

ACTIVE IMMUNIZATION AGAINST ACTH(1-24) AND CHRONIC PSYCHOSOCIAL STRESS INFLUENCE WOOL QUALITY CHARACTERISTICS IN FINE WOOL MERINO EWES

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The Hypothalamic-Pituitary-Adrenal axis modulates the physiological functions of animals subjected to stress, enabling the animals to survive. High circulating levels of cortisol, induced in response to stress, are associated with the formation of ‘tenderness’ or ‘breaks’ in the wool fibre.

This experiment was performed to investigate the effects of active immunization against ACTH (1-24) on various wool quality characteristics in grazing Merino sheep submitted to chronic psychosocial stress. Two groups of 50 mature Merino ewes were immunized against ACTH-ovalbumin in Freund’s adjuvant (I) or adjuvant alone (C) in weeks 0, 7, 11, 19 and 34 of the study. Twenty-five ewes from each group were grazed as a single group and handled minimally for the entire study (U). The other ewes were interchanged randomly between 2 grazing groups each of 25, at irregular intervals, every 2-14 days to disrupt the social hierarchy (S). Blood samples were collected by venipuncture at several times to measure ACTH antibody titre and cortisol. Mean antibody titres (\pm s.e.m.) achieved in the UI and SI groups at week 20 were 167.7 ± 16.9 and 291.8 ± 58.0 respectively. There was a significant suppression of plasma cortisol concentrations for the duration of the experiment (35.9 ± 6.9 , 5.0 ± 1.3 , 27.1 ± 3.5 and 1.5 ± 0.5 ng/mL at week 20 for UC, UI, SC and SI groups respectively). Midside samples of wool were taken from each sheep at week 38 of the study (9.5 months wool) and analysed for yield (WY), fibre diameter (FD), staple length (SL), staple strength (SS) and position of break (POB) by the Australian Wool Testing Authority.

Wool yield and fibre diameter were unaffected by immunization or stress (Table 1). However, both stress ($P<0.049$) and ACTH immunization ($P<0.068$) significantly increased staple length, an effect that was most evident in the SI group. Staple strength was significantly reduced by immunization ($P<0.063$) and significantly increased by chronic stress ($P<0.029$), with neither change correlating with variation in fibre diameter. Yet the imposed stress significantly ($P<0.001$) altered the position in the staple at which the break occurred, suggesting differences between treatments in fibre diameter down the staple.

Table 1. The effect of immunization against ACTH (1-24) (I) and psychosocial stress (S) in ewes on mean (\pm s.e.) wool yield (WY), fibre diameter (FD), staple length (SL), staple strength (SS) and position of break (POB) in midside samples

C, control; U, unstressed ewes

Group	WY (%)	FD (μ m)	SL (mm)	SS (N/ktex)	POB	
					Tip (%)	Middle (%)
UC	80.2 \pm 1.3	20.5 \pm 0.3	70.6 \pm 1.4	38.1 \pm 1.7	2.0 \pm 0.8	78.6 \pm 4.7
UI	79.0 \pm 0.6	20.6 \pm 0.3	71.8 \pm 1.6	33.4 \pm 2.1	1.3 \pm 0.7	84.0 \pm 3.7
SC	79.8 \pm 1.2	20.9 \pm 0.3	72.2 \pm 2.6	41.8 \pm 2.1	4.5 \pm 1.4	94.7 \pm 2.4
SI	77.7 \pm 1.0	20.6 \pm 0.3	78.2 \pm 1.8	38.8 \pm 2.4	3.6 \pm 1.7	95.3 \pm 2.0
Signif. (P-values)						
S	0.444	0.482	0.049	0.029	0.135	0.001
I	0.122	0.619	0.068	0.063	0.621	0.381
S \times I	0.664	0.443	0.208	0.680	0.974	0.488

In conclusion, the manipulation of circulating concentrations of glucocorticoids in grazing Merino sheep resulted in an increase in staple length without altering mean fibre diameter.

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