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BLOOD FLOW THROUGH THE SKIN OF HIGH AND LOW WOOL-PRODUCERS

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The physiological basis of differences in wool production between sheep of different genotypes is not yet fully understood, however recent studies indicate that it may reside specifically at the level of the follicle (Williams and Winston 1987; Black 1987; Hynd 1989; Hocking Edwards and Hynd in press). The level of production from the follicle may, in turn, be controlled by nutrient supply (blood flow) to the skin and wool follicles (Black and Reis 1979; Williams and Winston 1987). There is, however, conflicting data concerning the relationship between blood flow and wool production (Setchell and Waites 1965; Black and Reis 1979; Hales person. comm.). A new, simple technique of measuring the velocity and number of blood cells flowing through the skin using a laser beam has been developed (Stern 1975).

In order to elucidate possible causes of differences in wool production, the supply of nutrients to the skin of sheep is being examined. An initial experiment was conducted to determine whether blood flow through the skin differs between high and low wool-producing sheep. Wool growth was measured on a midside patch of four strongwool (high-wool producers) and four finewool (low-wool producers) Merinos. The sheep were a fed maintenance ration (1kg) of grain-based pellets and housed in metabolism cages in a controlled environment of 21°C and 80% relative humidity. Blood flow through the skin was determined using a laser doppler velocimeter (calibrated with radio-labelled microspheres to dog stomach) at six sites on the midside patch on two consecutive days. Both wool growth (WG) and blood flow (BF) through the skin were significantly greater in the high-wool producers (highs) than the low-wool producers (lows) (see table).

	Lows	Highs	
WG* ($gx10^{-3}$ cm^{-2} d^{-1})	0.47 ± 0.05	0.75 ± 0.10	P<0.05
BF# (ml min^{-1} 100g $tissue^{-1}$)	3.01 ± 0.09	4.05 ± 0.14	P<0.005

*Mean wool growth rates for four sheep ± standard error of the mean.

Mean blood flow rate for four sheep at six sites on two days ± standard error of the mean.

While it is recognised that previous environmental conditions were different for the two groups of sheep, it is considered the majority of wool growth differences observed were genetic in origin. Thus, these results indicate that blood flow differs significantly between genotypes and may account for some of the differences in wool growth associated with different genotypes of Merino sheep (r=0.69). The elevated blood flow rate in high-wool producers may increase the availability of nutrients to the wool follicles and thus increase the level of wool production as proposed by Black and Reis (1979) in their computer model. Further studies are underway to determine whether this increase in blood flow is associated with an increased density of blood vessels in the high-wool producing sheep.

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