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Lameness in Sheep

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Department for Environment
Food and Rural Affairs

Foreword

Lameness is a major health and welfare problem in all sheep producing countries throughout the world.

This booklet describes the main aspects of lameness and outlines some of the common sense management measures that will help prevent, or treat the condition. These measures should help to ensure better welfare standards by reducing the level of lameness and, in addition, maintain or improve the efficiency of production. While the booklet embodies much of the latest scientific advice and the best current husbandry practices, it cannot be exhaustive and is not intended as a substitute for expert advice.

Contents

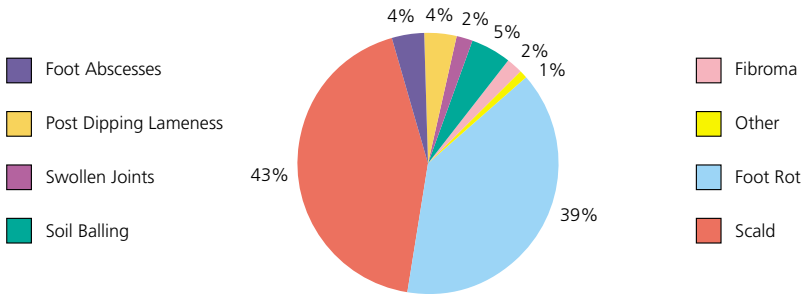
Introduction

Lameness is one of the most widespread welfare problems in the UK sheep flock. It is a significant cause of discomfort and pain and is a major source of economic loss to the sheep industry. Many of the infectious causes of lameness, footrot in particular, could be controlled more effectively by using the current methods of prevention and treatment to better effect.

An animal suffering from lameness is less able to graze and compete for feed. The consequences of lameness include:

- Decline in body condition
- Lower lambing percentage
- Lower lamb birth weight and hence reduced lamb viability
- Reduced growth rate in lambs
- Reduced milk production
- Lower fertility in rams
- Reduced wool growth

A postal survey carried out in 1997, by the Royal Veterinary College, showed that of 547 farms 92% had a problem with lameness and the reported incidence of lameness on those farms was between 6% and 11% of all sheep. The survey also quantified the causes of lameness and the results are shown in the chart below.



In 2002 the Scottish Agriculture College carried out a survey to assess the extent of footrot in Scottish flocks. The survey showed that more than 90% of sheep flocks had experienced cases of footrot in the previous year.

Lameness is a major challenge for sheep farmers, both to sheep productivity and sheep welfare. It should be remembered that lameness may be the first sign of foot-and-mouth disease in a flock. Early and accurate diagnosis of the cause of lameness ensures the correct treatment and preventative measures and will prevent unnecessary suffering.

A written health and welfare plan, which covers the yearly production cycle, should be prepared for each flock. This should be developed with appropriate veterinary and technical advice and reviewed and updated annually. The plan should assess vaccination policy, control of internal and external parasites and foot care as a minimum. Pasture management should form an integral part of disease control, especially in the case of internal parasites and footrot. Identification of high-risk periods for disease will encourage quick implementation of control strategies. All personnel attending to the flock should be acquainted with the contents of the flock health and welfare plan in addition to the current Code of Recommendations for the Welfare of Sheep.

The main causes of lameness

Footrot

Breed susceptibility to footrot is well known in the UK. The downland breeds may be more susceptible to footrot than cross breeds. Most hill breeds are naturally less susceptible, particularly at the low stocking rates typical of the hill environment. Damp conditions underfoot soften the interdigital space making it more susceptible to invasion by bacteria. Housed sheep are also at risk due to warm, damp bedding.

Footrot is a common, highly contagious disease of sheep, caused by a dual infection with the bacteria *Dichelobacter nodosus* and *Fusobacterium necrophorum* (the same bacterium that causes scald). *F. necrophorum* is widely found in the environment. Initially *F. necrophorum* invades the skin of the interdigital space and this is followed by *D. nodosus*. The infection then invades the horn and deeper tissues, leading to separation of the horn near the heel. It can extend beneath the horn, along the sole, and even up the wall of the hoof in serious cases. Footrot causes pain and obvious lameness and severe cases may result in the loss of the hoof. Affected feet have a characteristic foul smell. The disease is infectious and is particularly common under warm (above 10ºC) damp conditions, with peaks of disease between April and June and then August to the end of October in the UK. The footrot organism can only survive on pasture for up to 12 days under favourable conditions, hence rotational grazing and isolation of infected animals can help in the control of the disease.

Foot of sheep infected with footrot

Treatment

Footrot should be viewed as a whole flock problem. Treatment methods include:

- Segregation of badly affected sheep for treatment.
- Judicious paring of the foot.
- Antibiotics administered topically by spray.
- In severe cases, long acting antibiotic by injection, under the advice of a veterinary surgeon.
- Foot bathing, following the manufacturer's recommendations.
- Selective culling of sheep that do not respond to treatment.
- Vaccination as part of a control programme.

A combination of the methods described is required to effectively control footrot. A combination is more effective than just one method of treatment.

See Section on Treatment of Lameness for further details.

Scald

All age groups are vulnerable, but it is commonly seen in lambs on long, wet grass. Sudden outbreaks can occur with many lambs affected. It is caused by the bacterium *Fusobacterium necrophorum*, found naturally in the environment. Spread of the infection is particularly great in warm wet grazing conditions.

The skin of the cleft between the claws becomes inflamed, moist and swollen, but there is no separation or under-running of horn. Physical damage to the interdigital skin, typically by abrasive plants such as thistles or long stalky grass is thought to allow entry of the infective bacteria.

Foot of sheep infected with scald

Treatment

Foot bathing, following manufacturer's recommendations. Topical use of antibiotic sprays is also effective, however an outbreak should be treated as a flock problem.

See Section on Treatment of Lameness for further details.

Contagious Ovine Digital Dermatitis (CODD)

Since 1997 some flocks have had very severe outbreaks of "virulent footrot". Close inspection of some of these cases shows that the lesions start on the coronary band and not in the interdigital space. Sheep are severely lame with a high percentage affected. There is often rapid shedding of the whole horn case leaving a raw digital stump. The condition may spread rapidly with often 30-40% of the flock affected.

The essential difference between conventional footrot and CODD is the origin of the initial lesion at the coronary band. These lesions are ulcerative and proliferative and progress to extensive under-running, with complete detachment of the hoof in severe cases. The cause of the condition is not yet understood, although a variety of bacteria, including spirochaetes have been identified in affected feet.

Foot of sheep infected with CODD

Treatment

It is essential that prompt veterinary advice is sought. Conventional antibiotics and footbaths used for true footrot are not entirely effective. Effective treatment usually involves the use of specific restricted antibiotic injections and footbaths.

See Section on Treatment of Lameness for further details.

Soil Balling

In muddy conditions, or in poorly bedded buildings, hard lumps of soil or muck collect and harden between the claws. These cause physical damage to the skin between the claws and may predispose the foot to scald.

Treatment

Action to remove the encrustations, which may need to be softened prior to their removal.

Shelly Hoof

This is a common condition in which the outer wall of the claw becomes loosened forming a pocket, which in turn becomes impacted with soil. If the soil is forced up under the hoof wall, then an abscess may form.

Treatment

Judicious paring to remove loosened wall. This will prevent further impaction, the foot may require veterinary intervention if the condition is advanced.

White Line Abscess

The white line is the term for the junction between the sole and wall horn, visible as a pale line. An abscess here may track under the horn of the hoof wall causing acute lameness. Eventually pus may burst out at the top of the hoof or the heel after which the sheep gradually recovers, although the horn may become loosened and cracked.

Treatment

A poultice on the affected foot will draw out the abscess, seek veterinary advice if required.

Pedal Joint Abscess

The animal is usually extremely lame with a swollen claw. Pus bursts out in various places around the top of the hoof and between the claws. Often the joint within the hoof can be permanently damaged.

Treatment

Seek veterinary advice.

Granuloma

This is often the result of too severe paring but can also follow severe footrot or puncture wounds.

A strawberry-like growth develops which may become covered with loose horn but never heals properly and bleeds when touched.

Treatment

Seek veterinary advice.

Other

There are also many other reasons for lameness including:

Foot-and-mouth disease, joint ill, white muscle disease, mastitis, laminitis, congenital malformations.

Example of lesion on foot of sheep infected with foot-and-mouth

Consult your veterinary surgeon if routine treatments fail to resolve the problem.

Management Factors to Help Reduce the Incidence of Lameness

Avoid High Stocking Densities

In housed sheep, the build up of damp bedding will be greater if sheep are densely stocked. Aim to provide the space allowances given in Table 1 and always be generous with dry, fresh bedding, particularly when sheep are fed wet diets, such as silage or roots.

Table 1 : Minimum Floor Space for Housed Sheep

Reference : Code of Recommendations for the Welfare of Sheep

	Liveweight (kg)	Straw bedded floor(m^2)
Lowland Ewes during pregnancy	60 – 90	1.2 – 1.4
Lowland Ewes after lambing with lambs up to 6 weeks of age		2.0 – 2.2
Hill Ewes	45 – 65	1.0 – 1.2
Hill Ewes after lambing with lambs up to 6 weeks of age		1.8 – 2.0
Lambs up to 12 weeks of age		0.5 – 0.6
Lambs and sheep 12 weeks to 12 months of age		0.75 – 0.9
Rams		1.5 – 2.0

At grass heavy stocking rates will also encourage the spread of disease. Overwintering at high stocking densities or on poorly drained land with severe poaching will lead to a high incidence of lameness.

Rotational Grazing

Resting pastures on a rotational basis helps to reduce the spread of infection of the footrot causing bacteria, since these bacteria can only survive on pasture for up to 12 days.

Root Crops

Sheep on heavy clay soils grazing roots often show signs of lameness, due to soil-balling between the claws. A grass or stubble run back should be provided.

Physical Damage

Ensure roads, tracks, dipping and handling facilities are well maintained. Sharp edges and poor ground surfaces can cause physical damage to feet.

Dipping

Always follow the manufacturer's instructions when storing, handling and administering dip chemicals.

Most modern dip chemicals require the addition of a bacteriostat after dilution to control the build up of bacteria in the dip. Post-dipping lameness arises as a result of dipping sheep in a bath of dip that is heavily contaminated by the bacterium *Erysipelothrix rhusopathiae* (commonly found in soil and sheep faeces). It is vital to follow the manufacturer's instructions with regard to the use of bacteriostat and the number of sheep dipped before the bath is emptied, cleaned and recharged.

Post dipping lameness occurs within a few days of dipping and can be dramatic. Generally the whole of the lower limb and foot is affected and feels hot when handled. A veterinary surgeon should be consulted.

Feeding of zinc supplements

Zinc promotes normal healthy horn growth. There are several zinc-containing feed supplements commercially available which claim to reduce the incidence of lameness.

Treatment of Lameness

The Royal Veterinary College questionnaire suggests that 84% of lameness in British flocks is caused by scald and footrot. Hence it is clear that most of our efforts at preventing and treating lameness should be directed at these conditions in addition to CODD. These conditions should be treated as a flock problem and any treatment programme should take place immediately prior to an expected period of disease transmission, for example prior to housing. A proper diagnosis of the problem will help in the choice of treatment and veterinary advice must be sought if lameness persists.

Foot Trimming

Foot paring is a skilled procedure and specialist advice should be sought, if necessary. Inspection of the feet of all sheep in lowland and housed flocks should be carried out at regular intervals. A turnover crate can be invaluable to reduce the physical effort involved in turning large numbers of sheep. Treated sheep should be recorded and marked. Overgrown or misshapen feet should be trimmed, however **routine trimming of all feet should not be necessary**.

Excessive growth of the wall of the foot is common especially towards the toe, and excessive growth of the sole is seen, particularly at the heel. Wall horn should be trimmed with hoof shears, such that it will come into contact with the ground to protect the sole. Sole horn should be trimmed with a sharp knife.

The aim of trimming is to eliminate cracks and crevices that could trap mud and harbour footrot bacteria. **Do not draw blood** in any foot trimming exercise, since this increases the risk of infection and causes further damage to the foot.

Where footrot is present, the main purpose of foot trimming is to remove diseased tissue, allow penetration of foot bath chemicals and antibiotics and to expose the infected tissues to the fresh air. Severe paring back is neither necessary nor humane. Where severe footrot is present the animals should be treated with an antibiotic injection (consult your vet) the animal identified and the treatment recorded.

Correct Trimming Procedure

- Clean feet thoroughly before trimming and inspect each claw carefully.
- Trim outer wall first, starting at the toe and working backwards towards the heel.
- Leave wall slightly proud of the sole.
- Trim inside edge starting at the toe in as few cuts as possible.

Before foot trimming

After foot trimming

Hygiene

Hoof shears and paring knives may spread infection. To avoid cross-infection the hoof shears and paring knife should be cleaned and disinfected, ideally between each foot pared. To disinfect place paring equipment in a 10% zinc sulphate solution.

Ideally all sheep, once inspected or trimmed, should be put through a zinc sulphate foot bath to reduce the number of infectious bacteria.

Turn sheep out onto pasture that has not had sheep for at least 2 weeks.

Hoof clippings can harbour footrot bacteria and should be burnt and the treatment area thoroughly cleaned and disinfected after use.

Foot bathing

Choice of Chemical

Zinc sulphate is now the preferred chemical for foot bath treatments, although many farmers still use formalin. Zinc products are generally more expensive but can be re-used since they remain effective even in the presence of organic matter, unlike formalin. Zinc sulphate is also less of an irritant and does not cause hoof hardening. Zinc sulphate with a detergent additive is particularly effective because it penetrates deep into the foot.

Foot bathing is the most effective way of treating scald and footrot on a flock basis, but is only successful if all the sheep's feet remain in the foot bath chemical for the recommended length of time, always follow manufacturer's instructions.

The following regime is advised:

- Sheep should stand on a hard surface prior to foot bathing to help remove as much dirt as possible.
- Sheep should then be run through a water bath prior to foot bathing to clean the feet prior to treatment.
- Make up a 10% solution of zinc sulphate (10 kg zinc sulphate to 100 litres of water) and allow sheep to stand in for a period specified by the manufacturer's datasheets or as recommended by your veterinary surgeon. Alternatively use a 3% solution of formalin and walk sheep through steadily.
- After foot bathing allow sheep to stand on a dry, clean surface for up to an hour.
- Turn out onto a fresh dry pasture, so that the foot bath chemical is not immediately washed off the feet by wet herbage. The pasture should have had no sheep for the previous 2 weeks.
- Dispose of the contents of the foot bath carefully, well away from a watercourse to avoid pollution, meeting all current regulations relating to dip disposal.

As a routine, on all lowland farms, aim to foot bath five times per year. If footrot is a serious problem much more regular foot bathing will be essential. Many farms find it necessary to foot bath once a week during an outbreak or a prolonged period of housing.

Foot Bath Design

Stand-in rather than walk through baths are preferable particularly when using zinc sulphate. This type of bath allows larger numbers of sheep to be foot bathed at once and also allows for the correct stand-in time. Walk through baths are only appropriate when using formalin. Sponge mats can be used and save on foot bath chemicals but recommended stand-in times must be followed.

Example of a stand-in foot bath

Use of Antibiotics

Serious cases of footrot cannot be cured simply by foot paring and bathing and sensible use of antibiotics should be employed. Your veterinary surgeon should be consulted as to the most appropriate antibiotic to use. Topical use of antibiotic spray in addition to injected antibiotics will assist with rapid healing.

Once identified, serious cases should be treated with long acting antibiotics and isolated from the rest of the flock. Judicious paring and foot bathing should also be carried out once the antibiotics have had a chance to work, and only when the sheep has fully recovered should it be returned to the main flock.

Chronically Infected Animals

Transmission of footrot is by carrier animals which act as a reservoir of infection. Those that do not respond to repeated antibiotic treatment must be culled from the flock.

Vaccination

There is currently one vaccine available in the UK for the prevention of footrot, but alone it will not prevent lameness in a flock. The greatest benefit is achieved when vaccination is used as part of a programme which includes foot bathing, foot paring and segregation as necessary, antibiotic therapy and culling of chronic cases.

It is recommended that vaccination takes place shortly before the main periods of warm, damp weather, which favour spread of the disease or before housing. Vaccines may cause reactions at the injection site so it is very important to practice high standards of hygiene during vaccination.

The vaccine is intended to prevent infection, but can help in curing current cases of footrot. To obtain maximum benefit the vaccine must be used in conjunction with other foot care practices. The vaccine must be stored and handled strictly in accordance with the manufacturer's instructions and care taken that all vaccination equipment is maintained to a satisfactory standard.

Eradication of Footrot

It is possible to eradicate footrot from a flock but this requires careful planning, good fences, commitment and dedication. The best time to start an eradication programme is in summer after weaning and before tupping.

The following programme could be followed:

Day 0	Examine all feet, trim carefully if necessary. Foot bath all sound sheep and move to clean grazing. Treat footrot infected sheep with antibiotics and foot bath in zinc sulphate, move to a separate clean pasture.
Day 5	Re-examine the infected group and re-treat with antibiotics where necessary and foot bath. Move to another clean pasture.
Day 10	Foot bath whole flock, and move any lame sheep into the 'treatment' group – move remaining sheep to clean pasture. Re-examine treatment group, move sound sheep to main flock, foot bath all remaining.
Day 15	Gather treatment group, examine, treat and foot bath – move to further clean pasture.
Day 25	Re-inspect treatment group – any not fully recovered should be CULLED. Foot bath whole flock and move to clean pasture.

A number of clean pastures (land that has not carried sheep for 2 weeks) are needed to operate the programme.

Vaccine can be used to assist in an eradication programme. All sheep should be vaccinated at the time of the first gather. Vaccination will often shorten the period required to cure the infected group and, if a severe culling policy is adopted and there is plenty of 'clean' grazing, eradication can be complete in 25 days. Culling of incurable footrot carriers is extremely important. Contact your vet for advice.

Eradication is possible in closed flocks and for those with tight flock security. For most flocks however, control, rather than eradication is likely to be most practical.

Flock Security

Care should be taken when introducing new sheep, including rams, into an established flock. As with other infectious diseases it is possible to introduce footrot with replacement stock or stray animals. New stock should be isolated, foot bathed twice and vaccinated if normal practice, before mixing with the rest of the flock. Quarantine of new stock is a sensible precaution to avoid the introduction of any new disease to a clean flock. Good fencing is essential.

The elimination of footrot from your flock will:

- Improve the welfare of your sheep
- Improve flock performance
- Reduce veterinary and medicine costs
- Reduce labour costs
- Improve your farm income

Summary

- Quarantine all incoming stock
- Inspect all sheep for foot problems regularly
- Trim feet only when necessary
- Aim to foot bath all lowland sheep at least 5 times per year
- Segregate infected sheep
- Seek veterinary advice if necessary
- Treat serious cases of footrot with antibiotics
- Consider vaccination for footrot
- Cull chronically infected sheep
- Rotate grazing
- Develop a flock foot-care programme, incorporate this into the flock health and welfare plan and review Flock Health Plan annually

Further information

For further advice and information on farm animal welfare

For advice on sheep welfare and on any outbreak of disease – consult your veterinary surgeon.

General advice on sheep welfare may also be obtained from:

- The State Veterinary Service (Local Animal Health Office – address and telephone number in your local telephone directory)
- Specialist consultants

Other publications available from Defra that may be of interest

PB Number	Title
0621	Farm Fires: Advice on Farm Animal Welfare
1147	Emergencies on Livestock Farms
1381	Guidance on the Transport of Casualty Farm Animals
1875	Condition Scoring of Sheep
2072	Improving Lamb Survival
2111	Heat Stress in Sheep
2531	Summary of the Law relating to Farm Animal Welfare
2594	Explanatory Guide to the Welfare of Animals (Slaughter or Killing) Regulations 1995
6145	Golden Rules for a Healthy Flock
5162	Codes of Recommendations for the Welfare of Livestock: Sheep

Copies of the above publications, together with a 14 minute video (ref.: V766) on Lameness in Farm Animals, can be obtained, free of charge (except the video which is available at £7 + VAT) from:

Defra Publications
ADMAIL 6000
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Tel: 08459 556000

The Welfare of Farmed Animals (England) Regulations 2000 can be viewed on-line at www.legislation.hmso.gov.uk/si/si2000/20001870.htm

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