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Response of young beef cattle to treatment for internal parasites on the coastal lowlands of south east Queensland

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Summary

During 1973 to 1975 three anthelmintic treatment experiments were carried out with young beef cattle to investigate the effects of such treatments on liveweight gain. The young British (¾)-Sahiwal (¼) beef animals grazed fertilized improved pastures on the wet heath of the wallum country of south east Queensland. Stocking rates before weaning were 6.25 cows per hectare plus calves. After weaning in April stocking rates were 5 to 10 weaners per hectare.

In Experiment 1, treatments of (i) four levamisole treatments at monthly intervals after weaning in early April, (ii) oxyclozanide in April and July and (iii) levamisole plus oxyclozanide in April and July, *all* failed to give more liveweight gain than untreated controls.

In Experiment 2, three preweaning and seven postweaning levamisole treatments at monthly intervals gave 20 kg more liveweight gain than untreated controls.

In Experiment 3, three levamisole treatments at monthly intervals given in late spring (when calves were 78 to 135 days of age and first exposed to infected pastures), plus one levamisole treatment shortly after the stress of weaning in April, plus one levamisole treatment 3 weeks after the first spring rain resulted in no more liveweight gain than untreated controls.

Faecal egg count peaks in untreated animals occurred in late spring-early summer and again usually around weaning in April. *Cooperia* spp. were the predominant nematodes present throughout the three experiments with lesser numbers of *O. radiatum*, *H. placei* and *Trichostrongylus* spp.

1. INTRODUCTION

Growth rates of young beef cattle in the coastal lowlands of south east Queensland are low, particularly during the postweaning period (Ebersohn, Barnett, Bruce and Dowsett 1973). One of the possible factors responsible for this low growth rate is infection with internal parasites.

Previous studies on the epidemiology of helminths have indicated the presence of many different species in coastal and subcoastal Queensland (Roberts 1939; Roberts, O'Sullivan and Riek 1952; Keith 1953; Riek, Roberts and O'Sullivan 1953; Winks 1968).

The limited amount of work on the effect of anthelmintic treatment on young beef cattle in central Queensland has shown small or no liveweight response to treatment (Winks 1970; Seifert 1971). Seifert (1971) reported a response to treatment only when cattle lost weight due to poor nutritional status of pastures. Turner and Short (1972) reported a significant weight response to regular treatment in Africander cross and British cross cattle but not in Brahman cross cattle. With the higher stocking rates and higher rainfall of coastal south east Queensland, Bryan (1976a,b) reported significant weight responses to regular treatment in Brahman cross cattle.

The work reported here was carried out over 3 years to measure the effect of anthelmintic treatments on the growth rates of young beef cattle on improved pastures at Coolum Research Station in the wet heath environment of the coastal lowlands of south east Queensland.

2. MATERIALS AND METHODS

Coolum Research Station is situated at 26° 31′ S, 153° 04′ E. The experimental area was located on acidic, infertile, sandy soils (Talbot and Rossiter 1959) and was 2.1 to 2.7 m above mean sea level. The mean annual rainfall is 1700 mm, with 70% occurring from November to May. Frosting occurs mainly from June to August and is of variable incidence, ranging from 0 to 44 frosts per year. Mean maximum and minimum temperatures range from 29.0° and 21.0°C in January to 21.0° and 7.0°C in July, respectively.

Table 1. Details of the three experiments

	Experiment 1 1972–73	Experiment 2 1973–74	Experiment 3 1974–75
Commence worm egg counts (monitoring)	26 Sep 72	20 Nov 73	16 Oct 74
Commence anthelmintic treatment	18 Apr 73	16 Jan 74	11 Nov 74
Termination	5 Oct 73	11 Nov 74	12 Dec 75
Animal age at first treatment (days)	241	148	78
Animal weight at first treatment (kg)	193	140	96
Weaning date	4 Apr 73	16 Apr 74	14 Apr 75
Treatments	1. Untreated control 2. Levamisole* monthly (April–July 73) (6 mg kg^{-1}) 3. Oxyclozanide† on 18 Apr and 21 Jul 73 (13.3 mg kg^{-1}) 4. Levamisole plus oxyclozanide‡ on 18 Apr and 12 Jul 73 (dose rates as for 2 and 3 above)	1. Untreated control 2. Levamisole on 14 Jan, 14 May and 9 Sep 74, (6 mg kg^{-1}) and on 2 Feb, 3 Mar, 6 Jun, 9 Jul, 7 Aug, 1 Oct and 29 Oct 74 (3 mg kg^{-1})	1. Untreated control 2. Levamisole (i) at 78, 107 and 135 days of age (ii) 6 weeks postweaning (iii) 3 weeks after first effective spring rain (50 mm in 4 days) (6 mg kg^{-1})
Number of animals	48	48	48
Number of replicates (postweaning)	3	3	3
Stocking rate (postweaning)	10 animals ha^{-1}	5 animals ha^{-1}	5 animals ha^{-1}

*Trade name Nilverm — I.C.I.
†Trade name Zanil — I.C.I.
‡Trade name Nilzan — I.C.I.

The animals used in this work were the progeny of Sahiwal-Friesian crossbred bulls mated to Hereford cows and were three successive years' calves, born and reared on Coolum Research Station. Experimental dates, weights, ages, treatments and numbers of animals are outlined in Table 1. Before weaning the calves were part of a six paddock rotation versus set-stocking study. The stocking rate in both systems was 6.25 breeders plus progeny per hectare. All stock grazed pangola grass (*Digitaria decumbens*) fertilized with nitrogen. The cows were not treated for internal parasites at any time. After weaning in Experiment 1, one replicate of animals grazed pangola grass fertilized with nitrogen, the second replicate grazed Narok setaria (*Setaria* *sphacelata*) fertilized with nitrogen, while the third replicate grazed Nandi setaria (*Setaria sphacelata*) with greenleaf desmodium (*Desmodium uncinatum*) and siratro (*Macroptilium atropurpureum*). In Experiments 2 and 3, the pasture was pangola grass fertilized with nitrogen.

Animals were allocated to treatment groups by stratified randomization on the basis of liveweight within age, sex and previous treatment. Both before and after weaning, treated and untreated animals grazed together within a grazing system or replicate respectively.

Liveweights of unfasted animals were recorded at monthly intervals. Faecal samples were collected at the weighings and helminth egg counts were carried out by the method of Roberts and O'Sullivan (1950). Species were identified by faecal culture (Roberts, Elek and Keith 1962) and larval differentiation (Keith 1953).

Analysis of variance was used to test the effect of treatment, using an estimate of error based on animal-to-animal variation. Means were compared using the least significant difference procedure. The analysis of preweaning variates was carried out using birth dates and birth weights as covariates. For postweaning analyses, preweaning grazing status was tested as an additional covariate. Log transformations were used for egg counts.

3. RESULTS

Liveweight gains

Experiment 1. Liveweight gains on all treatments were not significantly different, mean gain of all treatments being 0.46 kg day^{-1} (Table 2).

Experiment 2. Treated animals gained more than untreated animals both before weaning (0.54 *v.* 0.48 kg day^{-1}, $P < 0.05$) and after weaning (0.44 *v.* 0.37 kg day^{-1}, $P < 0.01$) (Table 2).

Table 2. Liveweight (LW) and liveweight gain (LWG) of young beef cattle treated with various anthelmintic treatments over 3 years (kg)

Attribute	Control	Levamisole	Oxyclozanide	Levamisole + Oxyclozanide	s.e.	Significance
Experiment 1						
LW — 18 Apr 73	192.9	191.9	193.0	193.4	1.7	n.s.
LWG — 18 Apr 73 to 12 Jul 73	23.9	25.1	23.0	23.5	4.4	n.s.
LWG — 12 Jul 73 to 5 Oct 73	46.4	52.8	47.4	59.1	4.9	n.s.
Experiment 2						
LW — 16 Jan 74	142.2	139.3			2.9	n.s.
LWG — 16 Jan 74 to 16 Apr 74	42.9	49.2			1.9	*
LWG — 16 Apr 74 to 26 Nov 74	84.7	96.7			2.9	**
Experiment 3						
LW — 12 Nov 74	94.9	98.0			2.9	n.s.
LWG — 12 Nov 74 to 14 Apr 75	103.9	106.8			2.6	n.s.
LWG — 14 Apr 75 to 9 Dec 75	124.2	123.4			3.9	n.s.

n.s. — Not significant
* $P < 0.05$
** $P < 0.01$

Most of the total weight advantage (20 kg) occurred between early February and late March before weaning (6.2 kg) and between mid May and early June after weaning (8 kg).

Experiment 3. Liveweight gains on both treatments were not significantly different. Mean liveweight gain of control and treated groups was 0.68 kg day^{-1} before weaning and 0.52 kg day^{-1} after weaning (Table 2).

Faecal egg counts

Experiment 1. At the beginning of treatment in April 1973 the mean faecal egg counts of all treatment groups were not significantly different. Thereafter only the control group was sampled. Peaks in faecal egg counts occurred in November 1972 and in March and May 1973 (Figure 1). Paramphistome eggs were detected in faeces in January and April 1973 only (2 to 12 epg in 5 of 48 animals).

Experiment 2. Faecal egg counts reached a peak in the control group in December 1973, and declined thereafter (Figure 1). Anthelmintic treatment significantly depressed faecal egg counts at weaning in mid April ($P < 0.05$) and in August and September 1974 ($P < 0.01$). Paramphistome egg counts in the treated group were significantly higher than in the control group in May ($P < 0.05$) and August 1974 ($P < 0.01$).

Experiment 3. Peaks in faecal egg counts occurred in December 1974 and in April 1975 at weaning when counts were much higher than in the previous two experiments (Figure 1). Faecal egg counts in both groups were not significantly different throughout the postweaning period and declined rapidly to low levels by June 1975.

Species and incidence

Experiments 1, 2 and 3. *Cooperia* spp. were predominant throughout all experiments, making up 90 to 100% of larvae counted at 76% of samplings. The percentage of *Oesophagostomum radiatum* larvae varied from 0 to 18%. *Trichostrongylus* spp. and *Haemonchus placei* remained at low levels during all experiments. *Ostertagia ostertagi* was not detected in the first two experiments and was only present at low levels after weaning in Experiment 3. *Strongyloides papillosus* was present before weaning in all experiments. *Bunostomum phlebotomum* was recorded sporadically throughout the year in all experiments. Tapeworm eggs (probably *Moniezia* spp.) and paramphistome eggs at low levels were recorded in Experiments 2 and 3.

4. DISCUSSION

There was no significant increase in weight gain after anthelmintic treatment in 2 of the 3 years when treated and untreated animals grazed together. The varying response to anthelmintic treatment may have been mainly due to the different treatment regimes followed each year. In Experiment 2, regular anthelmintic treatments over a period of 10 months resulted in a significant liveweight response whereas the fewer and irregular treatments of Experiments 1 and 3 did not result in any significant weight gain response. In this area of high and frequent rainfall and quickly saturated sandy soils, release of infective larvae from dung pats would be virtually continuous (Durie 1962) providing pasture larval contamination for most of the year (Durie 1961; Bryan 1976a). This means that continual frequent treatments are necessary to control internal parasites and to obtain liveweight responses in this area (Bryan 1976a,b).

However, frequent (monthly) treatments over a prolonged period for the 20 to 29 kg weight gains obtained in Experiment 2 and by Bryan (1976b) would be of questionable economic value, particularly if there were any compensatory growth effects after treatment ceased (Keith 1969). A more attractive alternative with similar weight gain results would be treatments 3 to 6 weeks after saturating rains which have resulted in a reduction of the number of treatments from 14 to 9 (Bryan 1976b). The lack of weight response in Experiment 3 where cattle were treated in autumn and spring as recommended by Bryan (1976b) suggests this is

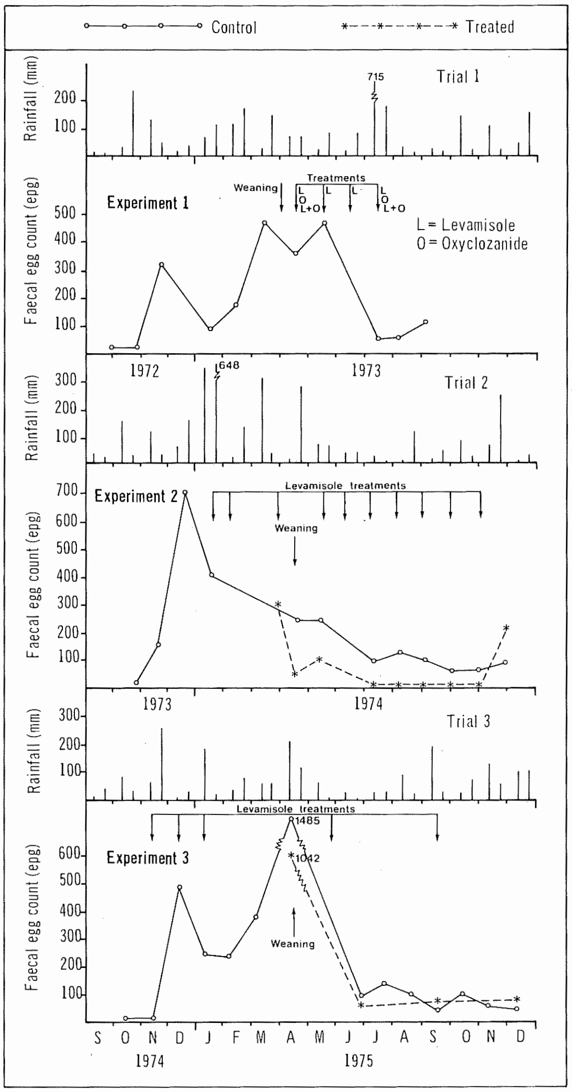

Figure 1. Fortnightly rainfall and mean faecal egg counts for Experiments 1, 2 and 3.

not a worthwhile practice. To obtain worthwhile liveweight gain responses it would appear that treatments must be on a regular and continuing basis, otherwise responses are negligible except perhaps in periods of great stress or to prevent deaths. Regular frequent treatments under more extensive management and lower rainfall in central Queensland have not resulted in significant liveweight responses (Winks 1970; Seifert 1971) except where cattle began to lose weight with a decline in nutritional value of pastures (Seifert 1971).

The short pre-patent period of *Cooperia* spp. of 11 to 16 days (Bailey 1949; Stewart 1954) combined with treatment intervals of at least 28 days and the grazing together of control and treated animals resulted in continual reinfection taking place in this study. While this may have reduced the potential response to treatment (Bryan 1976a) it possibly reflects the normal commercial situation where 'clean' pastures are difficult to achieve (Morley and Donald 1980).

Only a few animals in this study exhibited mild clinical signs of helminth infestation and no deaths were recorded. This contrasts with the reports of Keith (1968) and Bryan (1976a) where deaths were recorded with similar helminth species and faecal egg counts to those in this study. This is most probably due to differences in overall nutritional levels in the different studies. Keith (1968) and Bryan (1976a) recorded weight gains of 0.14 to 0.19 kg day^{-1} compared to 0.4 to 0.58 kg day^{-1} recorded in this study.

The lack of weight gain response to treatment for paramphistomes agrees with the results of Bryan (1976a).

The results of these experiments show that unless anthelmintic treatments are carried out frequently in young cattle grazing pastures on the wet heath of the coastal lowlands of south east Queensland, there is unlikely to be any significant liveweight gain response. Anthelmintic treatment shortly after weaning and after the first effective spring rain did not result in any liveweight gain response in 1 year. Further work is required to assess which anthelmintic treatment programme is likely to give the most economical response in this region.

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