

NADIS Sheep Disease Focus – Scald and Footrot Control



PRODUCTION LOSS AND WELFARE ISSUES DUE TO SEVERE FOOTROT CAN BE PREVENTED

Reports of lameness in sheep have increased over the past month, most outbreaks being due to scald (interdigital dermatitis) or footrot. Scald and footrot share the same primary cause, the bacterium *Fusobacterium necrophorum* which is normally present in ruminant faeces and is always present on grazed pasture.

F. necrophorum produces a number of toxins, which cause necrosis of the superficial layer of the interdigital skin and enable the establishment of other bacteria, including *Dichelobacter nodosus*, which causes footrot. The occurrence and persistence of foot problems are mostly related to those predisposing factors which enable *F. necrophorum* infection of the interdigital skin or white line. The most important risk factors are maceration of the interdigital skin due to constant exposure to moisture, and mechanical trauma, for example caused by grazing on long, mature ryegrass pasture.

Before instigating any control programme, it is first important to establish an accurate diagnosis. The diagnosis of foot abscess, toe abscess, white line separation, interdigital growths, thorn injuries and toe granulomas in individual animals is relatively straightforward, but when a large proportion of the flock is affected, the cause is usually scald, footrot or digital dermatitis. Digital dermatitis ([*FWi Ovine digital*](#)

dermatitis - 15.10.02) is characterised by primary involvement of the coronary band, but the diagnosis is often complicated by the co-existence of scald or footrot.

Scald and footrot both involve the interdigital skin, but while advanced and severe cases of footrot can be diagnosed on the basis of under-running of the hoof horn and a characteristic smell, early and benign footrot lesions cannot be differentiated from scald on the basis of clinical signs alone.



LAMENESS DUE TO INFLAMMATION OF THE INTERDIGITAL SKIN MAY BE CAUSED BY SCALD, BENIGN FOOTROT, OR EARLY VIRULENT FOOTROT

SCALD

Scald is the most common cause of lameness in sheep, which occurs on all farms, whenever conditions underfoot are wet. Typically several animals in the flock are lame in one or more foot. In extreme cases, 90% of the flock can be affected. Rubbing caused by long grass can exacerbate the problem and lameness can persist for several months if untreated. At grass, the incidence is generally greater in lambs than in ewes, but scald can become problematic in housed ewes, where straw bedding becomes wet and warm.

Clinical signs

The diagnosis of scald is based on clinical examination of lame animals. In mild cases the interdigital skin is red and swollen and covered by a thin layer of white necrotic material. In more severe cases, the interdigital skin is eroded to expose deeper, sensitive subcutaneous tissue, but unlike cases of virulent footrot, there is no under-running of the hoof wall or sole and no foul smell.



SWELLING AND NECROSIS OF THE SUPERFICIAL LAYER OF THE INTERDIGITAL SKIN
DUE TO SCALD

Management and control

Uncomplicated cases of scald often recover spontaneously when sheep are moved to dry pasture, although this is seldom a practical management strategy. Pasture around feed troughs and gateways can become trampled, muddy and heavily contaminated with faeces. Regular movement of troughs and avoidance of these areas can significantly reduce the incidence of foot diseases.

Individual cases of scald can be treated topically using oxytetracyclin aerosol sprays. When several animals are affected, walking of sheep through a 10% zinc sulphate solution or 3% formalin usually provides effective control. However, it is usually necessary to repeat the footbathing at weekly intervals throughout the risk period, which is tedious. Afterwards sheep should be allowed to stand in a dry area so that the formalin or zinc sulphate can dry on the feet. Failure of this strategy to control the problem often indicates the presence of virulent footrot, which may require more radical control. Scald cannot be controlled by the use of footrot vaccines. At concentrations greater than 5%, formalin can cause severe irritation of the interdigital skin. The practice of regularly replenishing footbaths with a few splashes of concentrated solution should, therefore, be avoided.

Scald is also important because it is the first stage in the pathogenesis of footrot and suppurative infection of the distal interphalangeal joint (foot abscess).

FOOTROT

Footrot is an extremely painful production limiting disease of sheep of all ages. Affected animals are ill thrifty, show reduced wool quality and yield and poor reproductive performance. Furthermore, the cost of treatment and control can be considerable in terms of both labour and veterinary medicines.

Footrot occurs as a sequel to scald under specific circumstances when the bacterium *Dichelobacter nodosus* is present. The severity of the disease depends partly on the strain of *D. nodosus* which is present. Mild strains result only in separation at the heels and back of the sole (benign footrot), while virulent strains can result in complete separation of the horn of the hoof wall and sole. However, in the early stages of the disease, when infection is likely to be transmitted between animals, it is not possible to differentiate clinically between benign and virulent footrot.

Clinical signs

The first sign of footrot is swelling and moistening of the interdigital skin. A break occurs at the skin horn junction from where infection spreads under the horn tissue so that the wall of the hoof becomes separated and the sole under-run. There is a characteristic unpleasant smelling discharge. In longstanding cases, the hoof walls and toes become overgrown and misshapen, trapping dirt and inflammatory exudate between the inflamed, granulating soft tissues of the sole and overgrown horn. Animals with advanced footrot are extremely lame, remain recumbent for long periods and may carry the affected leg. When both forelimbs are affected, animals may walk on their knees. Severely affected feet often become flystruck. Furthermore, affected sheep are prone to flystrike on their flanks, where the wool is soiled by unpleasant smelling exudate from their feet when they lie down.



EARLY FOOTROT LESIONS - INFLAMMATION OF THE INTERDIGITAL SKIN WITH SLIGHT UNDER-RUNNING OF THE AXIAL MARGINS OF THE SOLE



MODERATE FOOTROT LESIONS - UNDER-RUNNING OF THE SOLE AND AXIAL HOOF WALL



ADVANCED FOOTROT LESIONS - UNDER-RUNNING AND SEVERE INFLAMMATION EXTENDING TO THE ABAXIAL HOOF WALLS



SEVERE FOOTROT LESIONS WITH COMPLETE UNDER-RUNNING OF THE SOLE AND HOOF WALL AND OVERGROWTH OF THE TOES



BLOWFLY STRIKE IN A CASE OF SEVERE FOOTROT

Footrot control

Various methods can be employed for the control of footrot -

- foot bathing
- foot trimming
- antibiotic injections
- vaccination
- selection for resistance
- eradication

In practice, footrot control is based on a combination of the above. However, it is essential that the application of each of these methods is based on a clear understanding of the pathogenesis of the disease.

It is important to distinguish between those methods which are useful for treating severely affected sheep, such as trimming and parenteral antibiotics, and those which will help control disease when used correctly, such as foot-bathing and vaccination.



FOOTROT CONTROL SHOULD BE INSTIGATED EARLY DURING THE TRANSMISSION PERIOD, WHEN INFECTION IS LIMITED TO THE INTERDIGITAL SKIN AND DOES NOT INVOLVE THE HOOF WALL

The objective of footrot control is to prevent the development of painful and debilitating under-running lesions, using the least arduous and most cost-effective method. This is achieved in infected flocks by reducing the incidence of new infections to maintain the prevalence of disease at a low level. This approach utilises whole-flock control strategies such as foot-bathing and vaccination from the start of the high risk periods for disease transmission, rather than individual handling of each affected animal in order to treat advanced cases. If this objective is met, very few sheep in the flock will develop severe under-running infections and require individual treatment.

Footbathing: Application of antibacterial solutions in a foot bath is most effective for the control of footrot when practiced during the early stages of the disease, when infection in previously unaffected sheep is limited to the interdigital skin and does not involve the hoof wall. Footbathing usually needs to be repeated at fortnightly intervals during warm and wet weather when the risk of transmission is high, but when weather conditions are dry such treatment may achieve a 90 – 100% cure rate. Foot bathing alone is not particularly effective for the treatment of advanced footrot lesions.



FOOTBATHING IN ANTIBACTERIAL SOLUTIONS IS MOST EFFECTIVE WHEN PERFORMED BEFORE UNDER-RUNNING OF THE SOLE OR HOOF WALL OCCURS

Sheep should be walked through a footbath of 3% formalin or stood for up to one hour in 10% zinc sulphate solution. The standing time in zinc sulphate footbaths can be reduced by the addition of the penetrating agent, such as sodium lauryl sulphate or a squirt of washing-up liquid. Sheep should be allowed to stand in a dry area for at least an hour after footbathing to allow the chemical to dry on the feet.

Before footbathing, sheep should be run over coarse stones or slats to remove as much mud and faeces as possible. Alternatively, they should first be walked through a footbath containing only water. Excessive formalin footbathing in concentrations exceeding 5% can result in foot damage and should be avoided. Furthermore, zinc sulphate is less effective if formalin has been used within the previous two months.

Foot trimming: Traditionally routine annual foot trimming has been recommended for the control of footrot. However, foot trimming has no role in preventing infection and should not be considered as a preventive method when planning control programmes. Hoof trimming is only useful to limit the effect of the disease and assist in the resolution of the lesion after the infection has under-run the sole and hoof wall in uncontrolled cases of virulent footrot.

If hooves become severely overgrown despite effective footrot control, then the suitability of the sheep breed for the environment and management system should be reconsidered.



THE MAIN ROLE OF HOOF TRIMMING IS FOR THE TREATMENT OF SEVERE FOOTROT LESIONS, RATHER THAN FLOCK CONTROL

Antibiotic injections: The effect of parenteral antibiotics on interdigital lesions is minimal and they have no role in the prevention of footrot. However, injection of high doses of penicillin can be useful for the treatment of advanced, under-running lesions, provided that sheep are kept in a dry environment for at least 24 hours after treatment.



PARENTERAL ANTIBIOTIC INJECTIONS CAN BE USEFUL FOR THE TREATMENT OF ADVANCED FOOTROT LESIONS

Vaccination: Subcutaneous injection of 1 ml of a formalin inactivated vaccine containing most of the UK strains of *D. nodosus* in an oil adjuvant can be a useful adjunct for both control and treatment of footrot. An initial course of two injections 4 – 6 weeks apart is usually recommended, followed by booster doses in advance of

high-risk periods in spring and autumn. Vaccination provides protection against infection for about 4 - 6 months and there is some evidence that it may also enable already affected feet to heal more quickly. In some cases a single dose of vaccine administered in the face of an outbreak can be used to reduce the severity of the disease. The net effect of vaccination can be to reduce both the prevalence and severity of footrot in the flock. However, whole flock vaccination alone does not eradicate footrot and can prove expensive.

Unfortunately, in many parts of the UK, the high-risk period occurs throughout the year, so vaccination cannot economically provide the duration of protection required. In many flocks, vaccination is targeted at specific high-risk groups of animals, such as rams before mating.

Some local tissue reaction can occur at the footrot vaccination site. Furthermore, footrot-vaccinated sheep cannot be subsequently treated with injectable moxidectin because of a risk of fatal allergic reaction.

Selection for resistance: Resistance to footrot appears to be moderately heritable and breeding of resistant sheep by selective culling could be considered as a potential control strategy. However, while breeding of resistant sheep is a genuine possibility, the value of this strategy is limited by the stratified system of sheep production in the UK. To be most successful, selection should be practised at the level of the hill or longwool ram producer.

Footrot eradication: Unlike *F. necrophorum*, which is always present in the environment, *D. nodosus* only survives in diseased feet. Warm and moist pasture is required for the transmission of *D. nodosus* between animals, but the bacteria only survives in the soil for a maximum of about four days. It is, therefore, possible to eradicate footrot from affected flocks.

Eradication of footrot is possible through a combination of regular examination and separation of affected from non-affected animals, footbathing and strict culling of persistently affected sheep. There are several pitfalls and attempts to eradicate the disease are frequently unsuccessful. Eradication should only be attempted during

dry weather conditions when transmission of *D. nodosus* is slow and sheep are unlikely to be in the early stages of the infection, which could be missed or confused with scald. Unfortunately, identification of such slow transmission periods is difficult in many parts of the UK.

Replacement animals should be quarantined for at least one month, during which time they should be inspected. However, despite treatment of any infected animals, it may be impossible to prevent the re-introduction of the disease. Stray sheep from neighbouring flocks are another common cause of re-infection. *D. nodosus* can also be carried in the feet of cattle and goats, although cattle strains are usually benign for sheep. However some goat strains of *D. nodosus* are particularly virulent for sheep, so goats should be included where eradication of the disease is attempted.

The cost of eradication can be considerable when compared with the cost of management of endemic footrot in the flock. Eradication is, therefore, only suitable for closed flocks in drier parts of the UK.

General advice: In the past, the importance of some purported control activities has been overstated. For example, the disinfection of hoof trimming equipment between feet and between sheep to stop transmission is not important when the sheep have been co-grazing the same pasture for weeks beforehand. In addition, the advice that pastures should be rested for two weeks to avoid re-infection after clinically diseased sheep have been removed from a flock overstates the importance of the risk of re-infection from pastures, compared to the high probability that sub-clinically infected sheep will be left in the flock and will serve as a source of re-infection.

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