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NEMATODIROSIS IN LAMBS

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DURING the period 1956-1958 in New Zealand a number of outbreaks of an acute disease occurred in lambs and the condition was ascribed to heavy *Nematodirus* infestation. Although *Nematodirus* spp. are commonly found in sheep in this country, usually the number present in an individual is relatively small and the worm has been regarded previously as non-pathogenic. Similar views were held in the British Isles until about 1951 when an acute disease condition of lambs associated with heavy *Nematodirus* burdens reached serious proportions. The most likely explanation given for the apparent increase in pathogenesis of the worm, seems to be that the disease is associated with changes in grassland management which have resulted in increased stock carrying capacity and at the same time have produced conditions particularly favourable for the survival of the eggs and larvae of the parasite. Lambs have on this account been exposed to an unusually heavy intake of larvae.

The occurrence of acute *Nematodirus* disease in this country has been mainly confined to Southland and Canterbury. Gut samples submitted for diagnosis from outbreaks in these areas have revealed infestations of *Nematodirus* ranging up to 45,000 worms per host, and information received with these samples has indicated that the symptoms and mortality rate observed agree closely with those described by British workers.

The examination of gut samples, submitted to the Wallaceville Animal Research Station during the spring, summer and autumn of 1958-59, showed that 6.5 per cent. of 335 infested samples contained *Nematodirus* burdens of above 10,000 worms, which is the figure considered to be indicative of acute *Nematodirus* disease. Also during this period differential worm counts carried out on 221 *Nematodirus* infestations from 46 localities revealed the presence of three species, *N. filicollis*, *N. spathiger* and *N. abnormalis*. *N. filicollis* and *N. spathiger* are the important species in New Zealand, both being responsible for outbreaks of disease.

Nematodirus egg counts of lambs in various trials conducted at Silverstream from 1956 to 1959 have shown that the timing and pattern of infestation are remarkably regular. Eggs are

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first voided in the faeces in the middle of October, the infestation reaches a peak in mid-November and then falls rapidly away to a relatively low level which is maintained throughout summer and early autumn. In the late autumn the level is further lowered and the infestation is terminated in early winter—*i.e.*, when the lambs are 9 to 10 months of age.

The observed pattern of *Nematodirus* larval populations on pasture at Silverstream differs from that which would be expected, in view of the pattern of infestation in lambs, in that two larval peaks occur. During September and October there occurs, a small, sometimes ill-defined larval peak followed by a much larger peak in February or March. Recent work in England on the development of the various species of *Nematodirus* has shown that the eggs of *N. flicollis* voided on to the pasture in spring begin to hatch within six to eight weeks.

Thus the explanation of the observed larval pattern at Silverstream, where infestations are *N. flicollis*-predominant, would appear to be as follows: Lambs acquire an infestation from the relatively low larval peak in the spring and the major proportion of the eggs resulting from this infestation commence to develop almost immediately and hatch two to three months later to give the large autumn peak. It seems most likely that the low numbers of eggs voided by the lambs in the autumn, together with a proportion of those passed during the summer, survive on the pasture throughout the winter and hatch to give the small larval peak the following spring.

In normal circumstances, spring-infested lambs are unaffected by the autumn larval peak and continue to void small numbers of eggs throughout the autumn and early winter. This would appear to be the result of immunity stimulated in the lambs at the time of the spring infestation. When lambs, which had been maintained worm-free in pens since birth, were placed on the pasture with spring-infested lambs immediately prior to the autumn larval peak, they acquired a heavier infestation than did the original lambs in the spring. At the same time, the egg counts of the original lambs showed no response to the autumn larval peak. This eliminated the possibility that the lack of response of the spring-infested lambs to the autumn peak might be due in part to the fact that the lambs were older and had acquired an age resistance to infestation. The results also showed that lambs which do not experience a spring infestation are highly susceptible to the autumn larval peak.

In the spring of 1959, a trial was commenced at Silverstream to ascertain the effect of a sub-clinical *Nematodirus* infestation

upon the liveweight gain of lambs. Romney lambs 2 to 4 weeks old were randomized into two groups and grazed in four small paddocks with their ewes. The groups were run together and the paddocks were grazed on a daily rotation. One group was drenched with bephenium embonate at two-weekly intervals, the second group serving as controls. Faecal egg counts showed that the animals in the drenched group remained negative for *Nematodirus* throughout the trial, and mean egg counts for other trichostrongyle species were low in both groups. The highest mean *Nematodirus* egg count in the control group was 807 eggs per gram. The maximum difference in the liveweights of the two groups occurred 15 weeks after the commencement of the trial, when the mean weight of the drenched group was 7.3 lb higher than the control group.

The practical application of available knowledge of the epidemiology of *Nematodirus* infestation has been the recommendation of certain grazing procedures. *Nematodirus* has been recognized as a "lamb to lamb" disease, each crop of lambs deriving the major portion of its infestation from infection laid down on pasture by the previous year's lambs. As a result of this, it has been recommended that lambs graze only on pasture which did not carry lambs the previous year. Unfortunately, this rule is not easy to apply in practice. However, knowledge of the timing and regularity of appearance of *Nematodirus* infestation in spring will enable preventive drenching to be carried out. Preventive drenching in the spring, in addition to preventing or controlling current infestation, would also reduce pasture contamination for the following autumn and spring.

DISCUSSION

DR L. K. WHITTEN: I would like to say that we should thank Dr Brunson for his paper as it adds one more entity to the possible causes of poor lamb growth. It is important also to realize that the condition occurs over such a short period of time. It has been made possible to measure the effect of the infection by the use of bephenium embonate which is so specific for this parasite. It is possible that this may prove to be a useful research tool allowing further measurements of the effects of *Nematodirus* infection with a minimum of complication from the effects of other species. At present the cost of this material is high and it is essential to determine whether it can produce responses that are economic.

Q.: *I am interested in the possible use of "Frantin" as a research tool and would like to know how good a tool it is. The figures presented showed some effect on other species and might this not introduce a further complication?*

A.: The drug used in these trials was the original "Frantin" consisting of 90 per cent. embonate which is very highly specific for *Nematodirus*. More

recently a new formula with 30 per cent. embonate and 60 per cent. hydroxynaphthoate has become available and this has a rather wider spectrum of activity against other species of nematodes.

Q. : I seem to recollect that in Britain the timing of the larval peak in relation to the age of the lamb was important. Is this still considered to be so?

A. : Yes, this does appear to be so and British work has shown that a moderate larval peak when lambs were 5 to 7 weeks old gave heavier infection than did a higher peak which appeared when they were only 3 to 4 weeks old and consuming very little infective pasture.