Epidemiology and Control of Gastrointestinal Nematodes Infections in Dorper Lambs in a Semi-arid Area of Kajiado District

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Abstract
A study on the epidemiology and control of gastrointestinal nematode infections in lambs in a semi-arid area of Kajiado District of Kenya was carried out between January 2001 and December 2001. Forty Dorper lambs were randomly recruited at the age of 6 weeks and their faecal samples examined for strongyle type nematode egg output at 3 weeks intervals for a period of one year. At the age of 12 weeks the lambs were divided into two groups A and B each consisting of 20 animals. Group A lambs were then treated strategically with Albendazole at the dose rate of 5 mg/kg body weight, at the age of 12 weeks, at weaning (aged 4 months), post weaning in mid-dry season (aged 7 months) and 3 weeks into the short rains in November 2001. Group B lambs remained as un-treated controls and only received a salvage treatment based on clinical signs of nematodiasis. During each sampling occasion, the lambs in both groups were weighed to determine their growth rates. Strongyle-type nematode egg counts were first detected at the age of 9 weeks and then rose sharply at the age of 12 weeks. In the un-treated group the egg counts peaked shortly after weaning at the age of 4 months then gradually declined to the lowest level at around the 10th month. The lambs treated strategically had lower faecal egg output throughout the study period and had significantly higher weight gain compared to the un-treated controls. Eleven out of the 20 group B lambs received a salvage treatment, an indicator that young animals need protection from the adverse effects of helminthiasis. The strategic treatments given in this study effectively decreased the levels of pasture contamination and improved productivity and are therefore recommended for use in the study area.

Introduction
The rise in human population in Kenya has resulted in increased demand for animal proteins. To meet this demand, there is need to increase the population and production of food animals. Efficient use of the semi-arid areas of the country, which are currently under utilised, offers an excellent opportunity for production of ruminants. Due to their feeding habits, high reproductive capacity and rapid growth rates, sheep production enterprises may be more efficient in the use of such an environment than cattle. To exploit this potential, there is need to improve on management and control of production limiting diseases. Undoubtedly, helminthiasis is the most important single group of infections affecting sheep production in many parts of the country. This is particularly true for the strongyle nematodes, which are frequently endemic in the tropics (Curles, 1983).

Lambs are more susceptible to nematode parasitic infections than adults (Watson and Gill, 1991). Their greater susceptibility is ascribed to a defective development of protective acquired immune responses to nematode infections (Colditz et al., 1996). The higher susceptibility of lambs to nematode infection presents a considerable problem for farmers, which currently is addressed only by a combination of strategic treatments with effective anthelmintics and astute management (Dush, 1986). To develop strategic preventive measures against helminthiasis, it is necessary to have a precise knowledge of the seasonal epidemiology of helminth infections for the target group in a specific locality. The objective of this study was therefore to establish the levels and effects of gastrointestinal nematode infections and to assess the impact of strategic anthelmintic treatments in controlling naturally acquired infections in lambs in a semi-arid area of Kajiado District of Kenya.

Materials and methods
The study was carried out on female Dorper lambs raised at the Maasai Rural Training Centre Ranch in Isiolo Division of Kajiado District between January 2001 and December 2001. In January, a total of 40 lambs were randomly recruited at the age of about 6 weeks. Faecal samples were thereafter collected directly from the rectum of individual animals at three weeks intervals throughout the study period. The number of trichostrongylid nematode eggs per gram of faeces (EPG) was determined for each sample using a modified McMaster technique (Whitlock, 1948) with a lower limit of detection of 100 eggs per gram. In February, at the age of 12 weeks (3 months), the lambs were randomly allocated to 2 groups (A and B) of 20 animals each. Group A lambs were then treated with albendazole (Valbazen®, Novartis East Africa Ltd, Nairobi) at a dose rate of 5 mg Kg⁻¹ body weight, in April soon after weaning (aged 4 months), in July, mid-dry season (aged 7 months) and in November, 3 weeks into the short rains. No anthelmintic treatments were given to group B lambs except for salvage based on clinical helminthiasis. Data from all animals given salvage treatment was excluded from analysis. On each sampling occasion, the lambs were weighed and the cumulative weight gains determined for each group. The pasture infectivity was also monitored at the same interval by analysis of...
samples taken from the paddocks, watering point and around the night pen. The herbage samples were processed as described by Hansen and Perry (1994) and expressed as the number of infective larvae per kg dry herbage.

**Statistical analysis**

The numbers of strongyle-type nematode eggs per gram (EPG) of faeces were logarithmically transformed [log (x + 10)] to normalise their distribution. Analysis of variance (ANOVA) was performed using a Microsoft Excel Program to compare the faecal egg output and the weight gains between the treated and the un-treated groups where a value of P < 0.05 was considered significant.

**Results**

The arithmetic mean strongyle-type egg counts for the lambs and the amount of rainfall recorded during the study period are shown in Figure 1. Strongyle eggs were first detected in February when the lambs were 9 weeks old. The counts then rose sharply at the age of 12 weeks (3 months) and in the un-treated group, peaked in April shortly after weaning. The counts gradually declined as the lambs grew older and as the dry season advanced. The lowest counts were recorded in August followed by a small peak between September and November. The egg counts for the treated group were significantly lower (p < 0.05) than those of the un-treated controls as shown in Table 1. The trends in pasture infectivity recorded during the study period are also shown in Figure 1. The pattern of pasture infectivity closely followed the rainfall distribution pattern. The pasture larval counts were generally higher during the rainy season and soon after the rains. The counts then declined as the dry season advanced and were lowest towards the end of the dry season from August to October. The trends in weight gains for the strategically treated and control groups of the lambs as recorded during the study period are shown in Figure 2. Lambs in both groups recorded weight gains from the onset of the study in January till July and September when weight losses were observed in the control and treated groups respectively. In both groups, weight losses continued till October after which gains were recorded to the end of the study period. The cumulative weight gains were significantly higher (P < 0.05) for the treated than the un-treated controls as shown in Table 1. During the study period, 11 out of 20 lambs in the control group received salvage treatment as shown in Figure 1. Two of the treatments were administered pre-weaning (February - March), four shortly after weaning (April and May), three during the dry season between June and October and two during the short rains in November and December.

**Discussion**

The results of the present study showed that gastrointestinal nematode infections in lambs occurred in February when they were aged 9 weeks and had started to rely heavily on pastures. The onset and the level of infection in lambs largely depend on the prevailing environmental conditions and pasture.

Figure 1: The amount of rainfall recorded at the Maasai Rural Training Centre Ranch, faecal egg counts for the treated and control groups of lambs, the number of infective larvae recovered from pastures and the number of control group lambs that received salvage treatment between January and December 2001.

Figure 2: The cumulative weight gains for the treated and control groups of lambs during the period January to December 2001.

<p>| Table 1 | The overall arithmetic mean ± SD strongyle egg counts per gram of faeces (EPG), the cumulative weight gains and the p-values from the analysis of variance (ANOVA) for the treated and control groups of lambs during the period January to December 2001. |</p>
<table>
<thead>
<tr>
<th>Arithmetic mean</th>
<th>Treated group</th>
<th>Control group</th>
<th>p-values</th>
</tr>
</thead>
<tbody>
<tr>
<td>EFG Cumulative</td>
<td>563 ± 108</td>
<td>1320 ± 232</td>
<td>&lt; 0.01</td>
</tr>
<tr>
<td>weight gains</td>
<td>25.1 ± 6.8</td>
<td>21.5 ± 5.3</td>
<td>&lt; 0.01</td>
</tr>
</tbody>
</table>

Pasture infectivity is higher during the wet than the dry season and those lambs that start grazing during the dry season rarely get infected. During the present study, the level of pasture infectivity was high as a result of the high rainfall in January 2001. The most important source of pasture contamination for lambs is the peri-parasitric ewe that suffers a temporary loss of acquired immunity leading to increased nematode egg output. The effects of the peri-parasitric rise can be reduced by a pre-lambing treatment of ewes before moving them to “clean” pastures. However, the most effective control is achieved through improved feeding of the ewes to increase milk yields and hence delay the intake of large amounts of contaminated pastures (Carles, 1983). The results of this study also indicated that peak faecal egg output in lambs occurred at around the time of weaning. Weaning seriously compromises growth rates in lambs largely as a result of cessation of milk intake and lowered feed intake as the lambs spend more time calling and searching for their dams (Watson and Gill, 1991). In addition, the stress imposed by weaning results in immune-suppression and consequently increased susceptibility to infections and faecal egg output (Watson and Gill, 1991). Though the higher egg output may be short lived, the negative impact on the health of the weaned lambs may persist for long. In the present study, the negative impact was evident from the lower weight gain in un-treated than the treated lambs and in the large numbers that received salvage treatments in the control group. Poorly fed animals are more susceptible to the effects of internal parasites. In helminth infections, this manifests as increased establishment, survival and pathogenicity of the parasites hence production losses in the host (Coop and Kyraziakis, 1999). In the present study, this was evident during the dry season when the lambs in the control group lost weight earlier (July) than the treated lambs (September) and from the large number that received salvage treatments. The possible maturation of hypobiotic larvae of *Haemonchus* towards the end of the dry season and at the onset of the rainy season may worsen the situation leading to mortalities (Gatongi et al., 1998).

Due to the greater susceptibility of young animals to infections, the most important strategic treatments are those that provide maximum protection until weaning, at the time of weaning when they suffer their greatest nutritional stress and post weaning to improve on weight gain and reduce pasture contamination. In the present study, the strategic treatment of lambs at the age of 12 weeks, at the time of weaning, in mid-dry season and 3 weeks into the short rains resulted in significantly higher weight gains and lower faecal egg output, hence decreased pasture contamination. Based on the results obtained in this study, the strategy was effective in controlling gastrointestinal nematode infections in lambs and is recommended for use in the study area.

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**References**


