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EFFECTS OF LEVEL OF NUTRITION AND DRENCHING STRATEGY ON PASTURE UTILIZATION DURING AUTUMN BY SET-STOCKED HOGGETS INFECTED WITH GASTRO-INTESTINAL NEMATODES

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SUMMARY

In a 3 × 3 factorial trial, set-stocked ewe hoggets were offered pasture allowances of 2, 4, or 6 kg DM/head/day for 10 weeks during autumn 1979 and either given no anthelmintic or treated at 5- or 2.5-week intervals. Initially *Trichostrongylus* spp. were the major parasites, comprising 86% of the mean faecal egg count of 4 000 e.p.g., and 53% of the 450 larvae/kg herbage. However, the proportion of *Haemonchus contortus* increased during the trial. There was apparent resistance to the drench and large numbers were present in most groups at slaughter. Subclinical parasitism had little effect on intake and utilization of pasture. Substantial liveweight responses to drenching at the higher levels of nutrition could be due to better digestive or metabolic efficiency. Higher planes of nutrition reduced faecal egg counts and pasture larval levels for undrenched stock, and the animals gained weight.

INTRODUCTION

Poorly fed hoggets cannot withstand the debilitating effects of parasites and cannot establish and maintain immunity (Brunsdon and Adam, 1975). Anthelmintic drenching strategies and grazing management can regulate parasite populations so that substantial weight gains are achieved by sheep (Brunsdon, 1970, 1976a, b; Cottier *et al.*, 1976; Johnstone *et al.*, 1976).

Experimental investigation into the development and control of parasites is made difficult by the many factors affecting the host-parasite ecological complex. These include climate, district, weather, relative proportions of susceptible and immune hosts, the grazing history of the paddocks, and the structure of the sward. Such factors, in combination with the effectiveness of anthelmintics, determine the number, activity, and species of parasites.

This paper examines drenching strategies and levels of nutrition as factors affecting parasitism in hoggets set-stocked in autumn on contaminated pastures.

EXPERIMENTAL

ANIMALS AND MANAGEMENT

Ninety 6-month-old Suffolk × Coopworth ewe hoggets were randomized by liveweight into 9 groups ($n = 10/\text{group}$) and set-stocked for 10 weeks from March 14 to May 25 1979 on separate paddocks at Ruakura. The area had been previously rotationally grazed by ewes with lambs during spring and then alternately by weaned lambs and dry ewes during summer. The experimental hoggets came from an area grazed previously by ewes with lambs and had been drenched at weaning in December 1978. Three pasture allowances, 2(L), 4(M) and 6(H) kg/DM/head/day, allocated for 2.5-week periods, were obtained by adjusting paddock size. At each level of nutrition one group received no drench (0), one was drenched with Valbazen* at 2.5-week intervals (2.5), and the third every 5 weeks (5). Fasted (24 h) liveweights were taken at the beginning and end of the trial.

PARASITOLOGICAL AND PASTURE MEASUREMENTS

Faecal egg counts were made using the modified McMaster method and pasture larval counts were by the technique described by Vlassoff (1973). Faeces were cultured to determine predominant worm species in undrenched lambs at the beginning and midway through the experiment. Moribund animals were removed and replaced by undrenched hoggets. At the end of the trial the abomasal contents of all hoggets were visually assessed for presence of *Haemonchus contortus*.

Pasture allowance, yield disappearance, and utilization were measured at 2.5-week intervals using the framecutting technique with enclosure cages described by Rattray (1977).

RESULTS

Rainfall in February, March, April and May was 183, 145, 118, and 135 mm/month and mean air temperatures 18.1, 18.6 14.5 and 11.2°C, respectively. These conditions generally favour parasite proliferation (Vlassoff, 1973).

The mean pasture yield of the experimental area was between 2 and 3 t/ha. Mean values for pasture allowance and disappear-

* Albendazole, Smith Kline and French N.Z. Ltd.

TABLE 1: MEAN PASTURE ALLOWANCE AND UTILIZATION AT 2.5-WEEKLY INTERVALS
(RANGE IN PARENTHESES)

Level of Nutrition	Allowance (kg DM/head/day)			DM Disappearance (kg DM/head/day)		
	L	M	H	L	M	H
Drenching Strategy						
0	2.1 (1.3-2.7)	3.9 (3.2-4.9)	7.2 (6.1-11.2)	0.9 (0.7-1.3)	1.2 (0.2-2.3)	1.6 (1.2-1.9)
5-weekly	2.0 (0.8-2.8)	3.9 (3.0-4.8)	7.4 (6.3- 8.6)	1.1 (0.5-1.8)	0.9 (0.5-1.4)	1.7 (0.5-2.8)
2.5-weekly	1.7 (0.8-2.3)	3.2 (2.1-4.7)	7.2 (5.8- 9.3)	0.6 (0.3-0.8)	1.0 (0.2-1.5)	1.9 (1.5-2.6)

ance (apparent intake) are given in Table 1. The range of data for each variable was too large for meaningful statistical analysis. However, DM disappearance characteristically increased, and therefore utilization per grazing period decreased with increased pasture allowance. The pasture allowances were similar between drenching treatments with the exception of the 2.5-L and M groups which received a lower allowance due to lower yield of the pasture they grazed.

Drenching strategy had no consistent effect on DM disappearance, with apparent intakes of 0, 2.5 and 5 groups being similar at each level of allowance.

Initially, the mean faecal egg counts were approximately 4 000 e.p.g. faeces and larval levels on the paddocks ranged from 100 to 1 300/kg herbage (mean = 450). Values obtained for each treatment during the last 2 weeks of the experiment are given in Table 2. Drenching dramatically reduced faecal egg counts and pasture larval levels with the exception of 5-L, and the larger amount of herbage at the higher planes of nutrition appeared to dilute the larval population with undrenched hoggets. The negligible egg counts for the 2.5-L group probably reflect the relatively dry condition of their paddock and the regular drenching. Ryegrass staggers occurred in this group and this may have contributed to the low intake (Table 1).

TABLE 2: MEAN FAECAL EGG AND PASTURE LARVAL COUNTS PRIOR TO END OF TRIAL

Drenching Strategy	Eggs/g faeces			Larvae/kg Herbage		
	L	M	H	L	M	H
0	4988	3011	2914	5517	1272	298
5-weekly	1190	211	330	10208	559	0
2.5-weekly	20	100	470	0	0	0

Six hoggets from the 0-L group and one from the 0-H group became moribund during the trial and were slaughtered. On post-mortem examination they showed general helminthiasis in the early stages of the trial and haemonchosis in the later stages.

Faecal egg cultures indicated that *Trichostrongylus* species (86%) predominated at the start of the trial but five weeks later had fallen to 49%. In the same period *Haemonchus* rose from 4% to 31%. Other species were of little importance.

Visual assessment of *Haemonchus* at slaughter showed that all groups with the exception of 2.5-L had on the average moderate

TABLE 3: FINAL HOGGET LIVELWEIGHT AND CARCASS WEIGHT (kg)

Drenching Strategy	Liveweight			Carcass Weight		
	L	M	H	L	M	H
0	20.1	25.8	26.3	8.0	11.6	12.1
5-weekly	23.4	32.3	33.4	10.8	15.1	16.4
2.5-weekly	24.6	32.2	33.9	11.4	15.9	17.2
	SE diff. = 1.2			SE diff. = 0.7		

burdens although substantial infections were present in at least 50% of all groups.

The initial mean fasted liveweight of the hoggets was 24.3 kg. The final liveweights and carcass weights of hoggets that completed the experiment show significant responses to both drenching and plane of nutrition ($P < 0.01$). In some cases there were responses ($P < 0.05$) to 2.5-weekly compared with 5-weekly drenching (Table 3).

DISCUSSION

In this trial parasitism had little effect on apparent intake and pasture utilization with subclinically infected hoggets. It would appear that the reduced growth rate of undrenched hoggets in the M and H groups was due to reduced efficiency of feed utilization rather than to reduced intake. This is in line with the findings of Sykes and Coop (1976) who describe alterations due to parasitism in the utilization of digested energy, protein deposition, urinary N excretion, corticosteroid production, damage to the digestive tract, and retention of Ca and P. Many of the hoggets in the 0-L group died and were replaced, but it was obvious that moribund animals had stopped eating.

Vlassoff and Kettle (1980) showed that the strain of *Haemonchus* present in Ruakura sheep had a high degree of resistance to Valbazen. This was confirmed in this trial by the presence of adult worms in most drenched groups at slaughter. In spite of substantial production gains to the drenching strategies adopted, this resistance had a confounding influence on the results. Furthermore, set-stocking where animals are likely to graze swards more closely could have an added confounding effect through greater rates of recycling of parasites. In this respect a recent farmlot study at Ruakura has shown that hoggets undrenched in the autumn have made similar gains to those drenched

three times when rotationally grazed on erect growing swards ahead of adults (Jagusch *et al.*, unpublished). Further work, incorporating other variables such as type of drench, sward structure, paddock history, and grazing management, is required before final conclusions can be drawn.

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