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Barber's pole worm: a new solution

By Brown Besier, Veterinary Parasitologist, Albany Regional Office

Barber's pole worm (Haemonchus contortus) has been a major problem to the sheep industry for many years. About ten million sheep graze in Western Australia's high rainfall areas where barber's pole worm is prevalent, and the annual cost of losses and control totals millions of dollars each year.

Research in progress in Albany now offers the prospect of prolonged and reliable control of barber's pole worm, by means of few drench treatments.

Every sheep farmer in high rainfall areas must control barber's pole worm, or risk considerable loss. Outbreaks of haemonchosis, the disease caused by heavy barber's pole infections, claim many sheep each year, and there are still cases where scores of sheep die over a short period. Development of reliable control measures has therefore been a top research priority.

Importance of the disease

Several factors explain the importance of barber's pole worm, and complicate its control.

- Adult worms are blood suckers, and large worm burdens may kill sheep before warning signs appear. By the time infected sheep die many other sheep will have suffered severe disease and production loss. In other cases, smaller persistent burdens are a common cause of illthrift and poor production.
- Large worm burdens can develop rapidly. Female worms are prolific egg layers, and under favourable weather conditions, the number of larvae on the pasture can increase dramatically. Sheep grazing these pastures can quickly acquire massive burdens, and disease may develop four to five weeks later.

Above: Barber's pole worms in the abomasum of a sheep. Worms are about 20 mm long.

Left: Collecting faecal samples for worm egg test counts.
The shading indicates coastal areas where barber's pole worm exists and where haemonchosis is likely unless control measures are taken.

It is often difficult to predict whether or not haemonchosis will develop. Barber's pole worm larvae require warm conditions to develop, and hence disease outbreaks are seen mainly from spring to autumn. However, the size of worm burdens which develop depends largely on local weather conditions, and on pasture conditions on individual properties. Rather than risk losses, many producers have “insured” against haemonchosis by drenching sheep at frequent intervals during the suspected danger periods. However, this policy is costly in terms of drench and labour, as many of the treatments are not necessary. More importantly, excessively frequent drenching encourages the development of anthelmintic resistance.

The objective of our research at Albany over the past four years is to understand the life cycle of barber's pole worm under Western Australian conditions, and to develop control programmes for both barber's pole worm and the other important worm species, with the minimum use of drenches.

**Larval ecology project**

Understanding the relationship between the weather and the development of larvae which may infect sheep is the basis for predicting possible outbreaks of haemonchosis. With this information the times when drenches will be most effective in pre-empting barber's pole worm infection can be identified, and control programmes designed. Therefore, the first stage of the research programme was to define the ecology of the worm’s eggs and larvae on the pasture (Figure 1).

The first experiments involved simulating natural events by depositing sheep faeces containing barber's pole worm eggs on pasture plots at Albany and Mt Barker at fortnightly intervals. We applied egg-laden faeces to both annual and perennial pasture plots, and sampled the pasture every few weeks to determine whether larvae had developed. We also made detailed recordings of the weather from each site.

A consistent pattern of larval development emerged over three-and-a-half years. Almost all eggs failed to develop on annual pastures during hot dry weather; larvae rarely appeared during summer, unless there was heavy and sustained rainfall. During autumn, sporadic numbers of larvae developed until the "break" of the season. As soon as green pasture was abundant, the number of larvae increased rapidly, and their numbers peaked in early June. Over winter, cold weather often inhibited egg development, but by September each year all plots consistently carried larvae. A second larval peak appeared in October, but fewer larvae developed than in June. Few larvae developed after mid December.

Figure 1. Life cycle of barber's pole worm. When eggs and larvae are on pasture they are highly vulnerable to the environment. Extremes of temperature or very dry conditions are particularly lethal; these effects explain the seasonal and year-to-year variation in worm burdens.
Hot and dry weather also decreased larval survival. Larvae which developed in summer rarely survived for more than four weeks, but of those that developed in May, some survived for as long as seven months. Larvae from the spring peak were usually killed by the adverse summer conditions, and were rarely detected after December.

On the wetter perennial pasture a different pattern emerged. Moisture encouraged year-round development of the eggs, and prolonged survival of the larvae. Although hot summer conditions were the least favourable, some larvae were always found on these plots, and in some cases they survived for as long as ten months.

These results established that barber’s pole worm is most vulnerable during the dry summer and suggested action at that time as a basis for effective control measures.

Developing a control strategy

The classic aim of parasite control programmes is to break the parasite’s life cycle. If sheep are drenched to remove their worm burdens, and allowed to graze on a pasture which is not contaminated with larvae, they will remain free of worms for a long time. This is known as a “safe pasture” policy, but the problem is, how to make the pasture “safe”.

The results from the larval ecology project showed that under dry summer conditions almost all barber’s pole larvae on annual pastures die in a few weeks. However, spelling the pasture for this long is often impractical; at this time of year stocking rates are low because less pasture is available. Drenching sheep every three weeks would prevent newly acquired larvae from reaching the egg-laying adult stage, but as many as four drenches would be required, which is not desirable because of the risk of encouraging anthelmintic resistance, and the costs involved.

A possible answer became available in 1982 after the release of a new drench chemical with a long-acting effect against barber’s pole worm. Closantel (Seponver®, Smith Kline Animal Health Products) kills adult barber’s pole worms and continues to kill any larvae taken in by grazing sheep for four to six weeks after treatment. The minimum period between treatment with closantel and the re-appearance of eggs in sheep faeces is about eight weeks.

The existence of this drench suggested a new strategy which would allow sheep to continue grazing while creating a pasture free of barber’s pole larvae: a drench with closantel when the pasture dried off, then a broad-spectrum drench seven to eight weeks later to remove any worms that may have developed in the past three weeks.

Testing the new strategy

We first tested the strategy on farms in 1984, and in a more detailed experiment in 1985. Farm tests involved flocks of weaner sheep on three properties, at Albany, Denmark and South Stirlings. We collected worm eggs in faecal samples from 20 sheep in each flock every month, after the initial closantel drench.

On two of the farms there was a prolonged protective effect against barber’s pole worm. Egg counts remained low in the treated flocks for several months, but untreated sheep on each farm had high barber’s pole worm counts. On the third farm, where a proportion of the flock was not drenched with closantel, haemonchosis developed during autumn.

The success of these initial on-farm treatments prompted a detailed experiment in 1985 on Denmark Research Station, where areas of perennial pasture offered favourable conditions for larval survival. We selected four groups of 50 weaner sheep. Two of the groups received closantel plus a broad-spectrum drench (to kill all worm species) in January, followed by a broad-spectrum drench in March. The other two groups received broad-spectrum drenches only on each occasion. Worm egg counts were again used to indicate changes in worm burdens.

The strategy was highly effective. Figure 2 shows that barber’s pole worm counts fell to zero in sheep given closantel after the first drench, and were still at a low level when the trial ended in September. In contrast, barber’s pole worm egg counts in sheep that received only broad-spectrum drenches reached dangerously high levels in some animals, and although the counts fell after the March drench, average counts continued at a significant level until July. Although sheep bodyweights were not measured, these sheep would probably have suffered considerable production loss because of the continual worm burdens.

The strategy showed that even in an environment which favours survival of barber’s pole worm, drenching with closantel in summer provided prolonged protection, and eliminated the problem of heavy worm burdens in autumn.
Controlling all worm species

The "closantel in summer" strategy fits neatly into a worm control programme which the Department of Agriculture has advocated for many years—summer drenching. Summer drenching aims to control the "scour worm" species (chiefly Ostertagia, the brown stomach worm, and Trichostrongylus, the black scour worm) by eliminating burdens in sheep at the time of the year when there are few replacement larvae on the pasture. Two broad-spectrum drenches are recommended six to eight weeks apart, the first being given once the pasture has dried off. In dry climates a single drench may suffice, but two drenches are usually needed in the high rainfall areas.

A strategy which combines treatment against both barber's pole worm and the "scour worms" is simple: a broad-spectrum drench and closantel once the feed is dry (usually December), followed by a broad-spectrum drench alone, eight weeks later (usually February). Broad-spectrum drenches are necessary, because closantel does not kill the scour worms.

Summer drenching against the "scour worms" has proved effective over many years. However, if anthelmintic resistance is present, control of the "scour worms" may not be totally successful. Resistance to closantel in barber's pole worm is not yet known in Australia, and should be slow to develop with relatively infrequent use of the chemical. The strategy should therefore be highly successful against barber's pole worm except possibly where the pasture is predominantly of perennial species.