RESPONSES OF SHEEP DIFFERING IN FIBRE LENGTH TO DIAMETER RATIO TO NUTRITIONAL CHANGE

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Some sheep are more prone to fluctuations in fibre diameter in response to nutritional and other environmental variations than others, and are probably the sheep which tend also to increase markedly in fibre diameter with age, the so-called fibre diameter 'blowout' phenomenon. The latter results in a decrease in wool value, and the former in decreased staple strength (Hansford and Kennedy 1990), but little is known of the fibre and follicle characteristics associated with, or responsible for, diameter variations. The aim of the present experiment was to compare the fibre growth responses and follicle characteristics of sheep differing widely in the ratio of fibre length growth (L, μm/day) to fibre diameter (D, μm), to nutritional change.

Twenty S.A. strongwool Merinos with L/D ratios ranging from 13.4 to 24.9 (actual L's 268–506 μm/day and D's 17.5–26.8 μm) as measured by the ^{35}S-cysteine technique whilst on a low plane of nutrition (1 kg/day sheep pellets), were placed on a high plane of nutrition (2 kg/day pellets) for 8 weeks. Midside patches were clipped at the end of the period (2 week's wool growth) and fibre L and D measured again. Skin biopsies were also taken for measurement of follicle bulb and papilla dimensions.

While the L/D ratio was repeatable with nutritional change ($r = 0.95$, $P<0.001$) the actual increase in L (AL) was highly-variable between sheep (34 to 123 μm/day) as was the increase in D (AD) (0.9 to 6.4 μm). The ratio of L change to D change (AL/AD) for individual sheep ranged from 13: 1 to 80: 1. Some of the factors related to these divergent responses are listed in Table 1.

Table 1. Regression coeffkients for the relationships between fibre length (L) and diameter (D) and follicle density

Character	ΔD	ΔL	ΔL/ΔD
Initial D	+0.53*	–0.16†	–0.54*
L/D[A]	–0.66**	–0.08†	+0.51*
Follicle density[B]	–0.16†	–0.21†	+0.35†

[A]Mean for both levels of nutrition.
[B]Estimated from fibre volume growth and patch wool/area.
**$P<0.01$, *$P<0.05$, †$P>0.10$.

Sheep with high fibre D on the low plane of nutrition (initial D) had greater increases in D and lower AL/AD. High L/D sheep had lower D increases and greater AL/AD. The L/D effect however appears to be independent of its relationship with initial D ($r = -0.661$, $P<0.001$), as in a multiple regression of AD v . L/D and initial D, L/D removed a significant additional proportion of the variance ($P<0.035$). Furthermore, a comparison of sheep with similar initial D (21 .0 ± 0.56) also indicated that those with a high L had lower D increases ($r = –0.648$, $P<0.023$). Sheep with high L/D ratios had smaller bulb areas ($r = -0.688$, $P<0.001$), and smaller papilla lengths, diameters and areas ($r = -0.575$, $P<0.008$) but L/D was not related to follicle density. Direct or indirect selection of sheep with high L/D ratio should have 2 desirable outcomes; greater fibre length, and reduced fibre diameter variability.

HANFORD, K. A. and KENNEDY, J. *F?* (1988). *Proc. Aust. Soc. Anim. Prod.* **17: 4 15.**