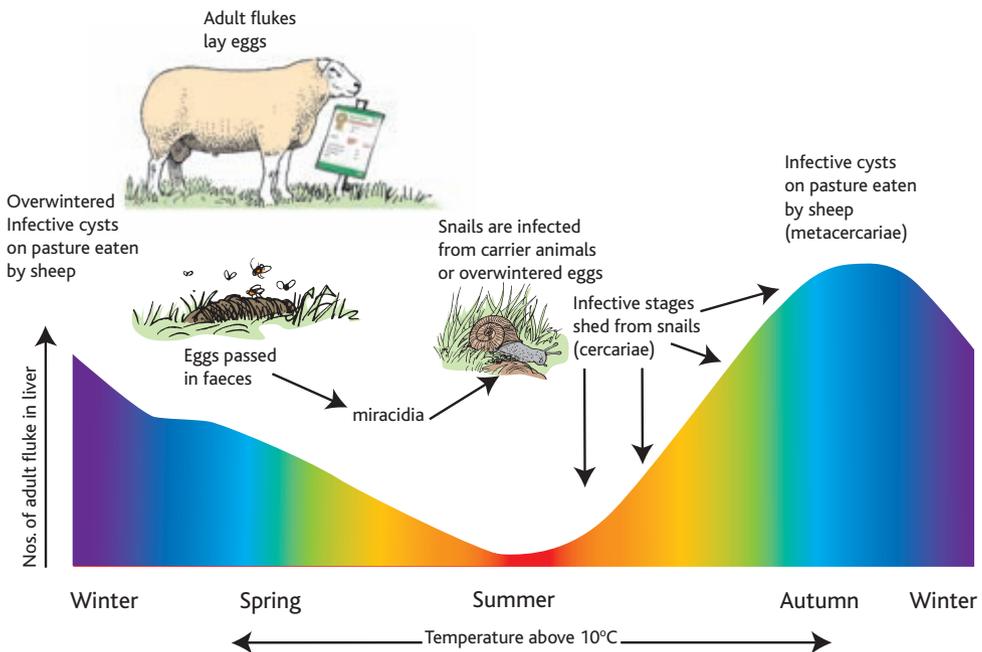
# Liver Fluke

Liver Fluke disease or fasciolosis is caused by a 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.

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, *Lymnaea truncatula*, which is found in wet muddy conditions and particularly areas associated with poor drainage. Fluke disease can only be maintained in areas which have suitable habitat for the mud snail. However, disease can also be seen in drier areas in bought in animals.

The reported incidence of liver fluke disease in sheep and cattle has increased over the past ten years. This is thought to be due to milder, wetter winters and wetter summers.

## Patterns of fluke infection over the seasons



## Implications

Liver Fluke disease causes significant losses to the UK sheep industry. Severe disease results in death, whilst milder infections result in a significant reduction in flock performance e.g. reduced lambing percentages, reductions in lamb growth rate.

## Early signs and identification

There are three clinical forms with varying degrees of severity depending on the timing, level and duration of the ingestion.

**Acute fasciolosis** is the least common form and occurs when sheep ingest massive numbers of infective cysts from herbage over a relatively short period of time 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 the abdomen may be swollen.

**Sub-acute fasciolosis** occurs when infection is acquired over a prolonged period of time. 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 year, around November-February. Signs include:

- Rapid weight loss
- Anaemia
- Shedding of low numbers of fluke eggs

**Chronic fasciolosis** is the most common and widespread form, and can occur in summer or winter. Moderate numbers of eggs will be present in faeces and other signs include:

- Progressive loss of body condition/weight
- Anaemia
- Pale membranes
- Swelling below the jaw (in severe cases)

Death is rare in well-nourished sheep.

## Next steps

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

Available products 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, so this has been the most frequently used flukicide in the UK. However, over the past ten years, resistance to triclabendazole has been reported. It is, therefore, more important than ever to use the right product at the right time, and not to over use any particular drug.

Fluke can be introduced to a farm with bought in sheep. The quarantine of bought in sheep should be included in your treatment plan. Sheep can continue to shed fluke eggs for up to three weeks after treatment, so bought in sheep should be grazed on areas which do not support the mud snail for at least three weeks after quarantine treatment. If fluke infected sheep are not treated, the fluke can survive in their bodies for years.

Consult your vet for a dosing schedule to suit your individual situation.



# Maximising lamb survival

A few losses around lambing are unavoidable in any flock, but unacceptably high levels can be avoided if sound husbandry, health measures and skilled shepherding are used.

## Reasons for losses



- Abortion
- Infectious disease
- Hypothermia
- Predators
- Difficult lambing
- Genetic defects

## Early signs and identification

There are a variety of infections that can lead to abortion (miscarriage). During pregnancy, optimum growth of the placenta is crucial to lamb survival and growth. Hormones affect colostrum and mothering ability of the ewe. Do not under- or over-feed ewes. Correct ewe nutrition is vital to ensure good lamb birth weight and plentiful milk supply.

**Joint Ill** is caused by infection, which 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 hind limbs only, or all the limbs.

## Hypothermia

Lambs are born with a supply of energy, which lasts for up to five hours. If the lamb does not feed in this time, its body temperature will fall and it will become hypothermic. Chilling also causes hypothermia, especially in lambs, which have not fed adequately.

**Watery Mouth** is usually fatal. Affected lambs usually stop feeding, show signs of abdominal pain and are wet around the mouth. *E. Coli* is commonly isolated from cases. However, inadequate colostrum intake is usually the underlying cause.

## Next steps

Hospital facilities are essential in any flock. They provide some protection to the flock through isolation of sick animals and provide a suitable environment for intensive care.

Facilities should be well-lit, have hot water readily available, and power points should be accessible for supplying a lamb-warming box and infra-red lights.

Ensure all lambs receive adequate colostrum immediately after birth and have their navels treated. If any ewes or lambs become ill, isolate and treat them. Remember that some infectious diseases can be transmitted to humans.

**Pre-lambing**

- Scan so that ewes can be grouped and fed according to number of lambs carried
- Analyse forage supplies and supplement with concentrates accordingly. Good nutrition of pregnant ewes is paramount
- Ensure shelter is available for outdoor flocks – even if just bales of straw
- For indoor flocks ensure you have adequate lambing pens (one per 10 ewes)
- Footbath ewes prior to housing, treat and segregate any that are lame

Vaccination against clostridial infections to ewes in late pregnancy boosts the ewes' immunity but is also crucial to lamb survival.

**At lambing**

- All lambs' navels should be treated soon after birth. Treat immediately to disinfect and dry up the cord, this prevents micro-organisms tracking up the cord. Repeat a few hours later
- Ensure lambs have adequate colostrum as soon as possible after birth to provide the lamb with the essential antibodies to protect it against infection (50ml per kg bodyweight in the first six hours, and 200ml per kg in the first 24 hours)
- If you castrate or tail using a rubber ring, this must be done in the first week of life. Other methods can be used in older lambs

**Assistance at lambing**

The aim should be to provide maximum supervision to lambing ewes with minimum interference.

- Assist if a ewe has been straining for an hour but nothing is showing, or if a ewe has been straining and given up (maybe tail or head showing, no fore limb, no progress)
- Before internal examination think cleanliness (armlength disposable gloves) and use copious lubrication to manipulate lambs with minimal damage

If you assist, always inject the ewe with antibiotics and an anti-inflammatory and keep her close by for frequent observation.

Lambs can become hypothermic through exposure during the first few hours after birth, or after 12 hours due to starvation. In lambs that are severely hypothermic (body temperature less than 37°C), treatment should be as follows:

**Less than 5 hours old**

Dry thoroughly  
Warm to above 37°C  
Feed warm colostrum with stomach tube  
Warm to 39°C

**Over 5 hours old**

Inject intraperitoneal glucose 20% at 5–10ml/kg (your vet can advise you how to do this)  
Feed warm colostrum with stomach tube  
Warm to 39°C



# Mineral deficiencies

Minerals are required in the sheep's diet in different quantities. Trace elements are needed in very small quantities but are essential for the maintenance of health. Others, such as calcium and phosphorus, are required in larger quantities.

## Implications

A lack or over supply of any one mineral or vitamin can cause a variety of problems.

## Early signs and identification

**Calcium** – a lack of calcium in late pregnancy is called 'lambing sickness in ewes' or hypocalcaemia or milk fever. It can be mistaken for pregnancy toxoemia or louping ill. It causes the ewes to become paralysed in the hindquarters, they can partially lose consciousness.

**Copper** – Sheep may suffer copper deficiency because the level in soil is inadequate, or because other minerals are binding to copper and preventing its absorption. The most important effect of copper deficiency is swayback in lambs, causing incoordination and a tendency to sway on their back legs. The condition can be congenital or delayed, and some lambs are so badly affected

that they are unable to stand. However, excess copper is poisonous to sheep. Copper toxicity is mostly seen in animals receiving concentrates over a long period of time. Affected animals show signs of diarrhoea, are often found dead and the carcass is jaundiced.



**Cobalt** – in certain areas of the country cobalt is deficient. Symptoms of deficiency are:

- Weakness
- Anaemia
- Stunted growth
- Dull fleece
- Poor fertility in ewe

**Magnesium** – Hypomagnesaemia or lactation tetany usually occurs in ewes within the 4 to 6 weeks after lambing. Affected ewes show trembling, and are often either unable to walk or walk in an uncoordinated manner. If stressed, they will rapidly become recumbent, with rigid extension



of the legs and titanic spasms. Death can often be very rapid. Sheep can not store magnesium, and require a daily supply, especially during lactation when demands are high. Magnesium levels are low in rapidly growing spring grass.

**Vitamin E and selenium** – In many areas of the UK, the soil is deficient in selenium. Vitamin E levels are low in conserved forages. If pregnant ewes are fed diets low in selenium and/or vitamin E, this can result in White Muscle Disease (stiff



lamb disease) in lambs up to 6 months. Lambs may be born weakly and die, or they may develop signs of generalised weakness and stiffness. Selenium deficiency may also affect ewe fertility by causing high embryonic mortality at the time of embryo implantation.

subcutaneous injection of calcium solution.

**Copper** – be careful where to graze sheep. Do not graze in orchards where fruit trees have been sprayed with copper salts or land treated with copper sulphate. Sheep have the capacity for storing copper so do not feed excess of 10

parts per million of copper in dry feeds over long periods.

**Cobalt** – If cobalt deficiency is suspected in lambs, blood samples would be required to confirm the farms situation. Where there is recognised deficiency, lambs will require routine cobalt supplementation from mid summer. This may be in the form of liquid drenches, in concentrate feed, in rumenal boluses, or by injection of vitamin B12.

**Magnesium** – target for the spring grass to be no more than 2.5% potassium in the dry matter. Potassium has an antagonistic role in causing magnesium disorders. If you introduce the animals earlier but more gradually to spring grazing it reduces the challenges.

**Vitamin E and Selenium** – dietary concentrations (mg/kg dry matter) of 0.1 for selenium and 30-50 for vitamin E should ensure adequate status of both nutrients. Pregnant ewes require 100mg of vitamin E per day. Over-supplementation should be avoided to prevent poisoning.

Consult your vet if you are worried about a serious problem.

# Mastitis

Mastitis frequently results in the loss of the affected half of the udder and consequently the culling and then replacement of a ewe. There are two forms: acute and chronic. Acute mastitis is a very painful disease.

The actual route of infection is not fully understood. However, it is thought that infection occurs through the teat canal or teat sores, caused by orf or vigorous sucking, allowing the bacteria to infect the udder. It is usually caused by *Staphylococcus aureus*, which lives on the skin of the ewe or *Mannheimia haemolytica* which is plentiful in the throat of healthy lambs.

## Implications

In lowland flocks, mastitis is one of the main reasons for culling ewes. Additionally lamb growth can be impaired and some ewes may die from the disease.

## Early signs and identification

**Acute mastitis** is usually seen in the first weeks after lambing and can rapidly progress to cause death of the ewe.

The ewe may stop the lambs suckling, her udder may become hot, red and swollen, and extremely painful. Infected ewes have no milk in the affected quarter 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.



### The signs for acute mastitis are:

- High temperature
- Loss of appetite
- Altered gait caused by the painful udder
- Swelling in front quarter, hard and swollen

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

## Next steps

Hygiene in the lambing sheds and pens will reduce the risk of mastitis caused by environmental organisms such as *E.Coli*. Consider vaccinating against orf, avoid teat lesions and ensure good fly control.

Reduce udder damage through ewe management:

- If producing too much milk restrict grass
- Do not expect a ewe to rear triplets
- Check your weaning policy – put ewes on a reduced diet away from sight and sound of lambs
- Ensure ewes are well fed in early lactation to improve milk yield – hungry lambs damage teats

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

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

# Orf

Orf is a highly contagious skin condition, which affects mainly young animals in their first year of life.

Other skin conditions can be confused with orf. The more serious outbreaks are generally associated with intensive sheep husbandry where there is a build up of infection in the buildings.

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

## Implications

Orf has been shown to cost the UK sheep industry £10 million a year.

Humans can also become infected with orf, resulting in localised swollen, red areas, which can be painful and on occasion result in severe systemic reactions.

## Early signs and identification

Infection normally runs a course of four to six weeks and is associated with poor growth during that period.

The orf virus causes scabby lesions around the mouth and nostrils of lambs. Lesions can become extensive and can affect the mouth, resulting in serious disease and mortality.

Orf can also affect other parts of the body, particularly the teats of ewes and lower legs of lambs. Ewes with infected udders may refuse to let lambs suckle.



## Next steps

There is no practical method of killing the virus once it has infected the animal, however the use of antibiotic sprays will minimise the risk of affected animals developing secondary bacterial infections. Attention to feeding may prevent weight loss in lambs having difficulty sucking.

The virus will survive a British winter outside but if protected from the weather it can persist in buildings for many years. Cleaning and disinfecting buildings is therefore important in controlling orf.

There are effective vaccines available, but they consist of viable organisms so may contribute to the environmental pool of infection. The vaccine should be applied to ewes at least eight weeks before lambing and the ewes should be kept away from the lambing area until the scabs are shed. Alternatively, vaccine may be applied to lambs when a problem is encountered. In no circumstances should the vaccine be used on farms that do not have a problem with orf.

# Pasteurellosis

Pasteurellosis is the term used to describe a number of disease forms caused by two related bacteria:

- *Mannheimia haemolytica* (previously *Pasteurella haemolytica*), which causes pneumonia in all ages and septicaemia in young lambs
- *Pasteurella trehalosi*, causing severe systemic infections in older lambs

Both types of bacteria are found in the nose and tonsils of normal healthy sheep.

## Implications

Pasteurellosis affects all ages of sheep and causes significant losses to the sheep industry. Disease is often very acute with animals being found dead.

## Early signs and identification

Pasteurellosis is often triggered by stress which may be caused by:

- Management systems (dipping, castration, clipping, dosing for worms, excessive gathering in warm weather)
- Transportation
- Climate (warm still weather and cold, wet, windy weather)
- Diet change
- Other infectious disease (viruses, tick-borne fever, other bacteria)

*M. haemolytica* causes acute pneumonias in all ages from about two months onwards and these occur either as flock outbreaks or as sporadic cases.

Signs of acute cases include:

- High temperature
- Found dead
- Depressed
- Laboured breathing

In very young lambs, *M. haemolytica* causes a septicaemia, and lambs are usually found dead.

*P. trehalosi* causes severe systemic disease most commonly seen in hogs and store lambs from September to December. The typical history is of a number of sudden deaths over a few days following transportation and/or a change of diet.

## Next steps

Managing the flock to reduce all the trigger factors outlined above is crucial to the prevention and control. Cases can be treated with antibiotics, which can help in the event of an outbreak.

Vaccination is effective in reducing losses. The pasteurella vaccines available protect against *M. haemolytica* and *P. trehalosi*. A primary course of two doses is needed to stimulate immunity. Thereafter booster doses should be given prior to periods of high risk.

There are combined vaccines that protect against clostridial diseases and pasteurellosis.



## Worm control

Worms are a major threat to the performance and health of lambs. Controlling worms is a vital part of any management programme and 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). Resistance to all major anthelmintics groups has now been found in the UK.

### Implications

The number of farms with resistant worms is increasing, all farmers should remember that the shift to resistance is irreversible and threatens all farms. There are only three groups of chemicals on the market and the SCOPS (Sustainable Control of Parasites in Sheep) guidelines should be followed.

### Next steps

Effective quarantine of all sheep brought on to the farm is critical to protect against resistant worms.

Administering the drench correctly is vital, so drenching guns should be checked to ensure they are measuring accurately and sheep weighed to ensure the correct amount of drench is given.

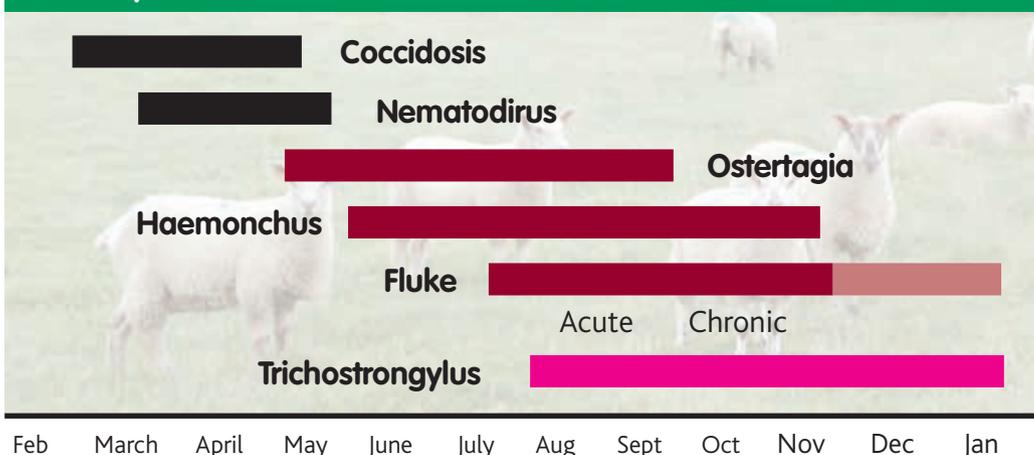
Use faecal egg counts to check ewes and lambs worm status and drench if required.

There are two basic weapons in the fight against resistance.

- **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.
- **Reducing selection pressure** – using anthelmintics less often and avoiding practices which select rapidly for resistance, e.g. drenching and then putting treated sheep straight on to clean pasture.

For further information see BRP manual number 8: *Target Worm Control for Better Returns*.

### When parasites threaten



# Best practice for flock health and management

## Medicines

The correct use of medicines is important.

- Draw up a health plan with your vet, indicating which medicines to use to treat the diseases that occur on your farm
- Always read the label, even if you have used the product previously, as instructions, especially withdrawal periods, can change
- Always follow the instructions as the product has been licensed by an independent committee to be used as instructed
- Always store in a locked container which is childproof and maintains the products at the recommended temperature
- Record the use of all medicines in the medicine book either on an individual sheep or flock basis
- Ensure product date has not expired

Injectable medicines may be designed for subcutaneous (under the skin) or intramuscular (into muscle) administration. Other medicines are given by mouth as a drench.

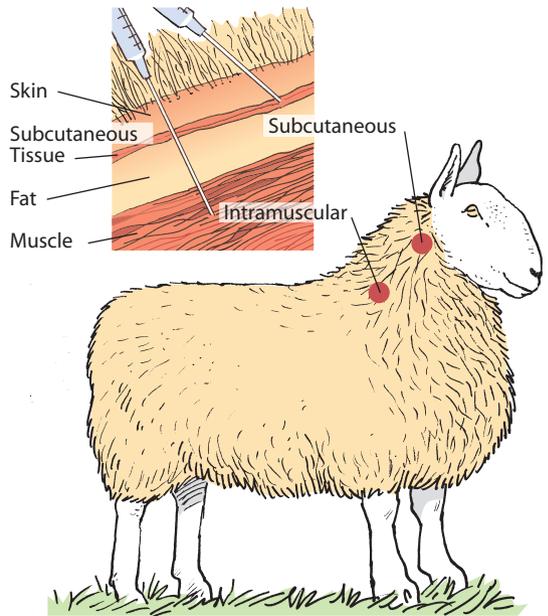
**Subcutaneous injections** need to be administered with care to ensure the product is placed under the skin and not into fleece or muscle. The sheep needs to be well restrained and the skin 'tented' away from the underlying muscle. The injection site is 10–15cm (4–6 inches) below the ear. Usually a 1.6cm (5/8th inch) needle is ideal. After administration the site should be gently massaged.

**Intramuscular injections** are made into muscle. Again care is needed to ensure that the product is deposited in muscle and not just under the skin. This requires sheep to be well restrained. The correct site is on the side of the neck 10–15cm

(4–6 inches) in front of the shoulder in the mid neck area well above the large jugular vein. Insert a 2.5–4cm (1 to 1½ inch) needle at 60° to the neck aiming inwards and upwards towards the head. Again massage in after administration.

The neck site for intramuscular injections ensures that no valuable cut of meat is damaged and the constant movement of the neck ensures good dispersion of the product.

**Oral dosing** needs to be carried out carefully. It is important that the nozzle of the dosing gun is not too long to minimise the risk of penetration of soft tissues at the back of the mouth. But for wormers it is important that the drench goes over the back of the tongue. Ensure sheep are adequately restrained and that the operator is careful not to damage the soft tissues at the back of the mouth.



## Treatment for external parasites

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

- If plunge dipping it is essential to know the capacity of the bath in order that the initial concentration of dip wash is as per data sheet
- Only use the two closed systems to charge the bath and to top up (These systems reduce the risk of the operators being exposed to the dip concentrate)
- Always top up as per instructions, if not the dip wash will strip out (adhere to the fleece) and later sheep will not carry enough insecticide for it to be effective
- Do not dip tired, thirsty or heat-stressed sheep
- Do not dip in wet weather
- Allow dipped sheep to drain in designated draining pens and do not return to pasture until all excess dip has been shed

When dipping sheep use protective clothing and handle equipment carefully and stick to manufacturer instructions. When treating for sheep scab remember showers and jettors have not been licenced, only plunge dipping (or licenced injectables) are fully effective.

**Pour-ons and spot-ons** need to be applied accurately and each manufacturer may recommend subtle differences. Use appropriate and calibrated guns, always clean with warm soapy water and then rinse after use. Store in a safe dry place. When treating sheep with these products make sure that they are applied along the back line. If placed to one side, the product will not spread evenly around the body. No pour-on or spot-on is effective against sheep scab.

## Control of internal worms and liver fluke

Apply SCOPS principles in the approach to worm and liver fluke control. SCOPS recommends that:

- Ewes are not wormed pre-tupping unless thin or are ewe lambs
- Lambs are not wormed and then moved directly to clean pasture
- Lambs are wormed and retained on their original pasture for 48 hours to dilute the effect of any resistance, or a proportion 10–15% of the stronger lambs showing no evidence of scour should be left undosed

Ask your vet for advice on how to test for wormer resistance on your farm and how best to quarantine and treat stock arriving at the farm.

Generally the only time ewes need to be dosed is at lambing to reduce the post parturient (lambing) rise. However, well-fed single bearing ewes generally have low faecal egg counts and therefore can often be left undosed.

As a general rule faecal egg counts should be carried out before any sheep, including ewes but more importantly lambs, are wormed. In many cases scour is not due to a worm burden, and dosing at this time only increases selection pressure for resistance.

Liver fluke are becoming more widespread. As a general rule unlike worming, fluke control may be timed to coincide with the routine handling of the sheep. Fluke do not produce any eggs until they are 12 weeks old by which time they can have inflicted considerable damage.



- In known fluke areas dose during October with a flukicide which kills young fluke
- In areas of high fluke incidence, or in years following a wet summer and mild autumn, a further dose in January/early February may be necessary

When drenching sheep or lambs it is essential that the product is placed at the back of the tongue. Some of the group should be weighed and the dose calibrated to the heaviest. When worming, best results are obtained in sheep with low rumen fill, which is achieved by yarding for up to 24 hours. The exception is pregnant ewes.



**It is essential that the weigh crate is accurate, the dosing gun delivers an accurate dose and the product chosen is suitable for the purpose**

## Lameness

Sheep suffering from lameness are less able to graze and compete for feed. Lameness results in reduced performance and premature culling in addition to the costs for the purchase and labour-intensive application of treatments.

Chronic pain from lameness is likely to significantly affect welfare. The most common causes of lameness in sheep are Scald, Footrot, Contagious Ovine Digital Dermatitis (CODD) and White line infections.

- Quarantine all incoming stock
- Inspect all sheep regularly and treat lame sheep as soon as possible after they are noticed
- Trim feet only when necessary
- Segregate infected sheep
- Seek veterinary advice if necessary
- Treat serious cases of footrot with antibiotics asap
- Consider vaccination for footrot
- Cull chronically infected sheep
- Rotate grazing
- Develop a flock foot-care programme, incorporate this into the Flock Health Plan and review annually

## Pneumonia

Adequate ventilation in buildings without draughts and vaccination are key to the prevention and control of pneumonia. Early diagnosis of pneumonia and effective treatment helps to limit the spread within groups and should also reduce the effects in individual animals. Take steps to improve ventilation when pneumonia occurs. It is important to accurately diagnose the cause of the outbreak to help prevent recurrence.

## Tupping time

Gather tups 10 weeks before tupping date

- Check reproductive organs, teeth, feet and condition score
- Aim for body condition score 3.5 at tupping. Provide supplementary feeding if necessary
- At same time gather ewes and check condition (3.5 is ideal at tupping). Supplementary feed thin ewes. Final check of teeth, udders and feet
- Vaccinate ewes, ewe lambs or hoggets against Toxoplasmosis or EAE, if necessary
- Remember: if in doubt, introduce teasers 14 days before tupping date

- Introduce rams which have been raddled
- Change raddles at least every 17 days (but variations on a theme allowed)
- Check rams after first cycle

## Scanning

Scan to determine barren ewes, those carrying multiples and those carrying singles. At appropriate time separate and feed according to foetal load.

## Pre-lambing

Condition score and feed supplementary rations of good quality from about six weeks prior to due lambing date. Keep cats, birds and dogs out of feed stores. Remember the pre-lambing vaccination and follow manufacturers' instructions on timings and boosters for older ewes. If a prolonged lambing period is expected, split into two groups to feed and vaccinate at appropriate times.

## Lambing

Prepare well in advance. Organise supplementary labour if necessary and make sure it arrives a few days before lambing to become familiar with the routines. Prepare a lambing kit with all essentials – in particular a plentiful supply of disposable gloves and lubricant for assisted births. Make sure everyone knows how to identify and treat hypothermia in lambs.

At lambing, dress all navels with strong iodine. Make sure lambs get enough colostrum in the first six hours of life. Keep individual lambing pens clean and apply lime before new bedding. If lambs are scouring give them simple fluids by mouth early in the course of the disease to prevent or treat dehydration.

Collect all placentas (cleansings) in polythene bags for disposal. If abortions start to occur, investigate the cause and isolate aborting ewes. In some cases losses can be reduced by prompt treatment of unlambing ewes.

Put ewes and lambs out into sheltered pastures. Keep areas around drinking troughs and gateways well limed to reduce coccidiosis, and foot problems. Check lambs at least every 12 hours and treat any that are sick or lame promptly. Remember nursing ewes require a plentiful supply of clean fresh water to milk well, and also supplementary concentrates if grass growth is poor.

## Weaning

Weaning should be carried out not by date but by availability of good fresh grass onto which the lambs can be moved. Experiments have shown that lambs weaned as young as 12 weeks onto good pastures containing clover did at least as well as those weaned at 16 weeks onto average pasture. In particular lambs should not be weaned onto rank pasture, anything longer than 8cms will check growth.

Weaned ewes should be put onto a bare pasture for about five days, but must have access to water. They should then be sorted into those to be culled and those to be retained. Very thin ewes to be retained need preferential treatment post weaning. If they have failed to improve within 6 weeks, seek veterinary advice to identify if there may be an underlying cause e.g. haemonchus, fluke. Review the Flock Health Plan at weaning when any problems during the season will still be fresh in your mind. If there have been problems with abortions consider what vaccines may be needed pre-tupping.

# Biosecurity and disease prevention when buying stock

When purchasing replacements or foundation stock, including rams, ensure you know their health status. Even the finest pen might bring new infection to the farm that could threaten existing stock or start the enterprise wrongly. A sound biosecurity programme can minimise the dangers. Check whether sheep have been on a clostridial vaccination programme.

## Buying new sheep

Whether purchasing new sheep privately or through auction markets, 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.

For private sales, ensure you look at the rest of the flock, not just those for sale and ask questions about their health status, and flock performance. Ask what the owner vaccinates against (EAE could indicate they have had abortion problems in the past) and check their ectoparasite prevention methods.

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. Look at all

the sheep for sale, not just the pen you fancy. If you are purchasing 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.

If there are limited sheep available at the sale or the ones you were looking at go for a high price, do not impulse buy other sheep with unknown backgrounds.

Some sheep are sold with health warranties such as treatment for scab, but you do not know if the vendor injected correctly, used the right dose, or, if dipped, the right concentration was used and for the correct time. Being over cautious is not a bad thing to protect your own health status.

Ideally purchase all replacements from an individual flock and transport directly from origin to the new premises. This prevents other diseases being picked up.

Ensure the transport is properly cleansed and disinfected. Avoid sharing transport and mixing stock from different sources, and where possible move in your own transport.



## Quarantine of incoming sheep

Any sheep bought on to the holding that has at any time been in contact with other sheep needs to be quarantined (even if returning from a show) to prevent the introduction of sheep scab, resistant worms, footrot in particular but also fluke, lice, and contagious ovine digital dermatitis (CODD). Any purchased sheep must be considered at risk of carrying the first three. The others are based on a risk assessment. Incoming animals should be quarantined for a minimum of 21 days. On arrival sheep should be treated for sheep scab and internal parasites. This is achieved by using an injectable product capable of killing worms and sheep scab mites at the same time plus drenching the sheep with a yellow drench based on the levamisole group. Hold the sheep on concrete for 24–48 hours after worming, then turn out onto dirty pasture. The sheep should be foot bathed every five days on three occasions in either 10% zinc sulphate or 3% formalin. At the same time observe carefully for signs of other diseases such as CODD.

## Flock health plans

All flocks should have a health plan ideally discussed and agreed with their own vet and reviewed regularly. All routine treatments and vaccinations should be planned in advance so that effective vaccines, wormers, medicines or management strategies can be identified and arrangements made so that they are available when required.

## Top 10 Flock Health Tips

1. Biosecurity – don't buy in disease
2. Monitor the health status of your flock
3. Improve the health status by culling infected animals
4. Control diseases that can not be eradicated, vaccination polices will save many times their cost
5. Have treatment protocols for diseases that cannot be completely prevented
6. Use management practices to improve health
7. Improve the environment, e.g. ventilation
8. Record reproductive performance
9. Record all procedures carried out
10. Form a team approach to reduce disease costs through farm health planning, involving farmer, shepherds, vets and other advisors





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264164 Aug 08