

## Evaporative water losses of exercising sheep in neutral and hot climates

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Hot climates require an accelerated water loss to allowed for thermoregulation (Rai *et al*, 1979, Trop Anim Hlth Prod, 11, 51-56). The water losses associated with locomotion should be greater and if they exceed water availability grazing systems would become unsustainable. Therefore the aim of this study was to examine the evaporative water losses of sheep at rest and during exercise at different ambient temperatures.

Four Merino ewes, 1 year old and body weight 35 kg (surface area of 0.94 m<sup>2</sup>) with 60 mm wool were walked on a treadmill at 4 km/h and 9° incline for 2 h at 20°C, 1 h at 30°C and 40 min at 38°C with relative humidity of 35-45 %. A fan blew ambient air at 2 km/h over the surface of the sheep. Fleece water loss was measured by taping a capsule to the wool surface over which ambient air flowed at 5 litres/min. Respiratory water loss was determined by passing ambient air flowing at 70 litres/min through a face mask placed on the animal at 10-20 min intervals for one minute. Differences in humidity of air entering and leaving the skin capsule and respiratory mask were calculated as skin and respiratory

water losses respectively. The respiratory water loss is shown as mean  $\pm$  sem for the first 40 min period of exercise.

Walking caused a 2 to 3 fold increase in evaporative water losses ( $P < 0.001$ ) with the respiratory system contributing about 65 to 70 % of the water. The increase in evaporative water loss was a function of walking period and ambient temperature. The magnitude of water loss did not increase greatly beyond 30°C indicating that evaporative thermoregulation does not increase further to facilitate cooling at high ambient temperatures. This makes the sheep susceptible to hyperthermia during exercise at high ambient temperatures.

In conclusion, woolly sheep have an increased evaporative water loss during exercise accounting for an extra 1.5 L at high ambient temperatures. This loss has a significant skin/fleece component (30-35 %) despite a substantial wool cover. The inability to increase water loss at high ambient temperatures (38°C) contributes to the sheep's susceptibility to hyperthermia.

Ambient Temperature	Skin Water Loss (g/m <sup>2</sup> /h)		Respiratory Water Loss (g/m <sup>2</sup> /h)	
	Rest	Exercise	Rest	Exercise
20°C	11 $\pm$ 1	29 $\pm$ 4	38 $\pm$ 4	64 $\pm$ 6
30°C	32 $\pm$ 5	50 $\pm$ 4	64 $\pm$ 8	99 $\pm$ 8
38°C	40 $\pm$ 7	58 $\pm$ 8	53 $\pm$ 6	105 $\pm$ 5