

New Zealand Society of Animal Production online archive

This paper is from the New Zealand Society for Animal Production online archive. NZSAP holds a regular annual conference in June or July each year for the presentation of technical and applied topics in animal production. NZSAP plays an important role as a forum fostering research in all areas of animal production including production systems, nutrition, meat science, animal welfare, wool science, animal breeding and genetics.

An invitation is extended to all those involved in the field of animal production to apply for membership of the New Zealand Society of Animal Production at our website www.nzsap.org.nz

[View All Proceedings](#)

[Next Conference](#)

[Join NZSAP](#)

The New Zealand Society of Animal Production in publishing the conference proceedings is engaged in disseminating information, not rendering professional advice or services. The views expressed herein do not necessarily represent the views of the New Zealand Society of Animal Production and the New Zealand Society of Animal Production expressly disclaims any form of liability with respect to anything done or omitted to be done in reliance upon the contents of these proceedings.

This work is licensed under a [Creative Commons Attribution-NonCommercial-NoDerivatives 4.0 International License](http://creativecommons.org/licenses/by-nc-nd/4.0/).



You are free to:

Share— copy and redistribute the material in any medium or format

Under the following terms:

Attribution — You must give [appropriate credit](#), provide a link to the license, and [indicate if changes were made](#). You may do so in any reasonable manner, but not in any way that suggests the licensor endorses you or your use.

NonCommercial — You may not use the material for [commercial purposes](#).

NoDerivatives — If you [remix, transform, or build upon](#) the material, you may not distribute the modified material.

<http://creativecommons.org.nz/licences/licences-explained/>

The effect of albendazole controlled release capsules and moxidectin injection treatment on faecal egg count and body weight of 18 month old ewes in the autumn

R. KEMPTHORNE, A.S. FAMILTON AND R.W. McANULTY

Animal and Veterinary Sciences Group, P.O. Box 84, Lincoln University, Canterbury, New Zealand.

ABSTRACT

Sixty 18 month old Romney ewes were drenched orally with ivermectin at twice the recommended dose rate (400µg/kg) when introduced to the trial area on the 8 March 1995. Eight days later all animals were weighed and faecal egg counts (FEC) performed (all FEC -ve at this time) and ewes were allocated on the basis of liveweight (LW) to 1 of 3 equal sized groups (n=20). Treatments commenced at this time (Day 0) with Group 1 receiving moxidectin injection (Vetdectin Injection, Cyanamid/Ancare Ltd, Auckland) at 200 µg/kg, Group 2 receiving an albendazole controlled release capsule (Extender 100, Nufarm, Ltd, Auckland) and Group 3 serving as controls. All ewes were grazed on parasite contaminated pasture with this challenge being supplemented by the oral administration of 15,000 L₃ *Ostertagia circumcincta* and 9,000 L₃ *Trichostrongylus colubriformis* twice weekly until Day 70 of the trial. The trial ran for 84 days with FEC and LW recorded weekly.

Faecal egg counts were 0 until Day 21 of the trial period in control ewes. A significant suppression of faecal egg output ($p > .005$) occurred in both treatment groups between Day 0 and 49. From Day 50 eggs appeared in the faeces of the moxidectin treated group but suppression of FEC continued in the albendazole CRC treated ewes until the trial ended on Day 84. Control ewes FEC peaked at 1850 epg on day 63 of the trial. Mean ewe LW for Groups 1, 2 and 3 on Day 0 and Day 84 of the trial were 47.4 (SEM 1.45), 48.4 kg (SEM 1.53), 48.2 (SEM 1.96) and 52.4 kg (SEM 1.84), 54.5 kg (SEM 1.31) and 50.0 kg (SEM 2.47) respectively. The difference (4.54 kg) between the live weight of the control ewes (n = 5) and the albendazole CRC treated ewes (n = 5) was significant ($p > 0.05$).

The trial showed that 18 month old ewes were susceptible to parasitic challenge and that considerable protection could be obtained by using either moxidectin injection or albendazole CRC. The trial confirmed claims that moxidectin injection will prevent parasite reinfection for 21 - 28 days after treatment.

Keywords: parasite; sheep; ewes; moxidectin; albendazole; CRC; faecal egg count; liveweight.

INTRODUCTION

The annual economic cost to the New Zealand sheep industry resulting from endo-parasitic infection includes production losses of; meat \$92M, wool \$150M, reduced reproductive potential \$92M and a labour cost for dag removal of \$5M (Brunsdon 1988). Farmers, in an attempt to control endoparasites, spend approximately \$26M on anthelmintics for sheep, the majority of which is targeted for use in lambs.

Suppression of gastro-intestinal nematode establishment and the prevention of development to egg producing adults in mature sheep is gaining greater prominence as farmers attempt to control pasture contamination and parasitic infection in lambs (Familton and McAnulty 1991; Uriarte and Valderrabano 1989). Previously breeding ewes were thought to be an unimportant class of stock to treat with anthelmintic because of presumed age immunity to infection (Charleston 1986). However in recent years farmers have been encouraged by drug companies and veterinarians to target adult ewes for anthelmintic treatment, in an attempt to control parasite egg output and so prevent pasture larval contamination and the subsequent production losses incurred from endoparasites.

Many claims have been made reporting the efficacy of some of the long acting anthelmintic preparations in ewes and in resultant production benefits although very

little data is available to substantiate some of these claims.

Moxidectin injection (Vetdectin, Cyanamid NZ) is a macrocyclic lactone similar to the avermectins, but is claimed by the company marketing the product to be a second generation milbamycin. It is available as oral, subcutaneous or transcutaneous (cattle only) preparations. The injectable preparation for sheep was approved for use and released in 1995.

Drug administration technology has allowed a re-examination of benzimidazole efficacy when delivered as an intra-ruminal controlled release capsule (Barger *et al.* 1993). The commercial product (Extender 100, Nufarm NZ) is claimed to release the 3.5g of compound at a constant rate over a period of 100 days. This preparation was released commercially in 1991. The active ingredient albendazole is a benzimidazole derivative of which there are numerous reports of anthelmintic resistance in certain strains of parasites (Hennesy 1993).

This study was designed to look at the field efficacy of these two long acting anthelmintics in 18 month old ewes, as measured by faecal egg counts and weight gain, during the autumn mating period.

MATERIALS AND METHODS:

Sixty 18 month old Romney ewes were introduced to the Lincoln University Research farm on 25 February

1995. At the time of introduction, 12 days before the trial started, all ewes were given 400ug/Kg LW (twice recommended dose) of ivermectin orally (Ivomec MSD Agvet, New Zealand) to ensure the removal of any existing worm burden. On 2 March ewes were allocated to one of three equal sized treatment groups (n=20) on the basis of LW and faecal egg count. On 8 March (day 0) the groups received the following anthelmintic treatments.

Group one (MI): 200ug moxidectin/kg LW (Vetdectin, Cyanamid New Zealand Ltd) by subcutaneous injection in the anterior neck region.

Group two (AB): 3.85g albendazole controlled release capsule (CRC) (Extender 100, Nufarm Animal Health NZ). These capsules are designed to be effective for sheep, up to 65 kg LW, and to release a minimum dose of 0.5mg albendazole/kg LW/day.

Group three (CO): the control group received no anthelmintic treatment.

Serial slaughter of 5 ewes per treatment, at 21 day intervals was undertaken to evaluate worm burdens and to assess the efficacy and duration of anthelmintic treatments to coincide with nematode development times. These results will be reported elsewhere.

All sheep, irrespective of treatment, were grazed together on ryegrass-white clover pasture for the duration of the trial. As a result of tracer lamb studies, this pasture was known to be contaminated with the following parasitic larvae of sheep; *Trichostrongylus colubriformis*, *Teladorsagia circumcincta*, *T. axei* and *Nematodirus spp.*. From the commencement of the trial all sheep were dosed twice weekly with 15,000 L3 *O. circumcincta* and 9,000 L3 *T. colubriformis* to reinforce the natural challenge. The larvae used were anthelmintic susceptible strains cultured at the Lincoln University's Parasitology Unit. Faecal egg count reduction tests (FECRT) had earlier established that some resistance to benzimidazoles existed in the parasite larvae on these grazing areas. Feeding level of the ewes for

the trial period was calculated to be 1.5 times the ewes maintenance requirement. Pasture cover was assessed twice weekly for the duration of the trial, and was maintained between 700 - 1200 kg DM /ha. Liveweight of ewes was recorded on day 0 and thereafter at 14 day intervals. Ewes were weighed ca. 2 hours off feed at ca. 10am to reduce variance due to gut fill. Individual rectal faecal samples were taken on day 0 and thereafter at weekly intervals between 9-10am. FEC were calculated using a modified McMaster technique (Vlassoff 1973).

The results were collated and analysis of variance performed using the statistical package Minitab 9 for Windows. Following the recommendation of Wood *et al.*, (1995) values for faecal egg count were subjected to log transformation ($\log(\text{epg}+1)$), then meaned and back transformed to achieve geometric means for faecal egg count. The statistical analyses for faecal egg count were performed on log transformed data with LW data being analysed without transformation. The asymmetric standard error bar was generated from the statistical analysis of non-parametric data. Values were back transformed for use in graphical representation of variance. (ie. the SEM value is multiplied by the geometric mean to achieve the upper limit of the error bar, the geometric mean is then divided by the transformed SEM to achieve the lower limit. [Van Houtert and Barger pers comm]).

RESULTS

Faecal egg counts:

Comparison of geometric means of the faecal egg counts for each group over the duration of the trial are shown in Figure 1. There was a rise in the faecal egg output of the control group between days 14 to 63, but levels decreased from day 63 to the end of the trial. The faecal egg output from the MI group increased between days 49

FIGURE 1: Comparison of geometric mean of faecal egg count (epg) between treatment groups, AB (□), MI (○) and CO (Δ) in 18 month old ewes over the autumn mating period.

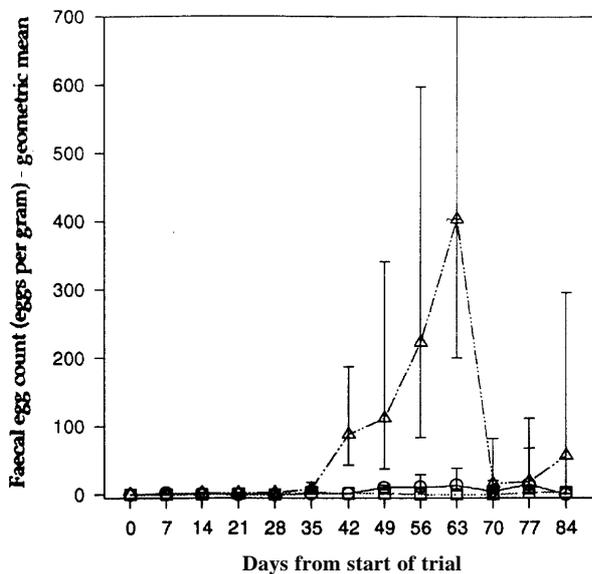
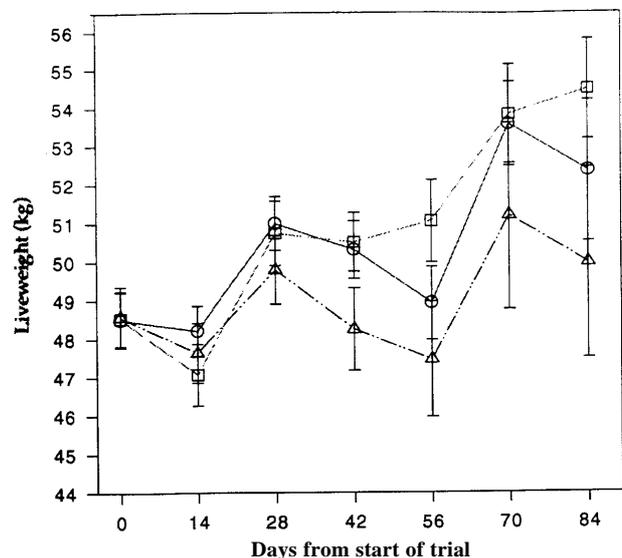


FIGURE 2: Liveweight at 14 day intervals of treatment groups AB (□), MI (○) and CO (Δ) in 18 month old ewes over the autumn mating period.



and 63 and thereafter declined. The AB group exhibited non-significant but sporadic faecal egg output.

The FEC for the CO group ewes between days 42 and 63 was significantly different from both AB and MI treatments ($p = 0.001$). There was a non significant difference in geometric FEC between the CO, MI and AB groups between day 0 and 28 and from days 70-84. For the MI treatment the geometric mean FEC of ca. 10 epg was recorded from day 49 until the end of the trial. The AB group maintained a very low geometric mean FEC for the full trial period. Significant differences existed between MI and AB groups between days 49 to 63 ($p = 0.05$).

Liveweight:

Ewe liveweight, recorded at 14 day intervals over the 84 day period of the trial, is shown in Figure 2. The mean liveweight gain over the 84 day trial period was 6.0, 4.0 and 1.5 kg for the AB, MI and CO treatment groups respectively. For the MI and AB groups these liveweight gains were significantly ($p > 0.05$) different from the initial Day 0 liveweights. For the CO group the difference between final and initial LW was not significant.

Significant between treatment differences in liveweight ($p > 0.05$) of 2.3, 3.6 and 4.5kg were recorded between the AB and CO groups only on days 42, 56 and 84 respectively, and for the MI and CO groups only on Day 42. The MI group LW remained above the mean LW of the CO group throughout the trial period. All groups followed a similar pattern of LW change with only the magnitude differing in the extent of the LW loss or gain.

DISCUSSION

The aim of this experiment was to assess the anthelmintic efficacy of albendazole controlled release capsules (AB group) and moxidectin injection (MI group) against parasitic infection in 18 month old ewes. Efficacy was measured by differences between the treatment and control groups

The ability of both AB and MI treatments to reduce FEC to negligible levels for 10-12 weeks indicate their potential for longer term production benefits, such as increased liveweight, increased lambing %, reduced pasture contamination and possible lactation increases after lambing (Anderson *et al.*, 1980; Anderson, 1985) even in the presence of benzimidazole resistance.

The AB and MI anthelmintic treatments used in this trial, provided protection for 18 month old ewes for varying lengths of time. Eighteen month old ewes are susceptible during the autumn mating period to some adverse metabolic consequences (hypoalbuminaemia, abomasal damage and increased protein turnover) observed in parasitologically naive animals as result of parasitic gastrointestinal infection (Holmes, 1986; McRae, 1993). These results will be reported elsewhere.

Statistical analysis of the raw data was limited by the experimental design. The decreasing sample numbers in each treatment over time (5 animals per group at 21 day intervals from day 21) meant only 5 ewes contributed to

the mean FEC towards the end of the trial on days 70, 77 & 84. For this reason the faecal egg data was subjected to a logarithmic transformation ($\log_{10}(\text{raw value} + 1)$) to generate geometric means so as to standardise the variance (Wood *et al.*, 1995).

Effect of anthelmintic treatment on faecal egg count (FEC).

The results presented demonstrate that the faecal egg output of 18 month old ewes is markedly suppressed following MI and AB treatment in the autumn mating period. AB treatment in this trial gave a 98.5% and MI treatment an 84.5% suppression of faecal egg output when compared to the faecal egg output of control ewes over the autumn period for at least 84 days. This level of suppression, in relation to AB treatment, is consistent with the findings of others (Barton *et al.* 1990; Corba *et al.* 1991; Barger *et al.*; 1992). The MI treatment suppressed nematode egg production for only 49 days following treatment (Figure 1). The duration of the effect on suppression of faecal egg output of the MI treatment was shorter than for the AB treatment, but is longer than the 35 days presently claimed for the moxidectin injectable product. A possible reason for this difference is that the 35 day claim was established using data from immunologically naive lambs rather than mature animals (Taylor *et al.* 1993). The duration from first infection to first significant egg output (ca 28-35days) in the CO ewes was longer than the 3 weeks post infection period commonly observed in naive lambs (Threlkeld, 1934; Leyva *et al.* 1982). This may have been caused by some form of host immunity to infection which may have prevented the more rapid appearance of eggs in faeces, although this remains to be investigated.

The acquired immune status of the ewes was not determined at the start of the experiment by either examining total worm burden or FEC prior to the quarantine dose of ivermectin. It was assumed however that the ewes had had previous exposure to gastrointestinal parasites. The evidence that some form of immunity had developed is suggested by the large drop in FEC observed between days 64 and 70. Though the randomly allocated ewes slaughtered on day 63 made a large contribution to the mean FEC recorded on that day, the remaining CO ewes ($n=5$) all showed significant reductions in FEC between days 63 to 70. The indication that an immune response was developed results from the FEC changes in the 5 remaining CO ewes, (ie CO ewes with FEC <400epg on day 63 were zero by day 70, whilst those ewes with more substantial FEC were halved by day 70). The reduction in the number of nematode adults and nematode female fecundity as a result of host immunity have been suggested as likely causes for the reduction in nematode egg output (Brunsdon and Vlassoff 1985).

A reduction in the over-wintered reservoir of eggs and larvae is suggested as a result of the anthelmintic treatments used in this trial. Such management of autumn pasture contamination aids in the reduction of primary parasitic infection in spring born lambs (Uriarte and Valderrabano 1989).

Liveweight change:

Coop (1966); Cockrem (1979); Rattray *et al.* (1980); Smith *et al.* (1983) have all shown that liveweight change prior to and during mating has a beneficial effect on the reproductive performance of ewes. Pre-mating liveweight change in ewes in the autumn observed in this trial has implications for subsequent lambing performance. Farmers wishing to increase the reproductive potential of their ewes are more likely to achieve pre-mating liveweight targets if ewes have low levels of parasitic infection. Increasing liveweight around mating increases the potential for multiple births and the possibility of an associated increased lambing percentage from ewes (Lewis 1975).

In this trial the faecal egg output of ewes grazed together on the same pasture was significantly different between treatment groups. The CO ewes showed very little increase in liveweight compared to the AB group grazing under the same nutritional regime with the MI treatment ewe LW change being intermediate (Figure. 2). Liveweight gains following AB treatment in ewes in this trial are similar to the 8.2kg LW gain reported by Barton *et al.* (1990). There are no published data on the effect of moxidectin treatment on the LW gain of ewes at any time of the year.

CONCLUSIONS

Susceptibility to gastrointestinal parasite infection is measured by increased FEC. The eighteen month old untreated ewes used in this experiment were susceptible to *Teladorsagia (Ostertagia)* and *Trichostrongylus* infection shown by the faecal egg production over the trial period. Prolonged anthelmintic protection provided by either moxidectin injection or albendazole CRC, significantly reduced faecal egg counts and may have reduced subsequent pasture contamination. Providing ewes with protection at this time resulted in an increased LW gain in treated over untreated ewes before and during the period around mating which may lead to increased reproductive potential in the treated ewes (Coop, 1966; Smith *et al.*, 1983). Significant reductions in FEC of all groups which occurred 8-10 weeks after challenge, suggests the first stage in the development of an immune response to increased larval challenge (Miller, 1983).

It is essential that examination of alternative forms of gastrointestinal parasite control continues. Emphasis on the reduced frequency of anthelmintic administration is important as is an appreciation of the factors resulting in the development of natural immunity so that parasitism does not become an even more serious constraint to production.

REFERENCES

Anderson, N.; Laby, R.H.; Prichard, R.K.; Hennessy, D., Controlled release of anthelmintic drugs: a new concept for prevention of helminthosis in sheep. *Research in Veterinary Science* **29**: 333-341, 1980.

- Anderson, N. Controlled release technology for the control of helminths in ruminants. *Veterinary Parasitology* **18**: 59-66, 1985.
- Barger, I. A., Steel, J. W., and Rodden, B. R. Effects of a controlled-release albendazole capsule on parasitism and production from grazing Merino ewes and lambs. *Australian Veterinary Journal*, **70**: 41-48, 1993.
- Barton, N. J., Rodden, B., and Steel, J. W. The efficacy of a controlled-release albendazole capsule in suppressing nematode burdens in sheep. *Australian Veterinary Journal*, **67**(11), 408-410, 1990.
- Brunsdon, R. V. The economic impact of nematode infection in sheep: implications for future research. *The economic importance of parasites of livestock in New Zealand.*, A.C.G.Heath, ed., New Zealand Soc. for Parasitology Inc., 4-16, 1988.
- Brunsdon, R. V., and Vlassoff, A. Long-term parasitological consequences and production responses in ewes and lambs after a single post-parturient anthelmintic treatment of ewes. *New Zealand Journal of Experimental Agriculture* , **13**: 135-140, 1985.
- Charleston, W. A. G. Parasites. In *Sheep Production*, S. N. McCutcheon, M. F. McDonald, and G. A. Wickham, eds., New Zealand Institute of Agricultural Science Publication, 204-217, 1986.
- Cockrem, R. E. M. Review of the influence of liveweight and flushing on fertility made in the context of efficient sheep production. *Proceedings of the New Zealand Society of Animal Production* **39**: 23 - 42, 1979.
- Coop, I.E. , Effect of flushing on reproductive performance of ewes. *Journal of agricultural Science, Cambridge*, **67**: 305-323, 1966.
- Corba, J., Krupicer, I., Legeny, J., Juris, P., Vesely, L. Effect of a controlled-release albendazole capsule on parasitism and productivity of sheep. *Veterinary Parasitology*, **40**: 3-4, 1991.
- Familton, A.S.; McAnulty, R.W.; Nicol, A.W.; Epidemiology of internal parasitism of sheep on irrigated pasture and the possible control measures. *Proceedings of the New Zealand veterinary Association, Sheep and Beef Cattle Society 16th Seminar*. 210-219, 1986.
- Hennessy, D. R. Pharmacokinetic disposition of benzimidazole drugs in the ruminant gastrointestinal tract. *Parasitology Today*, **9**(9): 329-333, 1993.
- Holmes, P.H. Pathophysiology of nematode infections. P443-451 in: Howell, M.J. (ed) *Parasitology - Quo Vadit*. Australian Academy of Science, 1986.
- Lewis, K. H. C. Ewe fertility response to pre-mating anthelmintic dosing. *New Zealand Journal of Experimental Agriculture*, **3**: 43-47, 1975.
- Leyva, V., Henderson, A. E., Sykes, A. R. . Effect of daily infection with *Ostertagia circumcincta* larvae on food intake, milk production and wool growth in sheep. *Journal of Agricultural Science, Cambridge* , **99**: 249-259, 1982.
- MacRae, J.C. Metabolic consequences of intestinal parasitism. *Proceedings of the Nutrition Society* , **52**: 121-130, 1993.
- Miller, H.R.P.; Jackson, F.; Newlands, D.; Appleyard, W.T. , Immune exclusion, a mechanism of protection against the ovine nematode *Haemonchus contortus*.. *Research in Veterinary Science* **35**: 357-363, 1983.
- Rattray, P. V.; Jagusch, K.T.; Smith, J.F.; Winn, G.W.; MacLean, K.S. , Flushing responses from heavy and light ewes. *Proceedings of the New Zealand Society of Animal Production* **40**: 34 - 37, 1980.
- Smith, J.F.; Jagusch, K.T.; Farquhar, P.A. , Effect of duration and timing of flushing on the ovulation rate of ewes. *Proceedings of the New Zealand Society of Animal Production* **43**: 13 -16, 1983.
- Taylor, S. M., Edgar, H., Kenny, J. Prophylactic efficacy of moxidectin for periparturient ewes and mid-summer lambs. *Veterinary Record*, **133**, 270-271, 1993.
- Threlkeld, W.L. The life history of *Ostertagia circumcincta*. *Virginia Agricultural experimental station technical bulletin* , **52**: 1-24, 1934.
- Uriarte, J., Valderrabano, J. An epidemiological study of parasitic gastroenteritis in sheep under an intensive grazing system. *Veterinary Parasitology*, **31**, 71-81, 1989.
- Vlassoff, A. Seasonal incidence of infective trichostrongyle larvae on pasture grazed by lambs. *New Zealand Journal of Experimental Agriculture* , **1**, 293-301, 1973.