Treatment, Control and Prevention of the Main Causes of Foot Lameness in Sheep

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Agnes Winter BVSc, PhD, DHSP, DipECSRHM, MRCVS, FRAgS
University of Liverpool

Clare Phythian BSc, BVSc, PhD, MRCVS
University of Bristol

Key points

- Lameness is an important welfare concern and results in significant economic loss. Consult your vet if many sheep are lame or fail to respond to treatment. In most cases lameness is treatable.

- Lame sheep should be attended to as soon as practically possible and infectious forms of lameness dealt with on a flock basis.

- The most important causes of lameness in the national flock are interdigital dermatitis (scald) and footrot which are essentially different stages of the same condition.

- A relatively new, serious, infectious disease called contagious ovine digital dermatitis (CODD) is becoming a problem in many flocks and can cause severe lameness.

- Adequate facilities are necessary to make routine foot inspection practical to carry out. These include good handling facilities and footbaths appropriate to flock size.

- Routine paring of healthy feet is unnecessary and paring is no longer recommended as part of the treatment or prevention of footrot.

- It is important to be aware that infectious forms of lameness can be introduced by bought in sheep.

- Foot health, including shape, horn quality and susceptibility to footrot may at least partially be inherited; thus more attention could be paid to selecting breeding stock with sound feet and culling those with issues.

Introduction

Lameness is a painful and debilitating condition and is an extremely common cause of welfare concerns for sheep throughout the world. It has major impacts on productivity, for example, lame ewes often have lower scanning and lambing percentages, are of lower body condition score and are at risk of other diseases, such as pregnancy toxaemia. Lambs of affected ewes have lower body weight taking greater time and costs to finish. Economic loss associated with reduced productivity, together with time and costs of treating lameness in sheep flocks can therefore be considerable. There are many causes of the condition, but where lameness affects a significant proportion of a flock, infectious agents are usually involved. Veterinary advice should be sought to confirm diagnosis and to formulate a plan to treat and control, in particular if lameness is sudden in many animals, persistent or fails to respond quickly to commonly used treatments.

Q1. Does lameness affect production and profitability on my farm?

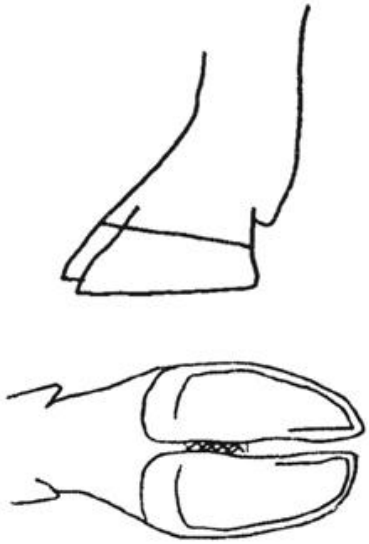
Lameness in sheep flocks is one of the most common and persistent disease problems. As well as being a major welfare concern, persistent lameness in a significant proportion of a flock has direct economic consequences with the cost to the industry of footrot alone having been estimated at £1.50 per sheep in the total UK flock. Knock-on effects of lameness include failure to gain weight, weight loss, metabolic diseases in pregnant ewes, reduced birthweight of lambs and poor colostrum production by ewes leading to increased lamb mortality and poor performance. Costing done by ADAS in 2011 suggested that the cost of treating footrot in a flock with a prevalence of 10% lameness was approximately £10 a head. This figure was based on treatment costs, labour, reduced scanning rates, increased feed but does not include losses due to reductions in lamb growth rate performance, so the cost of lameness is likely to be considerably more.

Q2. What are the most common causes of lameness in a flock?

Interdigital dermatitis (ID, scald, strip)

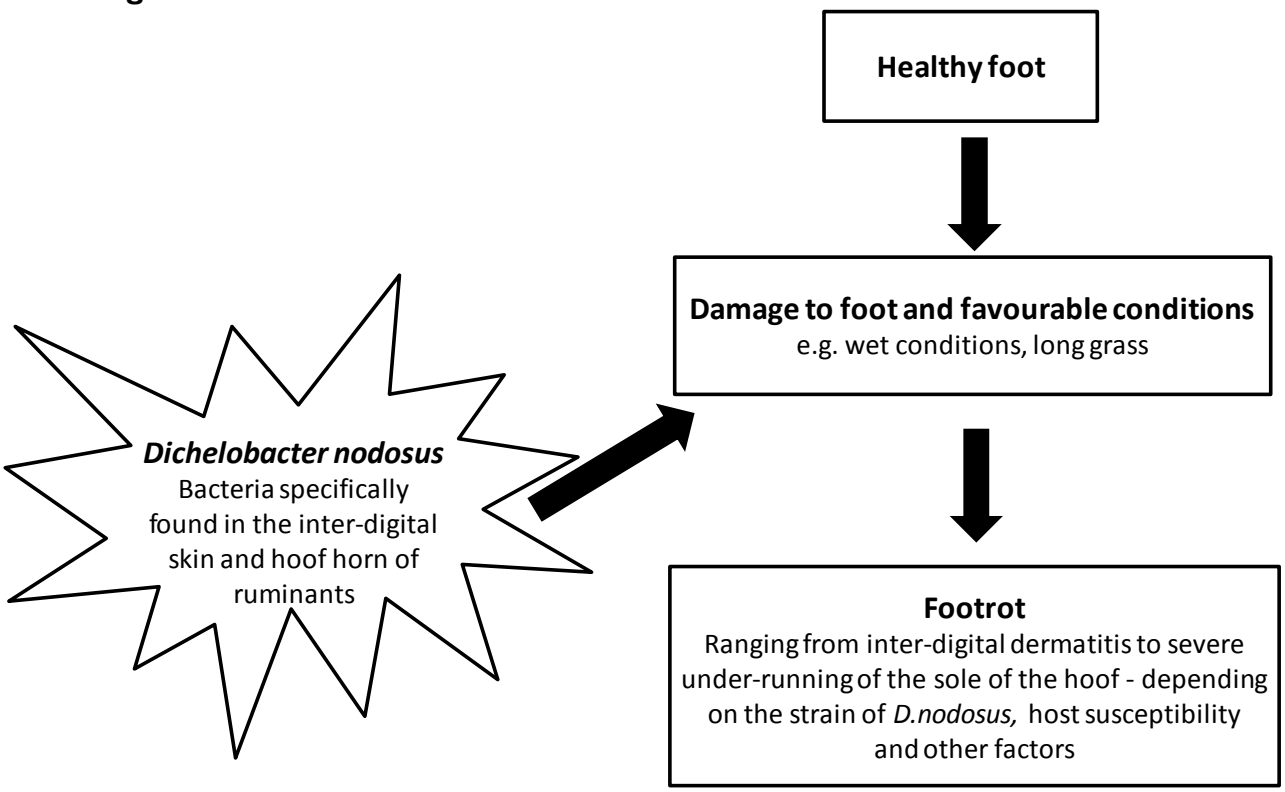
This affects the skin between the claws and is caused by *Dichelobacter nodosus* – the same bacteria that cause footrot. As such, ID is now recognized to be an early stage of footrot. Genetic variations in *D. nodosus* lead to variations in severity of the disease, accounting for 'milder' form of ID seen, although benign strains can also cause footrot in the right environmental conditions. It is particularly common in warm, wet weather and can spread rapidly in favourable conditions.

Figure 1: Interdigital dermatitis (scald)



Interdigital lesion only.

Diagram 1:



Footrot (FR)

This is caused by *D. nodosus* and, if untreated, the infection progresses from the interdigital space invading the hoof, leading to separation of the horn from the underlying sensitive tissues of the foot. The separation starts in the heel area adjacent to the interdigital space and, depending on the strain of *D. nodosus* involved, may spread across the sole and eventually up the wall of the hoof. One or both claws of one or more feet may be affected. In longer standing cases there is a build-up of characteristic smelly, grey debris under the loosened horn. Footrot spreads most readily in warm, moist weather outdoors and when sheep are housed.

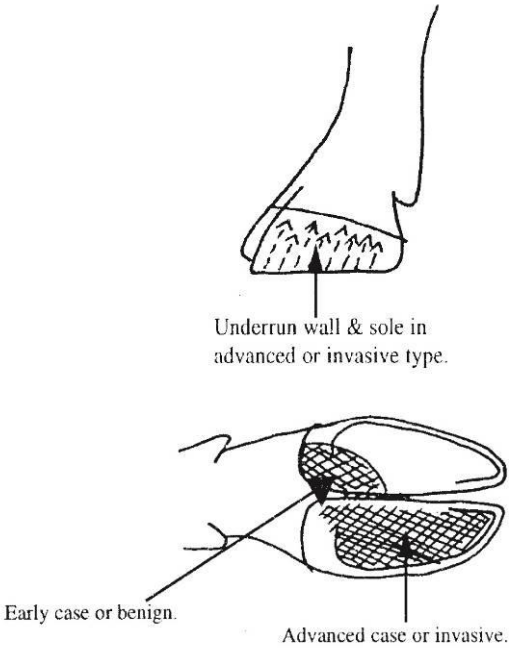
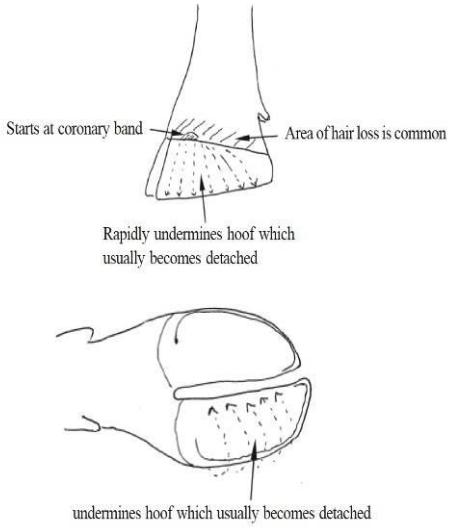


Figure 2: Severe footrot

Contagious Ovine Digital Dermatitis (CODD)

This relatively new, serious infection of sheep's feet is becoming widespread and has been seen in flocks in most parts of the country. It is thought to be caused by spirochaetes (treponemes), similar to those that cause digital dermatitis in cattle. The appearance is different from classic footrot, with the initial lesion at the coronary band, from where infection spreads rapidly down the hoof, separating the hard outer hoof from the underlying sensitive inner structures. Commonly the whole hoof is loosened and may eventually be shed leaving a raw stump exposed. Some feet remain permanently damaged.

Figure 3: CODD with horn capsules shed and laminae exposed



Other causes of lameness

Although ID, FR and CODD are the most common types of lameness, there are other causes, sometimes as simple as soil balling, but often for more complicated reasons. It is important to make sure that the diagnosis is correct before deciding on treatment. This may sound simple, but confusion can arise and misdiagnosis can be the explanation if well recognized treatments, for what is assumed to be footrot, do not seem to have the desired effect. Clearly, there can be a number of conditions affecting a flock or even the same hoof and mixed infections of FR and CODD are not uncommon.

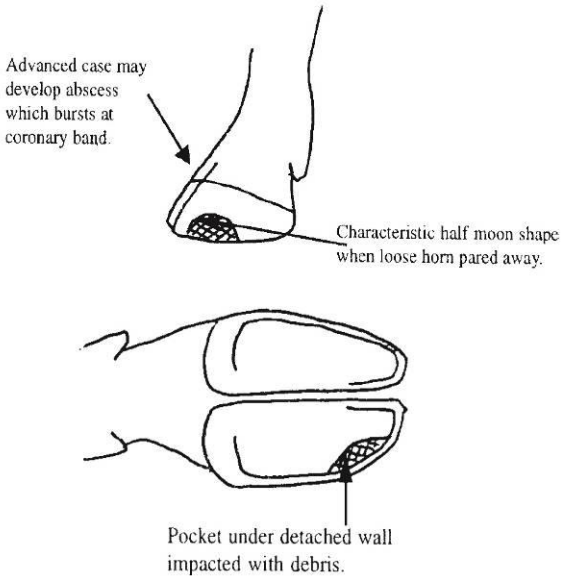
White line degeneration/disease

This affects the junction of the horn of the wall of the hoof and the sole (the 'white line'). It is a naturally weak area in the horn and there are two different problems which can occur here, both potentially leading to lameness:

a) Shelly Hoof

This very common condition consists of, sometimes extensive, degeneration of the white line. A part of the hoof wall becomes separated and forms a pocket which becomes impacted with dirt and other debris. In the early stages the sheep is not lame and, if the feet are carefully examined, it is very common to find mildly affected animals. Some cases progress to the stage where a large semicircular area of the horn of the hoof wall is detached, impacted debris is forced into deeper tissues, pus forms and the sheep becomes lame. The pus eventually bursts at the coronary band and recovery gradually follows.

Figure 4: Shelly hoof



b) White line (Toe) Abscess

This occurs when infection develops at a localised point somewhere along the white line, pus forms under the wall of the hoof and the animal becomes acutely lame. The affected claw is painful when it is manipulated. Careful paring of the sole will usually reveal a dark mark at some point along the white line; sometimes pus will be released during paring. If not treated, the pus eventually bursts out at the coronary band and the animal gradually recovers. Some animals suffer from repeated attacks, probably because of a permanent defect in the horn at that point.

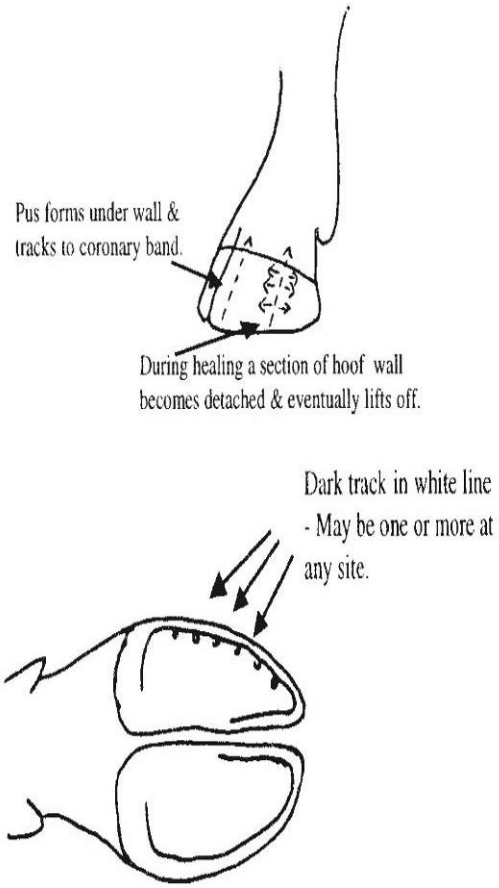


Figure 5: White line abscess healed

c) Foot Abscess

This is a more serious condition, where the deeper parts of the hoof, including the pedal joint, become infected. The animal is acutely lame and the affected claw is swollen and very painful. Within a short time pus bursts out at several sites around the coronary band, including between the claws. The deeper structures of the foot are usually permanently damaged, the claw becomes chronically swollen and misshapen and the animal remains permanently lame. In the case of a ram, his ability to do his work is greatly impaired.

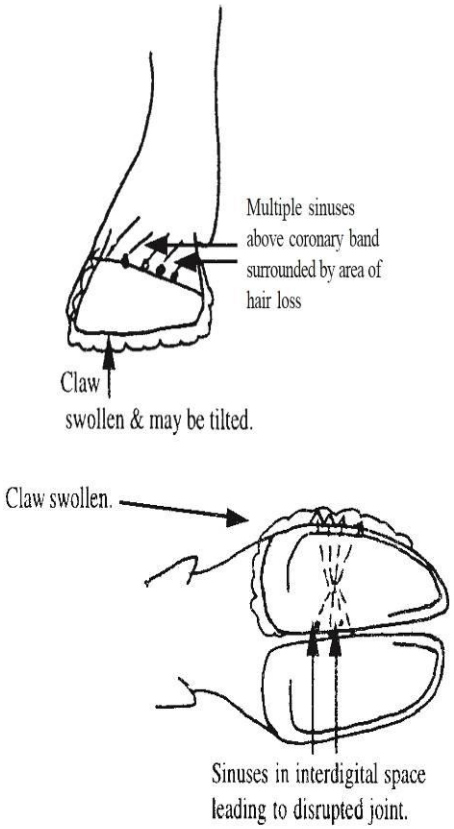
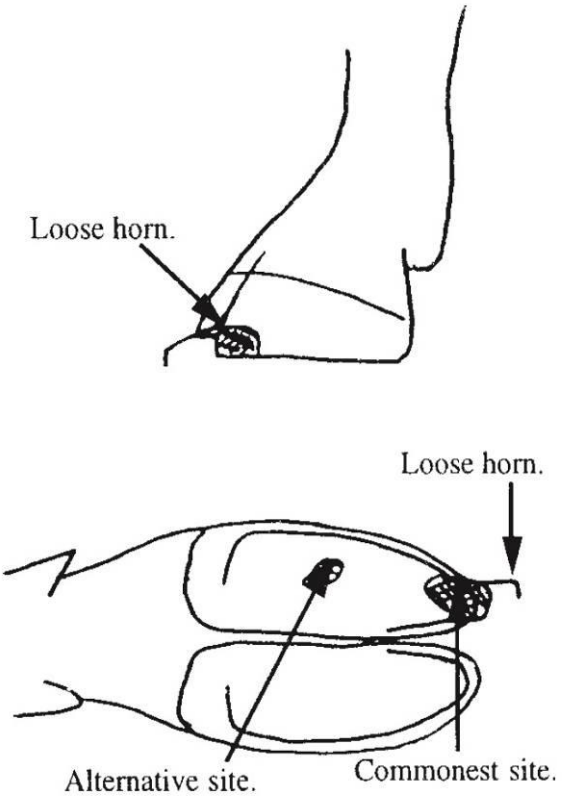


Figure 6: Foot abscess

d) Granuloma

This is a strawberry-shaped piece of proud flesh which grows at a site where the foot has been damaged and the overlying horn is unable to grow back normally. The most common site is at the toe and its development often follows over-paring which has caused bleeding. They can also occur for other reasons, for example following a penetrating injury. The usual picture is of an animal which has an overgrown misshapen hoof because it is chronically lame and doesn't put its full weight on the foot. When loose horn is pared away, the proud flesh is exposed and this bleeds as soon as it is touched. If it is cut off profuse bleeding occurs at first, then it gradually re-grows.

Figure 7: Granuloma



Q3. How do I treat infectious causes of lameness?

These diseases must be dealt with on a flock basis. Rapid identification and early treatment are essential to prevent spread throughout the flock and constant vigilance is necessary once control is achieved.

Treatment for interdigital dermatitis (scald): Remember that ID is the same condition as FR. The best practice advice is to treat ID cases as for **Foot Rot** – with topical antibiotic spray and antibiotic injection and ideally to return stock to fresh pasture. Where gathering of large number of lambs is required the most practical answer may be regular foot bathing. Any of the commonly used chemicals such as zinc sulphate, formalin or other proprietary product should be effective. Other measures to reduce the risk include keeping grass grazed short, and making sure gateways, feed and water trough surrounds etc. are kept as free of mud as possible.

Treatment for footrot: Footrot should always be treated as an infectious disease and needs to be tackled on a flock basis. It is possible to eradicate footrot as has been done in parts of Australia, Norway and in some flocks in the UK but this is only really practical for closed flocks. Rigorous measures have to be taken to maintain the footrot-free status by making sure neighbours' sheep do not stray in and by paying careful attention to any introductions such as rams. For most flocks, getting control and keeping control of footrot will be the most practical goal.

Recent work has shown that the use of antibiotic injection and application of antibiotic spray at the same time for all footrot-affected animals is very effective and should be undertaken with the guidance of your vet. Infected feet should not be pared as this delays healing time. Clearly mark and record the identity of affected sheep so that repeatedly lame sheep can be quickly identified and removed from the flock. Wherever possible, separate infected animals to reduce the risk of infection for sound sheep. The rest of the flock should be carefully observed and any newly lame animals caught and treated and moved out of the sound group as soon as possible to prevent spread of infection. Putting animals back on to fields which have been clear of sheep for at least 10-14 days will help as the causal bacteria can only survive on the grass for this length of time.

Vaccination can be very useful in reducing the number of infected sheep, since it can be curative as well as preventive, but needs to be part of a combined control plan. Recommended advice when starting the vaccination programme is to use a primary course (two vaccinations 4-6 weeks apart) followed by boosters every six months or sooner (prior to high risk period) as part of a wider footrot control plan including prompt treatment of affected cases, and culling of persistently infected animals. Be aware that the vaccine has an oily base and lumps may form at the site of injection into the skin high on the neck. Care needs to be taken when vaccinating, as it can cause severe reactions if accidentally injected into people.

The final key to controlling footrot is to cull persistently affected animals which do not fully respond to treatment, since these act as a continuous source of infection for the rest of the flock.

Figure 8: Chronic footrot

Footrot should no longer be considered a chronic disease and the majority of infected animals should respond to antibiotic injection and topical antibiotic treatment within one week. Therefore, re-examining treated sheep approximately one week after treatment and a 'two or three strikes and out' approach (each strike being a treatment) can be used to cull out persistently infected cases. Culling of persistently infected and lame sheep is a crucial aspect of minimizing the impact of footrot in the flock. This relies on having good records and easily identifying repeatedly lame sheep. Spray marking above the affected leg is useful identification for short-term management but to be able to identify repeatedly lame animals over the course of a year a permanent record in a notebook, electronic recording system, use of specific tags or other identifier is required. In the first year of implementing footrot control, it is expected that the cull rate often needs to be increased to effectively tackle the condition as part of the long-term aim for reduced lameness levels.

REMEMBER 5 key points for Footrot control

1. **Prompt treatment**
2. **Separate**
3. **Record**
4. **Cull repeatedly infected**
5. **Vaccinate**

Treatment for CODD: Affected animals are a particular welfare concern and permanent, severe foot damage may result if effective treatment is not administered. You should seek veterinary advice if you think your flock is infected with CODD, as this condition often fails to respond to orthodox treatments for footrot. Formalin footbaths should **not** be used because of the very painful nature of the lesions. Effective treatments include various injectable antibiotics and/or antibiotic footbaths and should be used after consultation with your vet.

Treatment of Other Types of Foot Lameness: Individual sheep which are lame as a result of pus developing under the wall of the hoof (toe abscess and shelly hoof) can often be helped by gentle and careful paring along the white line, with loose horn being carefully removed to release any pus, or at least allow it to find its own way out faster. The horn should not be pared so deeply that bleeding is caused.

In difficult cases, poulticing the foot for a couple of days will soften the horn and speed recovery. Further gentle paring to remove underrun horn may be necessary as the hoof heals, but should always be done carefully and not excessively.

Foot abscess (infection of the pedal joint) is a much more serious condition. The animal is severely lame and, because the infection is deep in the foot and involves the joint, it is unlikely to recover for many weeks, if at all. Veterinary attention is needed and, if given early, affected animals may be returned to soundness. Amputation of the digit is another possible solution that might be suggested by your vet for longer standing cases. However, many cases of pedal joint abscesses are identified when there is severe and advanced joint pathology and the severe welfare concerns for affected sheep mean that these animals should be promptly euthanased.

Veterinary attention is also often necessary to treat granulomas and in large flocks, frequently these cases need to be culled. The important message is not to cause them by unnecessary and over-trimming in the first place!

Other treatments to consider

Footrot, CODD and other types of lameness are painful conditions and the pain and discomfort associated with these and lesion pathology can have huge impacts on performance. Wherever possible, the benefits from including non-steroidal anti-inflammatory (NSAID) drugs to reduce inflammation and pain in cases with severe foot lesions, alongside the treatment of infections with appropriate antibiotics, should be considered. Note that NSAID products are not licensed for sheep and should be used in consultation with your veterinary surgeon.

Q4. How can I minimize lameness problems in my flock?

It may be unrealistic to expect that you will never have a lame sheep because there are many types of lameness, with causes involving infectious agents, environmental and mechanical factors, variations in horn quality and other unknown factors. However it is possible to significantly reduce the most common types – ID, FR, CODD – and to keep other types under control by implementing the following:

- ✓ DIAGNOSIS – make sure this is accurate and involve your veterinary surgeon.
- ✓ INSPECT daily if possible, certainly at not more than 3 day intervals, to reduce spread. The key sign to note is a head nod, as an early indicator of lameness.
- ✓ TREAT every individual lame sheep as soon as seen and as soon as possible to gather. Treat cases even when lameness appears mild – don't wait until it has become severe as lesion severity and lameness do not always correlate. Ewes which become lame during late pregnancy should be treated when seen rather than being left until after lambing. Gentle handling should ensure that no extra stress is involved; if necessary the affected foot can be lifted and examined with the sheep standing restrained against a wall to save turning the animal over.
- ✓ FOOT TRIMMING – do NOT carry out foot trimming on footrot affected feet, as this significantly delays healing.
- ✓ SEPARATE infected animals until they have cured.
- ✓ MONITOR – assess the level of lameness in groups of sheep during routine stock inspections and record the number of animals treated for lameness.
- ✓ RECORD which animals become lame.
- ✓ CULL repeat offenders and chronic cases.
- ✓ SELECT animals with sound well-shaped feet.
- ✓ BUY only sound replacements and select those from your own flock which have never been lame.
- ✓ ISOLATE new stock and examine feet.
- ✓ IDENTIFY key control times to prevent spread infectious causes of lameness – e.g. housing and turn-out after lambing.
- ✓ CONSULT your veterinary surgeon and make lameness part of your flock health plan, devising flock-specific treatment and control plans and discussing whether other strategies such as vaccination may be appropriate and cost-effective for your flock.
- ✓ CLEAN GRAZING – allow 2 weeks break (as long as possible if aiming for eradication).
- ✓ FOOT BATHING – where used, facilities must be in good order and the product used at correct concentration and according to manufacturers' directions regarding stand-in times and standing on hard (clean) ground after bathing.

Other important points to consider for successful lameness control:

Equipment and Facilities: Good foot care and dealing with flock problems are more likely to be successfully performed if well designed and maintained handling facilities and equipment are available. Flooring should be solid and cleaned regularly. Several systems which incorporate devices to turn the sheep over are available, so that work can be carried out in the normal standing position reducing back strain; these are well worth investigating particularly for larger flocks. If footbaths are used they should be regularly cleaned and ideally they will be large enough to stand a number of sheep in rather than the narrow 'run through' type.

A special mat can be placed in the bath to reduce the volume of chemical necessary to ensure proper coverage of all feet and a water bath can be placed before the footbath with the addition of some regular washing-up detergent to clean the feet prior to entering the footbath. Entering the bath with cleanest feet possible is particularly important for formalin footbaths since formalin is inactivated by organic matter such as dirt and faeces. Formalin concentrations of no more than 5% (preferably 2-3%) should be used for sheep – it recommended to be used only for scald/strip cases. For 10% zinc sulphate solution a stand-in period of several minutes or longer is needed. A dry area where the sheep can stand for a while after passing through the chemical will ensure that efforts are not wasted by turning sheep out immediately into wet grass.

Paring Feet: It is no longer considered necessary to routinely pare the foot of every sheep in the flock; although it is still important to routinely, and regularly, inspect feet to assess overall flock foot health status. If an animal is affected with footrot, treatment with injectable and topical antibiotic is the most effective first line of attack. Avoid trimming excessive loose horn in infected footrot cases and re-examine sheep one week after treatment. Only if really excessive loose horn is present or there is a risk of blowfly strike the excess horn can be carefully removed. Where used for such cases, foot shears should be disinfected after paring infected feet, and at the end of each session. They should be cleaned and oiled, not left to rust! Any foot trimmings should ideally be swept up, collected and burnt as the footrot bacteria can reside in horn trimmings for many weeks. Over-paring, which causes bleeding **must** be avoided - this is painful and may cause permanent damage to the foot and/or result in toe granulomas.

Records and identification: Having an effective and easy means of recording lameness treatments and the identity of individual sheep is key part of a long-term and effective control of infectious causes such as FR. Recording in this way allows you to identify whether there are animals that do not respond to repeat treatments or are chronically lame so that they can be rapidly removed to reduce the risk to other sheep, and to manage cost-effective targeting of time, effort and money.

Veterinary flock health planning: Make lameness control and prevention a core part of the flock health plan and use the consultancy services offered by your sheep veterinary surgeon. It is essential to review the risks for introducing diseases such as CODD onto your farm and to update control plans based on the latest scientific advance in order to maintain low lameness levels in flocks currently without issues as well as effectively addressing issues in affected flocks.

Q5. Is biosecurity important when considering lameness control in my flock?

It is important to consider the following when introducing new sheep into the flock:

Many important diseases can be introduced to flocks by failing to take simple biosecurity procedures (see Moredun newssheets Vol. 3 Nos 12 and 13 for further information). Footrot and CODD can easily be inadvertently introduced with the purchase of new sheep (don't forget the rams as well as the ewes). If footrot is present in your flock, new sheep can still introduce more virulent strains of *Dichelobacter nodosus* that could cause far worse problems than you may already have. New sheep should never be added to the resident flock without a period of quarantine, during which time the feet should be examined and appropriate treatment carried out where necessary. Even if all appears well it is good practice to footbath as a precaution.

And finally….

We have highlighted the main causes of lameness here but there are many other reasons why sheep become lame. These may involve the foot, joints, bones, nerves or muscles of the legs, or highly infectious diseases such as foot and mouth disease. If lame sheep are not responding to treatment or if many are lame, then prompt veterinary advice should be sought.

Produced by: The Moredun Foundation,
Pentlands Science Park
Bush Loan,
Penicuik,
EH26 0PZ,
Scotland

Phone: +44 (0)131 445 5111
Fax: +44 (0)131 445 6235
E-mail: info@moredun.org.uk
Website: www.moredun.org.uk