Current and Emerging Flock Health Concerns (Caseous Lymphadenitis, Lameness, Anthelmintic Resistance)

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Introduction

The main principles of control of infectious disease are illustrated in this paper by outlining three emerging flock health concerns – caseous lymphadenitis, contagious ovine digital dermatitis and anthelmintic-resistant parasitic worms.

Caseous lymphadenitis

Caseous lymphadenitis (CLA) is caused by the bacterium *Corynebacterium pseudotuberculosis*. Although it can affect a number of domestic species and man, it is as a disease of sheep and goats that CLA is most important (Baird, 2003). *C. pseudotuberculosis* causes chronic abscessation in lymph nodes and internal organs. When superficial lymph nodes are affected these abscesses are visible as swellings beneath the skin, which may rupture and discharge pus. CLA is present in many countries throughout the world and was first recorded in sheep in Northern Ireland in 1999, when the source of the infection was traced to imported Scottish sheep. CLA is a notifiable disease in both Northern Ireland and the Republic of Ireland, but has not been notifiable in Great Britain since 1991.

Implications for sheep farming

Economic losses occur mainly by the culling of affected animals, carcass condemnations and restrictions on trade. Production losses may occur when internal abscesses are present. Although uncommon, human cases of *C. pseudotuberculosis* infection have been reported.

Diagnosis

CLA may be detected clinically if superficial lymph nodes are affected. These lymph nodes lie under the skin in the head, neck, shoulder, groin and leg regions. CLA abscesses may also be present in internal lymph nodes (such as those in the chest and abdomen) and in internal organs such as the lungs. The abscesses may be present in single or multiple sites. *C. pseudotuberculosis* must be cultured from the abscesses to obtain a definitive diagnosis and rule out other diseases such as actinobacillosis, *Arcanobacterium pyogenes* infection and staphylococcal dermatitis.

Workers in the Dutch Animal Health Service and Central Veterinary Laboratory evaluated a double antibody sandwich ELISA test for the detection of CLA in healthy sheep from CLA-free flocks and in sheep with culture-confirmed CLA (Dercksen and others, 2000).

This test is not yet commercially available and a study was designed to evaluate its use as the basis of a test and cull policy in six infected flocks located in Scotland, England and Northern Ireland (Baird and others, 2003). Flock owners were given specific advice on management changes likely to reduce the spread of CLA infection within the flock. Flocks were then visited at approximately six monthly intervals. All sheep over the age of six months were clinically examined for evidence of CLA and blood sampled. In four of the six flocks seroprevalence of CLA, as measured by the ELISA, was reduced to zero and no new clinical cases of CLA were reported during the last six months of the trial. A fifth flock (flock E) was tested twice before being withdrawn from the trial. However, in the sixth flock (flock C) where little effort was made by the owner to remove antibody-positive animals, disease prevalence increased considerably (Table 1).

Table 1. Seroprevalence rates (%) for the six flocks in the trial

Flock	Initial	Final
A	13	0
B	63	0
C	29	67
D	8	0
E *	5	2
F **	0	0

***** Flock withdrawn from trial after 6 months
** Second flock test at 9% seroprevalence

The results of this trial confirm that with the application of a serologically based test and cull policy, allied with changes in management practice, it is possible to greatly reduce disease prevalence within CLA-infected flocks. It is anticipated that such ELISAs will become commercially available in the near future.

Control

A number of factors make the control of CLA difficult. The disease may be detected clinically in superficial lymph nodes, whereas a number of CLA abscesses may be present only in visceral lymph nodes or organs such as the lungs. CLA has a relatively long incubation period, of 2-4 months, before it may be detected clinically. *C. pseudotuberculosis* may also survive for long periods in the environment, thus providing a source of infection in the absence of clinical cases. In addition, antibiotic treatment is ineffective.

A closed flock policy (including rams) should be maintained, where possible. Sheep should only be purchased from flocks known to be free from CLA. Newly introduced sheep should be quarantined and examined regularly for lymph node enlargement. It is important to note that internal lesions cannot be detected clinically.

Once CLA is detected in a flock, affected animals should be separated, thus forming clean and dirty flocks. However, it should be remembered that “clean” flocks might contain subclinically infected animals. Affected stock should ideally be culled, although it is accepted that widespread culling is usually not financially viable, especially in pedigree flocks.

The results of blood testing young sheep for antibodies to CLA have indicated that few lambs contract the infection while suckling their

mothers. This suggests that early weaning and subsequent isolation of the lamb crop from the adult sheep population could form the basis of a CLA management and control strategy.

C. pseudotuberculosis can persist in purulent discharges for up to several months under optimal environmental conditions. Contaminated buildings should be thoroughly cleaned to remove all organic material using hot water and/or steam. The building should then be disinfected using proprietary disinfectants. There is no data available to allow estimates for survival times on grass under British or Irish conditions, but it is reasonable to assume that most pastures will be safe 6 months after grazing with affected sheep.

Shearing or tail docking (because of contaminated equipment) and dipping (because the organism penetrates wet skin) are high-risk transmission factors. Appropriate hygienic precautions, including thorough equipment disinfection, should be undertaken at shearing/docking and dipping, and sheep should not be housed together for longer than necessary when handling for routine procedures.

CLA is controlled in Australia and the USA by vaccination. However, commercial CLA vaccines are not licensed in Britain or Ireland.

Contagious ovine digital dermatitis (CODD)

The major infectious causes of lameness in sheep are interdigital dermatitis (scald), footrot and contagious ovine digital dermatitis (CODD). A recent Warwick University survey found that 88 per cent of flocks had cases of interdigital dermatitis (scald) within the previous 12 months, while 86 percent of the same flocks reported having foot rot. By contrast less than 4 per cent of these farms reported having seen CODD in their flocks (Wassink and others, 2003). Effective control of lameness requires accurate diagnosis and identification of high-risk periods. Quarantine treatments are also important to ensure that virulent footrot strains or CODD are not introduced to the rest of the flock.

Infectious causes of lameness

Scald

Scald only affects the skin between the claws, which is moist and painful (Figure 1). There is no under-running of the horn, which occurs in footrot. This disease is caused by an environmental bacterium, *Fusobacterium necrophorum*, which also causes interdigital dermatitis (foul foot) in cattle. Scald is common in lambs at grass, particularly in warm wet weather, but is also frequently seen in housed ewes. Treatment of scald is by oxytetracycline foot spray or footbathing with either formalin or zinc sulphate.

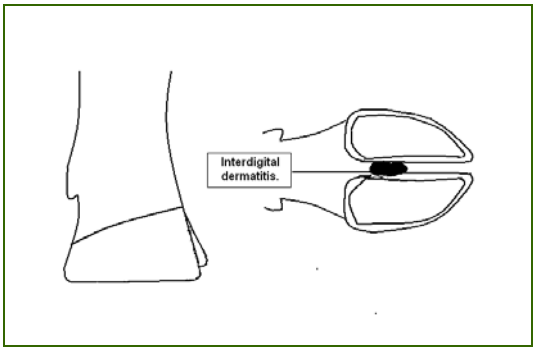

Figure 1. Scald affecting interdigital skin

Footrot

Footrot is the single most important cause of lameness in sheep.

Footrot is preceded by scald (interdigital dermatitis), which progresses when a secondary infection with the bacterium *Dichelobacter nodosus* occurs. This bacterium is found in infected feet, surviving in cracks in the horn, but can only live on pasture for about two weeks. *D. nodosus* invades the hoof, causing separation of the horn from the underlying tissues of the sole and wall of the hoof. The separation begins in the heel area and, depending on the strain of *D. nodosus* involved may spread under the sole and up the wall of the hoof (Figure 2). One or more claws or hooves may be affected.

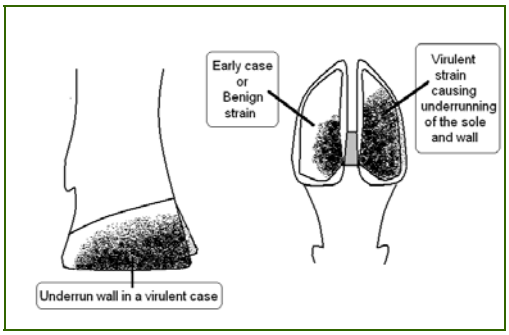

Figure 2. Classical footrot

All cases of footrot should be treated and isolated. Treatment by long-acting antibiotics is effective, but sheep repeatedly lame with footrot should be culled. Footbathing with 3% formalin or 10% zinc sulphate is necessary to control footrot in the remainder of the flock. Sheep should be stood on a hard surface for at least one hour after footbathing and then, if available, turned onto "clean" pasture, i.e. pasture that has been free from livestock for at least two weeks. Commercial footrot vaccines have been shown to be both protective and therapeutic when used in infected animals.

Contagious ovine digital dermatitis (CODD)

A new severe foot disease in sheep, CODD, has been described relatively recently (Winter, 1997). CODD differs from footrot in that the disease is more severe and begins at the coronary band of the hoof, not the interdigital skin as in footrot. Typically, a large proportion of the flock is affected. Ulceration and separation of the horn proceeds from the coronary band, sometimes leading to shelling of the horn that leaves a bleeding stump of sensitive tissue. A single claw is usually affected (Figure 3).

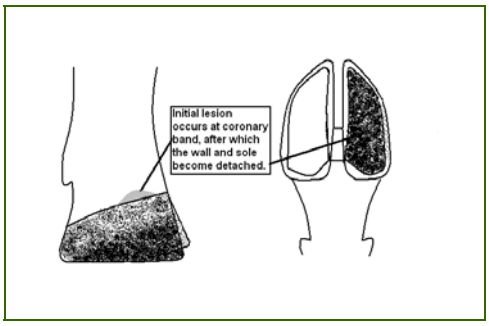

Figure 3. Contagious ovine digital dermatitis (CODD)

Conventional footrot treatments are often ineffective for the treatment of CODD. If CODD is confirmed treatment options include antibiotic footbaths or sprays containing either lincomycin/spectinomycin or tylosin, or tilmicosin by injection (Winter, 2004). These antibiotic footbaths are not licensed for use in sheep, but they may be used by veterinary surgeons under the prescribing "cascade" (http://www.vmd.gov.uk/lu/amelia/amelia8.pdf). Tilmicosin does not have a marketing authorisation for the treatment of CODD, but it is licensed for sheep, so may also be

used by veterinary surgeons under the prescribing “cascade”.

Key measures in preventing the introduction of CODD include quarantine of all introductions for a minimum of three weeks, inspection of feet on arrival and weekly thereafter, walking sheep through a formalin footbath and inspection of each foot before allowing sheep to join the main flock.

Anthelmintic-Resistant Parasitic Worms

Parasitic worm infections of sheep can cause clinical disease and loss in production. These worms live in the stomach and intestine, breed and lay eggs, which are passed onto pastures and hatch there into larvae that develop and re-infect susceptible sheep. This life cycle can become rapid during mild moist conditions, particularly under intensive husbandry conditions. Pasture larvae levels can build up resulting in parasitic gastro-enteritis, which is characterised by severe diarrhoea. The introduction of effective anthelmintic drugs in the early sixties made treatment an effective way of reducing worm burdens in intensively managed sheep. Anthelmintics used to prevent or treat parasitic gastro-enteritis fall into three main groups depending on their chemical structures and mode of action (Table2).

Table 2. Groups of Anthelmintic Drugs

Group 1 (BZ)	Benzimidazoles	“White” drenches
Group 2 (LM)	Levamisole, morantel	“Yellow” drenches
Group 3 (ML)	Macrocylic lactones	“Clear” drenches and injections: ivermectins, doramectin, moxidectin

However, resistance to the existing drugs has become increasingly more prevalent and there is little prospect of new drugs being available in the near future. In addition, economic alternatives to anthelmintics for the control of parasitic worms are unlikely in the foreseeable future. Therefore it is important that measures that delay the development of resistance to the currently available anthelmintics are adopted.

A recent survey in Scotland found that resistance to benzimidazoles (white drenches) was 81% in lowland flocks, with a much lower prevalence in hill (45%) and upland (56%) flocks (Bartley and others, 2001). There are also reports of anthelmintic resistance in Ireland (Good and others, 2003). Anthelmintic resistance in the UK is mainly to the benzimidazole (BZ) group of anthelmintics, with isolated reports of resistance to other drug classes in the stomach worm *Teladorsagia (Ostertagia) circumcincta*, because of the widespread distribution of this parasite. Ominously, resistance to all three groups of anthelmintics has been described recently in the UK, including a lowland flock in Scotland (Sargison and others, 2001).

Recommendations on new worm control strategies have been

published through the SCOPS (Sustainable Control of Parasites in Sheep) initiative. These are available in detail on the Sheep Veterinary Society website (http://svs.mri.sari.ac.uk/scops.htm.).
The main recommendations include:

- Quarantine treatment for bought-in animals with both a ML and LM drug sequentially. Sheep should be yarded for at least 24 hours after dosing and then released onto “dirty” pasture.

- Good drenching technique to ensure correct dose (dose for heaviest lamb in batch) and ensure that oral drenches are completely swallowed. Withholding feed for 12-24 hours before dosing will improve the efficiency of both BZ and ML anthelmintics.

- Rotate chemical groups of anthelmintics each year. This does not apply to quarantine treatments.

- Testing flocks using faecal egg counts (FECs) to determine dosing requirements (Figure 4).

- Lambs may be treated for Nematodirus worms with a BZ anthelmintic.

- Testing for drug resistance using pre- and post-drenching FECs.

- Sheep should not be moved to “clean” pastures after dosing, as this practice is highly selective for anthelmintic resistance.

- The number of treatments given to ewes should be reduced. Fit adult ewes should not be treated pre-tupping and ewes do not always need to be treated in the pre-lambing period. Closantel may be used if the blood-sucking worm *Haemonchus contortus* has been identified in the flock.

Figure 4. *Nematodirus* and strongyle worm eggs

DARD’s Veterinary Sciences Division has plans to initiate a project this year to investigate worm control strategies in Northern Ireland and also to set up a testing program to measure the extent of anthelmintic resistance on local farms.

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