

**Meat and Wool New Zealand**  
**Final Report**  
**Contract 03AR44**  
**Strategies for Managing Internal Parasites and Drench Resistance**

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**Abstract**

A field trial tested whether undrenched adult ewes, rotationally grazed over pastures with drenched lambs, could i) function as a source of unselected parasites ‘in refugia’ capable of slowing the development of anthelmintic resistance, and ii) suppress the build-up of parasites resulting from the development of anthelmintic resistance.

Two grazing systems were compared (Lambs only vs Lambs followed by Ewes) along with two Drench types (albendazole to which resistance was present and ivermectin + levamisole to which resistance was absent) in a factorial treatment structure. Parasite populations were monitored by faecal nematode egg counts (FEC), faecal larval cultures, pasture larval sampling and slaughter of tracer lambs. Animal performance was measured by liveweight, body condition score, dag score and fleece weights.

Undrenched adult ewes contributed to pasture infestations of most parasite species, but not *Nematodirus*. Modelling suggests that these unselected genotypes should be capable of slowing the development of drench resistance. Parasite species on pasture and infecting the lambs was changed when ewes were present, but despite the ewes contributing to pasture contamination there was no net increase in larval populations on pasture in the autumn. In the presence of anthelmintic resistance parasite populations were reduced when ewes grazed in rotation with lambs implicating the ewes as net removers of parasite challenge.

**Executive Summary**

The escalating threat of anthelmintic resistance in parasites of grazing livestock has forced New Zealand sheep and beef farmers to reconsider the way they use drenches to control ‘worms’. This research project was part of an industry wide programme aimed at supplying farmers with practical and reliable strategies to control parasites whilst reducing any further selection for drug-resistant genotypes. One of the cornerstone concepts for managing drug resistance globally is that of ‘refugia’, which entails maintaining a gene pool of unselected parasites capable of diluting resistance genes selected when livestock are drenched.

In this project the potential and implications of using undrenched adult ewes as a source of refugia was studied. The results are encouraging in that they indicate adult sheep are cycling most of the same parasite species as lambs (with the notable exception of *Nematodirus*) and as long as the ewes are not treated with anthelmintic these should be a source of unselected genotypes. Particularly encouraging was the fact that although ewes were contributing to pasture contamination there was no net increase in autumn contamination indicating that the ewes were ingesting and killing as many larvae as they were contributing through faecal contamination. Further, when worm control in the lambs was suboptimal, due to drench resistance, the ewes suppressed worm populations by becoming net removers of parasite larvae. Lastly

there were lamb performance benefits associated with rotational grazing with ewes which appeared unrelated to parasitism.

Thus, this rather simple management practice appears, based on this study at least, to offer farmers benefits both in terms of worm control and drench resistance management, with the added benefit of possibly increasing lamb performance. This strategy is clearly worthy of further consideration/evaluation as a strategy for managing drench resistance.

### **Background and industry context**

The context of this work is the escalating issue of drench resistance in parasites of grazing livestock and the need to develop, validate and implement on-farm strategies which will preserve the efficacy of existing anthelmintics into the future. The initial part of this contract involved funding the conclusion of a study (initially funded by FRST) to evaluate pre- and post-lambing drenching of ewes as a risk factor for developing anthelmintic resistance (Leathwick et al 2006). An interesting observation in this trial was that despite significant levels of resistance developing in a number of parasite species over the trial period, clinical parasitism was never observed. In attempting to explain this apparent lack of 'severe' parasitism despite only moderate levels of drench efficacy it was hypothesised that rotationally grazing adult ewes with drenched lambs had functioned to suppress the build-up of parasite populations as drench efficacy declined. This would presumably depend on the adult ewes ingesting significantly more parasite larvae off pasture than they contributed through faecal contamination, thereby acting as net removers of parasite pasture contamination (as proposed by Charleston 1986). If this hypothesis were correct, it would suggest that rotationally grazing undrenched adult ewes with drenched lambs might present a very attractive option to farmers attempting to manage both anthelmintic resistance and parasitism.

### **Objectives**

The present study was undertaken to address the questions of whether undrenched adult ewes have the potential, when rotationally grazed over the same pastures as drenched lambs, to

- 1) Slow the development of anthelmintic resistance by acting as a source of susceptible parasites 'in refugia'?
- 2) To suppress the build-up of parasite populations resulting from the development of anthelmintic resistance?

### **Methodology**

The trial methodology is described in detail in the attached manuscript. Briefly, replicated farmlets were established which involved either lambs grazing alone or lambs grazing in rotation with adult ewes. All lambs received a 5-drench preventive programme of anthelmintic treatments with half the mobs (n=6) being treated with albendazole (to which resistance was present) and half (n=6) with an ivermectin + levamisole combination (to which resistance was not present). The ewes were never treated. There were thus 4 Treatments;

Trt. 1 - Lambs only	Drench Type I (resistance present)
Trt. 2 - Lambs only	Drench Type II (resistance absent)
Trt. 3 - Lambs + ewes	Drench Type I (resistance present)
Trt. 4 - Lambs + ewes	Drench Type II (resistance absent)

Parasite populations were assessed by FEC, faecal culture, pasture plucks and tracer lamb worm burdens while lamb performance was assessed by liveweight, fleece weight (in the first year), body condition and dag scores. The trial ran from spring to autumn of two years (Dec 2004 – Jun 2006).

### **Findings and conclusions**

For details see the attached manuscript. Key findings include;

- 1) Ewes were a source of unselected parasites of most but not all species (*Nematodirus* was not present in the ewes) and modelling suggests that they could therefore function as a useful source of ‘worms in refugia’, capable of slowing the development of anthelmintic resistance
- 2) The mix of parasites infecting the lambs was different when they were grazing with ewes compared with when they grazed alone.
- 3) Despite evidence that the ewes contributed to pasture contamination there was no detectable increase in autumn pasture larval infestations of lambs grazed alone.
- 4) When worm control in the lambs was reduced due to anthelmintic resistance the ewes functioned as net removers of parasite larvae effectively suppressing worm populations.
- 5) Lambs grazed with ewes grew faster and had heavier fleeces, had higher body condition scores and lower dag scores than lambs grazed alone, although these differences could not be attributed to parasitism.
- 6) The cost of using a drench which was not fully effective was a 19-24% reduction in lamb liveweight gain although this was only 14-19g/day in this trial. However, the trial was ended prematurely in year 2 due to indications of impending clinical parasitism, suggesting that these figures are likely to be conservative.

### **Information Transfer**

The attached manuscript has been submitted for publication as a peer-reviewed scientific paper in the New Zealand Veterinary Journal. A precise of the work will be presented to the annual seminar of the Sheep and Beef Cattle Society of the New Zealand Veterinary Association in May 2008. A synopsis of the work will also be released as an AgBrief under the *Wormwise* banner.

### **Commercialisation**

Not relevant

### **Impact on livestock industry**

This study is part of a wider industry programme aimed at supplying farmers with reliable and effective strategies to manage parasites into the future whilst minimising any further development of anthelmintic resistance. The results of this study will give farmers, and their advisors, some confidence that undrenched adult ewes can be used as an effective source of ‘refugia’ in the management of drench resistance. Further, the results indicate that ewes can play a useful role in managing parasitism in lambs especially in a situation where worm control by drenching is sub-optimal.

## **Recommendations**

Farmers and their advisors should be encouraged to consider how they might incorporate grazing undrenched adult ewes over pastures grazed by drenched lambs as part of their overall worm and drench resistance management programme.

## **References**

**Charleston WAG.** Parasites. In: McCutcheon SN, McDonald MF, Wickham GA. (eds). *Sheep Production: Volume two, Feeding, Growth and Health*. Pp 204-43. New Zealand Institute of Agricultural Science in association with Ray Richards Publisher, Auckland, New Zealand, 1986

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