Published in : ***Proceedings of the Australian Sheep Veterinarians, 2011 Conferences (Barossa Valley and Adelaide), pp. 55-58***

The Influence Of Gastro-intestinal Worms And Nutrition On Performance Of Prime Lambs In South-eastern Australia

I Carmichael, P Blackburn and R Martin
SARDI Livestock and Farming Systems, Waite Building LG20, Gate 1, Waite Road, Urrbrae, South Australia 5064

Introduction

There has been significant recent growth in production and prices in the Australian prime lamb industry, with rewards for efficient, intensified production. Genetic improvement and nutritional management programs to address important factors influencing productivity were developed early, however a recognised threat was the potential impact of internal parasites, given that worm management practices based on wool sheep flocks had limited application in the emerging prime lamb production systems. A project "Parasite Control in Southern Prime Lamb Production Systems" was therefore developed by Meat and Livestock Australia and the South Australian Research and Development Institute to evaluate constraints placed on the industry by internal parasites and to demonstrate and promote tools to underpin decisions concerning worm management.

Materials and Methods

Experimental sites were established on 15 farms from 2004-2007 in South Australia (12) and Victoria (3), representing all key production systems, namely dry land, flood irrigation, pivot (spray) irrigation and cropping. Ten dry land and 5 irrigation enterprises were included. A range of finishing systems was studied, as well as lambs marketed for slaughter directly from their dams. On each property the success of current worm management strategies was studied. Seasonal levels of worms on pasture and worm burdens derived from them were measured, and their influence on lamb growth rates quantified. Nutrition and worm effects were separated in 28 growth studies in which the performance of lambs that were suppressive-treated for worms by means of sustained release anthelmintic capsules or repeated injections of moxidectin (Cydectin Injection™) was compared with that of lambs subject to the normal drenching program on the property. An average of 95 lambs managed as a single flock or as part of a larger flock was included in each trial. Lambs were ranked within the narrowest practicable weight range and randomly allocated either to suppressive treatment or the regular drenching program on the property. A wide range of measurements was taken, including lamb growth rates, faecal worm egg counts, worm types present (larval cultures), worm levels on pasture, quality and quantity of pasture, total worm counts in finished lambs, drench resistance tests and several other environmental measurements.

Results and Discussion

Mainly in the drier areas, *Teladorsagia circumcincta* was the dominant scourworm throughout much of the year, especially in summer. In the more southerly, cooler, higher rainfall areas, *Tel. circumcincta* was replaced by *Trichostrongylus vitrinus* in late autumn on some properties and on others from mid-Spring until early summer. Transmission of *T. vitrinus* persisted over summer on irrigated pastures in cooler areas and on dry land production systems in mild southerly areas. *T rugatus* replaced *T vitrinus* as the dominant *Trichostrongylus* species in the sandy, lower rainfall mallee regions.

An overriding feature of the production environment from 2004-2007 was drought, in many areas the worst on record, so this needs to be taken into account in considering industry performance. However, despite drought, many producers profitably produced commercial prime lambs whilst others failed to do so, even on irrigated pastures.

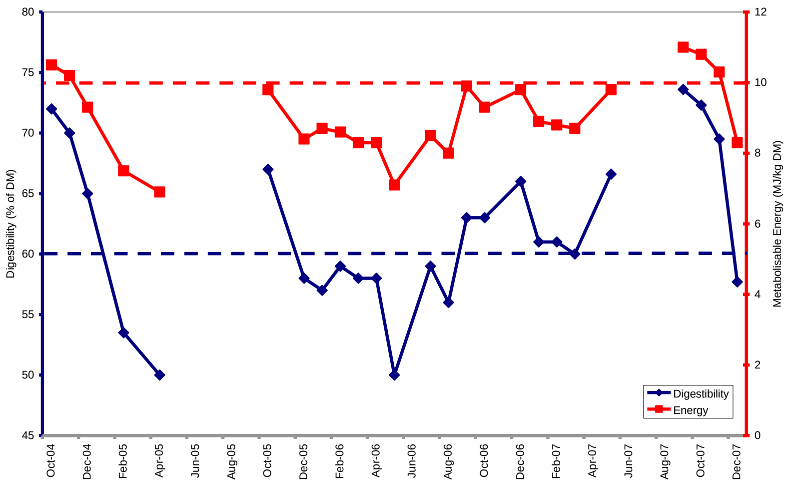
The average growth rate (270 g/day) of suppressive-treated lambs in the 7 most productive flocks (upper 25%), all of which were dry land production systems, serves as a benchmark for good productivity over this period, with a growth rate below 150 g/day representing a level at which economic returns were likely to be marginal. Differences between properties and within individual properties were brought about by interactions of genetics, nutrition quality and quantity, day to day management, suspected disease conditions and levels of worm challenge. Where sub-optimal production due to parasites was identified, the economic penalty could be estimated directly (*ie*, in kilograms of body weight not gained) or indirectly (*ie,* increased time to reach market specifications or failure to do so). It is expected that the values derived from these calculations for direct losses will apply across the whole slaughter lamb industry (including prime lambs, light lamb, feeder/restocker lamb and Merino lambs sold for slaughter), whereas indirect losses would specifically penalise prime lamb profitability. Other factors affecting either profitability (such as nutritional influence on carcase dressing percentage), or with broader implications for the industry (such as meat quality in nutritionally compromised lambs) were not accounted for in this exercise. Estimation of the overall costs of worm infections to the industry is another issue, too complex to address in the current paper.

<u>Growth rates of lambs</u>

Growth rates were generally disappointing. Pasture quality, (declining energy and increasing neutral detergent fibre) in summer was often insufficient to drive reasonable lamb growth rates, despite irrigation. Only 25% of 'worm free' flocks grew at >250g/day and 30% of flocks failed to exceed 150g/day. In more productive flocks the top 20% of lambs consistently grew at >335g/day, confirming that there is huge scope for genetic improvement in the industry, providing management can be optimised to realise this potential.

Figures 1 illustrates seasonal changes in quality of an irrigated pasture near Kingston SE, South Australia (25 measurements over 38 months). Base values (digestibility 60%; energy 10 MJ/kg DM) are highlighted, below which lamb growth (depending on body weight) might be compromised, even in the presence of abundant pasture. The pasture, in common with several others did not provide optimum requirements for finishing of prime lambs.

Figure 1 Seasonal pasture quality analyses
Flood irrigation, Kingston SE, South Australia, 2004-2007



The summer decline in digestibility and energy content of mixed grass/legume pastures, including those under irrigation, is often sudden and dramatic as illustrated above, and its critical influence on the capacity of lambs to grow is frequently underestimated, or overlooked.

<u>The influence of worms on lamb growth rates</u>

Control lambs subject to the normal farm worm control program grew slower than suppressive treated lambs in 10 trials (38%) leading to significant differences in final weights 57-207 days later (average difference 2.16 kg, range 1.52 – 3.11 kg). In these trials lamb growth was reduced by 6.4%-19.8% (average 12.2%) by worms, with daily penalties ranging from 10-34g/day (average 19g/day). Penalties increased in severity with elapsed time as the finishing process to market specifications progressed. For daily penalties of 10g or more, the average percentage penalty during the last weighing interval (10-107 days, average 49 days) doubled (22%) relative to that across the duration of the trial.

In a further 35% of trials an estimated average 0.32 kg carcase weight was lost per lamb. In 27% of trials there were no production differences between the two groups of lambs, confirming that an efficient worm management program was in place on the property at that time.

Some examples of the growth data and derived commercial implications from 10 of the 28 studies are summarised in Table 1. The days between the start of the study and marketing of the first batch of finished lambs appear in the second row, growth rates for worm-suppressed and 'regular drench program' lambs in the third and fourth rows respectively, and data derived from these values in rows 5-9.

Table 1. Mean growth rates (g/day) of prime lambs in South-east Australia and penalties associated with worm infections

Trial number	1	2	3	4	5	6	7	8	9	10
Duration of trial (d)	91	57	90	174	207	166	84	97	117	107
Suppressive treatment growth (g/d)	280	238	226	180	162	157	147	136	112	64
Normal management growth (g/d)	275	219	198	181	147	140	122	113	102	65
Difference (g/d)	-5	-19	-28	+1	-15	-17	-25	-23	-10	+1
Penalty (%)	1.8	8.0	12.4	0	9.3	10.8	17.0	16.9	8.9	0
Average weight penalty (kg)	0.46	1.1	2.52	0	3.11	2.82	2.10	2.23	1.17	0
Growth during final weighing interval (g/d) †	258	174	107	252	109	136	42	113	13	65
Retention time to negate worm penalty (d) ‡	2	8	30	0	35	26	62	25	112	0

†Growth rate of control (normal management) lambs in the last measurement (weighing) interval (average 49 days) of the trial
‡Calculated using value for growth rate during final weighing interval adjusted by 25% to provide for further decline in growth rate as the season progresses.

In 4 trials (7-10) growth was unsatisfactory (below 150g/day) in worm-free lambs. Adverse seasonal conditions probably contributed to compromised lamb growth on some properties, but on others poor quality or insufficient feed was responsible, including some irrigated pastures. Producers often incorrectly incriminated worms and trace mineral deficiencies in poor lamb performance.

The greatest losses ascribed to worms arise from failure to gain weight at optimum rates. These losses sometimes add to a penalty arising from poor quality grazing, but on other occasions they are independent of it. Superficially it might appear that there is no penalty associated with slower growth rates, provided that the lambs can be finished to access the planned market. However, this becomes increasingly difficult with time. Unforseen or significant delays are invariably costly, from the perspectives of market price variations, additional unbudgeted grazing pressure on the property, increasing retardation of growth by worms over time, declining pasture quality and quantity and ongoing contamination of paddocks with worm eggs passed by the lambs. The important issues determining the level of loss are the period over which losses due to worms accrue and the actual daily losses themselves (see Table 1). Thus, for example, on property 1 the average difference between suppressive-treated and normally managed lambs would only be 460g; market access would not be affected, and the difference made up in 2 days at the current growth rate of 258g/day. On property 5, however, the comparable figures are 3.11 kg and 35 days – as pasture quality declines later in the season it is likely that grazing lambs subjected to the regular management regimen on this property would not be finished for market. On this basis, 6 properties where worms had an adverse effect on production (3,5,6,7,8,9) and 4 properties where worms had no appreciable effect (1,2,4,10) can be identified in the example. In addition, 4 properties (6,7,8,9) had significant losses due to worms superimposed on sub-optimal growth rates below 150g/day.

Summary

Despite most producers having what they understand to be an effective worm control program in place, worms are significantly reducing productivity on up to half of prime lamb production systems in South-eastern Australia. Nutrition plays a significant and larger role in poor lamb performance. Pasture quality, (declining energy levels and increasing neutral detergent fibre) on both irrigated and dry land pastures in summer is often insufficient to drive commercially viable lamb growth rates. The two constraints to production may be additive on a specific property.