

PROTEIN COMPOSITION IN RELATION TO THE INTRINSIC STRENGTH OF MERINO WOOL FIBRES

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Intrinsic strength (force to break/cross-sectional area at break) of individual wool fibres is associated with staple strength in Merino sheep (Thompson *et al.* 1996). Fibres with a lower cross-sectional area at the point of break have been reported to be intrinsically stronger (Thompson *et al.* 1996). While the cellular and molecular basis for this association is largely unknown, it is hypothesised to be associated with differences in the composition of the proteins of the fibre cortex.

Wool samples from 20 sheep with extreme differences in average intrinsic strength were selected from the sheep used in the experiment described by Thompson *et al.* (1996). Wool fibres (≈ 3 mg) were cut from the broken tip-end (1-2 mm) of about 20 staples from the mid-side of each sheep. Clean wool was then solubilised, and the proteins were S-carboxymethylated and separated by 1-dimensional polyacrylamide gel electrophoresis, using a modification of the procedures described by Marshall and Gillespie (1982). Proteins were visualised by staining with Coomassie Blue, and quantified using a densitometer. Identification of proteins was based upon molecular weight (MW), and their position in the gel by comparison with the well characterised proteins of wool. The relative amounts of the different proteins were compared, assuming that the staining intensity was directly proportional to the concentration of protein.

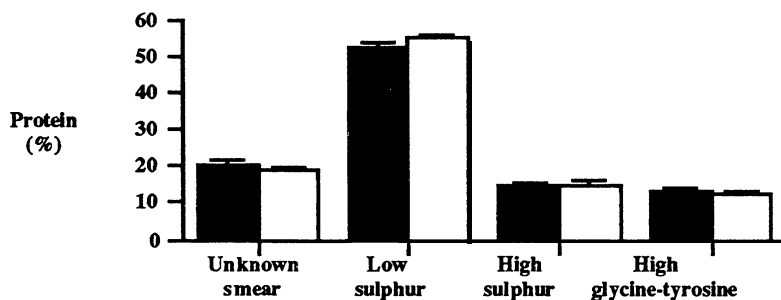


Figure 1. Protein composition (%; $\pm$ s.e.m.) of low (■) and high (□) intrinsic strength wool samples

Analysis of variance revealed that intrinsic fibre strength differed significantly between the 2 groups of wool samples (195.6 ± 4.03 vs. 235 ± 1.21 N/ktex; $P < 0.001$). However, there were no significant ($P > 0.05$) differences in the levels of any of the proteins (Figure 1). The relative amounts and composition of the proteins identified fluctuated between individual sheep was the random occurrence of a high sulphur protein (MW, ≈ 25 000 Daltons) (data not shown), which constituted less than 2% of total protein.

We conclude that differences in intrinsic strength were not associated with any detectable differences in the composition of the main protein families of the wool fibre cortex. This however does not imply that such associations do not exist, since (i) no electrophoretic system separates all proteins, and (ii) changes in protein composition which may lead to weakening of the fibre could occur within a very small distance from the broken fibre-end, such that any differences were swamped by other changes in protein composition along the 1-2 mm of fibre used in our analysis.

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