RUMEN PROTECTED DL-METHIONINE STIMULATES WOOL AND BODY GROWTH IN GRAIN SUPPLEMENTED MERINO EWE LAMBS ON SUMMER PASTURE

L.D. STAPLES, S.R. McPHEE, A.H. WILLIAMS** and R.J. JOHNSON*

Summary

The effects of rumen bypass DL-Methionine (2 g/h/d of product) on body and wool growth were evaluated in merino ewe lambs grazing pasture but provided with a mixed oat and lupin supplement. Observations of linear wool growth, fibre diameter, body growth and condition score were made during the pre-treatment period and during the first four weeks (phase one) and second six weeks (phase two) of treatment and at four weeks post treatment. The mean rates of liveweight gain during the first and second phases of treatment were increased ($P< 0.001$) by 20.1 to 26.1 g/h/d (compared to control) resulting in treated lambs being 1.44 kg heavier than controls at the end of treatment. Liveweight distribution and condition score were also improved ($P< 0.001$) by treatment. Wool volume growth rates were increased by 18.95% ($P< 0.05$) and 29.21% ($P< 0.001$) during the first phase and second phases of treatment (respectively) due to combined effects of methionine supplement on length growth rate and fibre diameter. Tensile strength of wool grown during treatment was slightly increased (+ 2.1%, n.s) and 10 month fleece weights were increased by 7.3% ($p< 0.005$) by methionine treatment. This data indicates considerable potential for the use of this form of protected methionine to enhance production in weaner sheep under farm conditions.

I. INTRODUCTION

Merino ewes in some regions of Australia are joined in Autumn so that late pregnancy and lactation are supported by Spring pasture. However, this strategy means that the lambs are weaned onto poor quality pasture during their first Summer. This leads to poor growth rates, low wool production and high losses in a syndrome commonly known as "weaner ill thrift". Grain and hay supplements are often fed to lambs weaned during this period to maintain body weight, or allow some increase in weight, but these diets are still generally deficient in limiting nutrients such as sulphur amino acids.

Abomasal infusion or parenteral injection or implantation with methionine have been shown, in pen studies, to increase wool production (Reis 1979) and analogues of methionine, which are poorly soluble or which resist microbial degradation in the rumen, have been used as oral supplements to stimulate wool growth (eg Langlands 1972; Radcliffe et al. 1985). However, there has not been a practical method to administer natural DL-methionine to unrestrained grazing animals.

A microencapsulated rumen bypass form of methionine, developed by Rhone Poulenc (Robert et al. 1989), has been shown to increase plasma free methionine levels in sheep for several hours after feeding (Staples et al. 1992). The purpose of this study was to assess whether micorencapsulated DL-methionine would improve growth rates and wool production when fed with grain supplements to unrestrained merino weaner lambs grazing summer pasture.

Applied Biotechnologies Pty Ltd, P.O. Box 59 East Kew, Vic 3102 and *Rhone Poulenc Animal Nutrition Pty Ltd, 19-23 Paramount Rd West Footscray, Vic 3012 and **Victorian Institute of Animal Science, Werribee, Vic 3030

II. METHODS

(a) Animals and pasture and supplementary feed

In December 1990, five month old fine wool merino ewe lambs, weighing approximately 20 kg, were allocated at random into two groups which were grazed at the same stocking rate in adjacent paddocks in the Western District of Victoria.

Group one (methionine treated) consisted of 162 lambs grazing 9.85 Ha and group two (control) consisted of 440 lambs grazing 26.2 Ha, of which 190 were tagged for observation in the trial. Both groups were fed a mixed grain ration of oats (107 g/h/d) and lupins (21 g/h/d) as a three times weekly feed on Mondays, Wednesdays and Fridays. Oats were 89.2% DM, 8.4% protein, 72.3% digestible and contained 10.6 MJ/kg DM digestible energy. The lupins contained 91.3% DM and 32.2% protein, were 84.4% digestible and contained 12.5 MJ/kg DM digestible energy.

Whereas the long term average January rainfall for this area was 30 mm, the actual rainfall experienced during January 1991 was 164 mm, which fell as two storms at the start and end of the month. Thus pasture conditions in both paddocks from late January to early March were much better than is typical. Standing pasture at 21st January was 3282 kg/Ha; of which 13% was green and 87% dry. The green pasture contained 20.3% crude protein, 9.4% MJ/kg metabolisable energy and was 68.3% digestible. The dry pasture contained 4.8% protein, 6 MJ/kg DE and was 46% digestible. The proportion of green pasture increased markedly during February but was not quantitatively assessed.

(b) Treatment

Ewe lambs in treated Group one received rumen protected DL-methionine, containing $\geq$ 65% w/w DL-methionine, (Staples et al. 1992, Rhone Poulenc) at an average dose of 2 g product/head/day (4.66 g/h/feed). The product was evenly mixed with the grain ration and bonded using 3% molasses. Grain fed to control lambs contained molasses but no methionine. Grain was fed in long trails on the ground and, after a short acclimatisation period, the lambs ate all supplements within one hour of feeding.

(c) Observations

Wool was dyed at skin level at eight weeks before treatment, just prior to the start, at four and 10 weeks after the start of treatment and at four weeks after the end of treatment. This permitted analysis of length growth, tensile strength and fibre diameter at two phases of treatment and in the post-treatment period. Treatment was for 10 weeks commencing on 9th Feb. Liveweight and condition scores were recorded at 4-5 weekly intervals. Whole fleece weights were recorded at shearing in July.

III. RESULTS

(a) Liveweight and condition scores

Liveweights did not differ between groups prior to treatment (T-C = -0.31 kg) but were higher in treated lambs after four weeks (+ 0.65 kg, n.s.) and 10 weeks of treatment (+ 1.44 kg, $P < 0.001$). By one month post treatment the advantage in treated lambs had reduced to + 0.47 kg (n.s). Growth rates were not significantly different before treatment but were increased during the first (+ 26.7 g/d, $P < 0.001$) and second phases of treatment (+ 20.1 g/d, $P < 0.001$, Table 1). Condition scores of lambs were also increased ($P < 0.001$) during the first and second phases of treatment (Table 1). Liveweight distribution was improved by methionine treatment (Figure 2).

(b) Wool growth and greasy fleece weight

The rate of length growth of wool was increased by treatment during the first (+ 5.8%, P< 0.05) and second phases of treatment (+ 8.0%, P< 0.001, Table 2). Fibre diameter (measured by laser FDA analysis on a sub-sample of 32 wool staples per group) was also increased by treatment in phase 1 (+ 0.82 μ, n.s.) and in phase 2 (+ 1.46 μ, P< 0.005), in addition to a concomitant increase of 2-3 μ in both groups due to the availability of green feed in Feb-March. The combined effects of increased linear growth rate and fibre diameter resulted in wool volume growth being increased by 19% (P< 0.05) during phase one and by 29% (P< 0.005) in phase two. (Figure 1 and Table 2). There was an apparent carryover effect of + 12% (n.s.) during the post-treatment period (Table 2).

Greasy fleece weights were 7.3% higher (P< 0.005) in the treated weaners (2.66 ± 0.04 kg/h) than in the untreated control flock (2.48 ± 0.03 kg/h) despite the fact that the lambs were under the influence of treatment for just 10 weeks of a 10 month fleece growth period from birth to first shearing.

Table 1 Effect of rumen protected methionine (2 g/h/d) on (mean ± SEM) liveweight, growth rate and condition score of merino lambs.

		Feb. 2 Pre treatment	Mar. 9 After 4 weeks	Apr. 18 After 10 weeks	May 18. Post treatment
Liveweight	C	22.0 ± 0.2	25.7 ± 0.2	26.7 ± 0.2^{x}	26.5 ± 0.2
(kg)	T	21.7 ± 0.3	26.4 ± 0.3	8.1 ± 0.3^{y}	27.0 ± 0.3
Growth rate	C	I——107.1 ± 2.5^{x}——II	——24.7 ± 2.2^{x}——II	——5.0 ± 2.7^{a}——I	
(g/d)	T	I—— 34.4 ± 3.2^{y}——II	——44.7 ± 2.1^{y}——II	——37.4 ± 3.0^{b}——I	
Condition	C	1.90 ± 0.02	2.13 ± 0.02^{x}	2.02 ± 0.02^{x}	1.95 ± 0.02
Score (units)	T	1.90 ± 0.04	2.29 ± 0.03^{y}	2.27 ± 0.03^{y}	2.01 ± 0.03

a ≠ b P< 0.05, x ≠y P< 0.001 within parameter groups and dates; C = control; T = methionine treated.

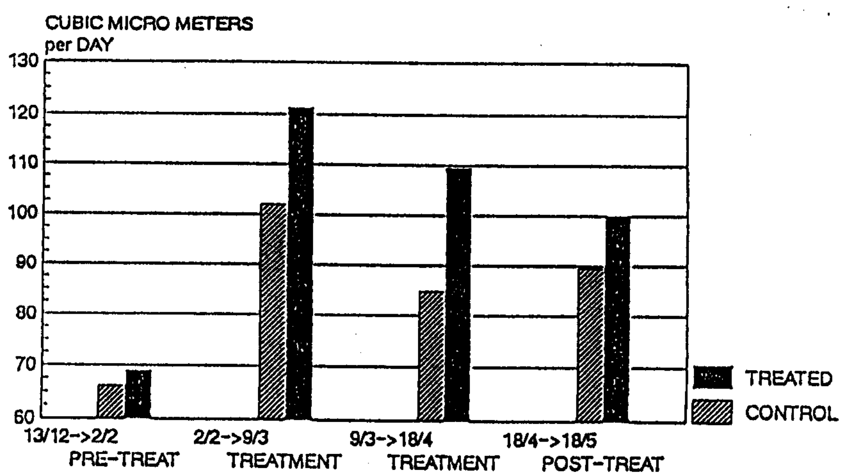

Figure 1 Fibre volume growth rates in treated and control lambs.

Table 2 Effect of microencapsulated DL-methionine on wool growth rate (mean ±SEM) in merino weaner lambs at pasture

		Dec 13-Feb 2 pre-treatment	Feb 2-Mar 9 Phase 1	Mar 9-Apr 18 Phase 2	Apr 18-May 18 Post Treatment
Linear growth	C	0.250 ± 0.002	0.311 ± 0.003[a]	0.273 ± 0.002[x]	0.297 ± 0.003
mm/day	T	0.245 ± 0.003	0.329 ± 0.004[b]	0.295 ± 0.003[y]	0.297 ± 0.004
Fibre volume	C	3370 ±146	3567 ±1 73[a]	3389 ±1 65[x]	2684 ± 38
μm3/day	T	3518 ±130	4243 ± 162[b]	4379 ± 156[y]	3001 ± 115
		+ 4.39%	**+ 18.95%**	**+ 29.21%**	**+ 11.81%**

a ≠ b, P< 0.05, x ≠y P< 0.005 within times within parameter groups; C = control; T = methionine treated.

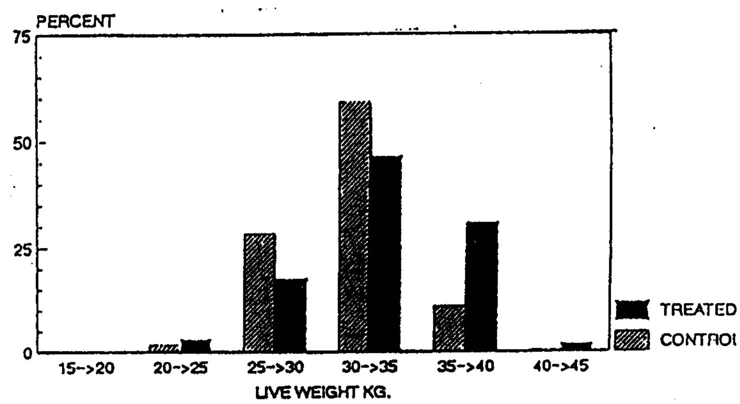

Figure 2 Distributions of liveweights after 10 weeks of treatment

(c) Wool quality

The weakest point on most staples occurred just prior to the start of treatment and coincided with the unseasonal transition to green feed in late January. Thus the strength of the whole staple was not effected by treatments applied from Feb to April. However, the mean tensile strength of wool grown in the Feb - April period was slightly (2.1%, n.s) higher in the treated group (46.3 ± 1.3 N/Ktex) compared to control (45.3 ± 1.5 N/Ktex).

IV. DISCUSSION

This paper describes, the stimulatory effects of a rumen protected DL-methionine, as a nutritional additive to grain supplement, on both body and wool growth in grazing weaner lambs.

Treatment at an average dose of 2 g/d, fed three times weekly, was well tolerated responses were obtained by, and without adverse effect in, all animals and resulted in an immediate response within the first four weeks of treatment, even though the trial was conducted under unexpectedly good pasture conditions existing in summer 1991. The maximum increase in wool growth rate of 29.2% was observed during the second phase of treatment when all wool emerging and measured was grown under the influence of treatment. The apparent carryover effect during the post treatment period appeared to be a consequence of the lag phase in emergence of wool with higher fibre diameter grown during treatment, since linear growth rates returned to control values once treatment ceased.

The data is consistent with many pen and laboratory studies of the stimulatory effects of methionine on wool growth (Reis 1979) but also proves, for the first time, the practical feasibility of using medicated grain supplements to increase both wool growth and body growth in growing lambs and in unrestrained group feeding situations on farms.

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