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Progress toward eradication of virulent footrot

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Footrot causes severe production losses.

PHOTOS: Laurie Benson, Albany

By Bob Mitchell
State Footrot Coordinator, Albany

Western Australia is well placed to eradicate virulent footrot from the State's sheep and goat populations.

Between 1950 and 1993 the proportion of sheep flocks with footrot fell from about 15 per cent to less than 2 per cent, and the 1990-92 outbreak has been turned around. One hundred and eighty properties (1.7 per cent) of flocks, mostly in the high rainfall South-West, are in quarantine for footrot today.

This high level of footrot control is the result of strong support from the sheep industry and years of good cooperation between farmers and the Department of Agriculture.

Western Australia leads in the control of virulent footrot and has enabled most sheep and goats to remain free of this painful and important disease.

Advantages
Western Australia has some key advantages that enable us to be further advanced towards eradication of virulent footrot than other States. Our hot and dry climate during summer and early autumn provides ideal conditions for eradication inspections on farms. Interstate animal quarantine surveillance, initially at the Norseman and Parkeston (Kalgoorlie) checkpoints, is effective in minimising re-entry of virulent strains of footrot.

Economic analyses have shown:
- The net annual benefit of the current footrot campaign is about $6.8 million, and the benefit to cost ratio is 5.3 to 1, over 20 years.

- The economic benefits of completing the eradication of footrot, which would require extra resources, are estimated at $44 million net present value over 20 years, and a benefit to cost ratio of 4.9 to 1.

Western Australian farmers need to consider the highly infectious nature of footrot, the potential for explosive outbreaks, the severe production losses, eradication costs on-farm, and the animal welfare aspects of this debilitating and painful cause of lameness.

About footrot
Footrot is a contagious disease of sheep and goats caused by the bacterium *Dichelobacter nodosus*. (Reference to sheep in this article applies equally to goats.)

The bacterial infection can cause varying degrees of damage to the horn of the foot, leading to lameness and severe loss of bodyweight and wool production.

*D. nodosus* has a limited host range. Merino and crossbred sheep, and goats, are highly susceptible. British breed sheep are less affected. Cattle and deer are readily infected with strains of *D. nodosus* associated with benign footrot. Cattle can also be infected with virulent footrot, though this seldom happens, and it is not a major impediment to eradication.

There are two forms of footrot, virulent and benign. Both forms are caused by infection with strains of *D. nodosus* of varying virulence. All infections start as inflammation of the skin between the toes. With benign footrot there is only minor damage to the horn of the foot.

Virulent footrot
The first sign of infection with virulent footrot is inflammation of the skin between the toes and then spread to the soft horn of the sole and toe. Smelly, creamy material appears and may separate the sole from the soft horn. This process is known as under-running of the soft horn and sole of the foot.
Benign footrot is usually a mild, seasonal disease caused by benign or protease-unstable strains of *D. nodosus*. It is not practical to eradicate benign strains. Cattle are often infected.

Virulent footrot is the moderate to severe disease that is caused by virulent or protease-stable strains of *D. nodosus*. Western Australia's objective is to eradicate these strains.

There is no adequate laboratory test to differentiate between the virulent strains of *D. nodosus*. The term 'intermediate footrot' was once used to describe the less virulent of the protease-stable strains, however, it is no longer valid. It is likely that some of the most virulent strains have been eliminated from Western Australia.

Owners of sheep affected or suspected to be affected with virulent footrot must report this to the Department of Agriculture. Veterinary practitioners, stock agents or other people noticing abnormal lameness in sheep must also report this to the Department.

There is a good correlation between confirmed laboratory tests for protease stability and inspections of foot lesions in the field. Under ideal conditions for lesion development, protease stable strains consistently produce under-running of the sole, whereas protease unstable strains rarely produce under-running.

Survival of the bacterium and methods of spread

Warm, moist weather in autumn and spring is ideal for development of foot lesions and spread of footrot infections whereas cold weather in winter and hot, dry conditions in summer are not.

*D. nodosus* is killed readily by drying out and by exposure to air. In summer, the bacteria do not survive for more than a few days other than in the infected feet of sheep or goats. Spread is mainly from purchased infected animals or from infected straying sheep.

However, the disease can also be spread in other ways.

**Sheep yards and raceways** are safe two weeks after they have been used by footrot-affected sheep. In late summer, the risk period may be less than one week.

**Paddocks** that are destocked for two weeks are safe. New, clean sheep can be put into them safely.

Terms used

**Virulent footrot** is the moderate to severe disease that is caused by virulent or protease-stable strains of *D. nodosus*. Western Australia's objective is to eradicate these strains.

**Benign footrot** is usually a mild, seasonal disease caused by benign or protease-unstable strains of *D. nodosus*. It is not practical to eradicate benign strains. Cattle are often infected.
PCV (Present Value of Program Costs) is the total cost of the eradication program over 20 years in 1993 dollars.

NPV (Net Present Value) is the value of the eradication program over 20 years in 1993 dollars.

IRR (Internal Rate of Return) is the percentage 'interest rate' earned on money invested in the eradication program.

BCR (Benefit Cost Ratio) is the ratio found when the eradication benefits of the program are divided by the costs of the program.

### Value of footrot eradication over a 20-year period

<table>
<thead>
<tr>
<th></th>
<th>Number of farms affected</th>
<th>PVC ($m)</th>
<th>NPV ($m)</th>
<th>IRR</th>
<th>BCR</th>
</tr>
</thead>
<tbody>
<tr>
<td>High level of control</td>
<td></td>
<td>50</td>
<td>$10.1m</td>
<td>80%</td>
<td>5.3 to 1</td>
</tr>
<tr>
<td>Faster eradication</td>
<td></td>
<td>0</td>
<td>$10.5m</td>
<td>64%</td>
<td>4.9 to 1</td>
</tr>
</tbody>
</table>

(After 8 years)

Trucks that have carried footrot-affected sheep should be washed out thoroughly to remove faecal material before reloading with clean sheep. The permit required to move sheep from a quarantined property direct to an abattoir or export feedlot will specifically mention truck wash-down.

Footwear of inspectors and farmers should be cleaned after handling footrot affected sheep, to considerably reduce the risk of spread. Boots can be washed in chemical disinfectant in water as an extra precaution.

### Prospects for eradication

Apart from Western Australia's geographical and environmental advantages for eradicating footrot, the very nature of *D. nodosus* makes it possible to do so. This is because the bacterium:

- has a narrow range of host animals that carry and spread it;
- does not survive well in dry conditions and when exposed to air;
- can grow in suitable media to be transported from the farm to the laboratory; and
- can be isolated and tested with a reliable laboratory test.

### Control history in Western Australia

In 1950, sheep producers urged the Department of Agriculture to implement a footrot eradication program because an estimated 15 per cent of sheep flocks were affected.

Footrot became a notifiable disease. Properties were placed under quarantine until they were confirmed as free, usually the following spring.

By 1983, the known prevalence of footrot had dropped to less than 0.3 per cent of properties, and some of the most severe virulent footrot strains were probably eradicated.

Some less virulent strains (then called intermediate strains) of *D. nodosus* probably entered the State with the huge numbers of sheep imported from the Eastern States after the severe 1981–82 drought. A secondary outbreak of footrot developed and was controlled from 1984–88.

A third outbreak appeared in the spring of 1989 and during 1990, developing initially in Boyup Brook and nearby districts. The number of farms in quarantine increased from 52 to 126. The State Government provided additional staff and funding to the Department of Agriculture to control this outbreak within two years. The emphasis was on district surveillance, and extension of footrot eradication procedures and management options to farmers.

As a result of intense surveillance, improved tracing of affected sheep to properties, and greater farmer awareness about the need to eradicate footrot, the number of properties in quarantine for footrot increased from 130 at November 1990 to 293 in May 1991. This represented almost 3 per cent of the 11,000 sheep properties in the State.

In July 1993, the number of affected properties had fallen to 184, representing 1.7 per cent of sheep flocks. Most of these properties should be released from quarantine by January 1994.

### Economic considerations

Is it better to retain the current expenditure and high level of control of footrot? Eradication might be achieved but we may only improve to where approximately 50 properties per year are still quarantined for virulent footrot.

Or should Western Australia progress faster towards state-wide eradication of virulent footrot? This would require extra resources over the first eight years, but substantially less resources after that (see Table).

High level of control or a more definite push for state-wide eradication are both good economically viable options; which is chosen will depend on the will of sheep industry groups and the availability of adequate resources.

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