

MERINO SHEEP SELECTED FOR DIVERGENT FLEECE WEIGHT DO NOT DIFFER IN THE PROPORTION OF SULPHUR-CONTAINING KERATIN WOOL PROTEINS

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Minus fleece weight (-FW) selected Merino sheep produce less wool of a higher sulphur (S) concentration than plus fleece weight (+FW) selected sheep (Piper and Dolling, 1966). An experiment was conducted to test the hypotheses that these differences in fibre growth and composition result from differential expression of high-S (HS), ultra high-S (UHS) and low-S (LS) wool keratin genes.

Sixteen, 18-month old Merino rams from the SARDI Selection Demonstration Flocks (SDFs) were selected for divergent estimated breeding values (EBVs) for wool production. All sheep had similar total follicle numbers and live weights, and were fed a high-S or a low-S containing diet for 6 weeks prior to the collection of wool samples. Wool growth rate (WGR) and wool S concentration were measured. Skin samples taken at this time were frozen at -80°C and RNA was extracted (Chomczynski and Sacchi, 1987). A Northern blot technique was used to quantify the expression of UHS (represented by KAP 4.2), HS (represented by KAP 2.12), LS (represented by K 2.10) and high-glycine tyrosine (HGT; represented by KAP6.1a) sequences.

The S concentration of wool did not differ significantly for +W and -W sheep (2.75% and 2.87% S respectively), or for the high-S and low-S diet (2.90 % and 2.73 % S respectively), contrary to previous findings. Correspondingly, there was no difference in the expression of any of the keratin genes between selection groups and dietary treatments. There was a significant difference in the WGR between +W and -W rams ($p < 0.001$) and between high-S and low-S diets ($p < 0.001$) (Table 1), however the expression of all keratin genes investigated was similar for both selection groups and dietary treatments.

Despite the similarities in expression of all keratin genes examined, a general linear regression approach was used to describe the relationship between WGR variation and selection group, dietary treatment and keratin genes. Only a small percentage of WGR variation generated by selection group and dietary treatment was attributable to differences in keratin gene expression (Table 1) whilst group and diet accounted for between 32% and 49% of the WGR variation (Table 1).

Table 1 : Variation in WGR and the percentage of variation accounted for by the expression of LS, HS, UHS and HGT keratin genes.

	+W	-W	High-S diet	Low-S diet
WGR (g/d)	32.5	17.7	31.9	18.3
	Percentage variation accounted for by:			
Keratin gene type	Gene	Group	Diet	Group x Diet
LS	4 *	44 ***	36 ***	na
HS	5 ***	46 ***	32 ***	na
UHS	2 ns	43 ***	33 ***	3 *
HGT	0 ns	49 ***	40 ***	3 *

ns not significant; * $P < 0.05$; ** $P < 0.01$; *** $P < 0.001$; na not applicable (interaction ns thus removed from model)

The variability in wool growth generated by sheep selection and dietary treatment were not associated with differences in keratin gene expression. It appears that differential wool growth was achieved by variation in follicle rate processes or cellular efficiencies rather than differential gene expression.

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