

THE INFLUENCE OF WOOL LENGTH ON THERMOREGULATION IN SHEEP EXERCISED AT DIFFERENT AMBIENT TEMPERATURES

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Possible limitations to the duration of exercise are numerous but in sheep they centre around problems of hyperthermia (Bell *et al.* 1983; Pethick *et al.* 1991). The aim of this research was to examine the effect of work rate, wool length and ambient temperature on thermoregulation in sheep. This report describes the effects of wool length.

Nine dry merino ewes, 4-5 years old, body weight 51 ± 2 kg (mean \pm s.e.m.), and body condition score 2-2.5 were fed to maintenance on a diet of cubed *Medic-ago sativa*. The sheep were trained on a belt treadmill for 10 days. Under general anaesthesia thermocouples were placed onto the carotid artery and immediately above the dorsal sagittal sinus; a catheter also was placed in the jugular vein. After 1 week of recovery experiments began. All sheep were exercised at 4 speeds (3, 5, 7 and 9 km/hour on 9° incline), at 3 ambient temperatures (15, 25 and 38°C) and 2 wool lengths (3 and 91 mm); humidity was not controlled and was inversely related to ambient temperature (range 62-30%). Exercise lasted for 40 minutes unless animals showed signs of fatigue (Pethick *et al.* 1991). The 24 treatments on any 1 sheep took 6 weeks, with experiments in long wool preceding those with the animals shorn.

All sheep were able to exercise for 40 minutes at speeds of 3 and 5 km/hour (slow and fast walk respectively) however they showed signs of fatigue at 38°C at these speeds. At faster speeds time of exercise ranged from 10-30 minutes, with woolly sheep consistently able to exercise for 5 minutes less than shorn sheep. Resting body temperature was significantly higher in woolly sheep and this was maintained during exercise. Wool length did not increase the rate of rise in body or brain temperature above that found in shorn sheep, indicating that the respiratory adjustment was sufficient to dissipate the heat load via respiratory cooling.

Table 1. Effect of wool length on resting body temperature (°C), rate of rise of temperature in the body and brain (°C/minute), jugular PCO₂ (mm Hg) and lactate concentration (mmol/L) and respiratory volume (L/minute)

	Resting body temperature	Rise in temperature		Blood Concentration		Respiratory volume
		Body	Brain	PCO ₂ ^A	Lactate ^A	
Woolly	39.2	0.077	0.046	18.7	6.6	43.2
Shorn	38.8*	0.071	0.041	21.6*	3.7*	31.8*
s.e.m.	0.05	0.005	0.005	1.0	0.8	2.5

^AValues respresent grand means at 15 minutes of exercise. *Significantly different to woolly; P < 0.05.

Although woolly sheep were more affected by heat stress during exercise as indicated by the concentration of CO₂ and lactate in blood, the difference was small and shorn sheep also suffered hyperthermia. This suggests that respiratory cooling rather than loss of heat from the trunk remains the controlling mechanism for heat loss regardless of wool length. Management practices must account for both internal and external heat loads when sheep are exercised in hot conditions.

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