THE GROWTH OF WOOL FOLLICLES IN CULTURE

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A major impediment to our ability to differentiate between local and physiological mechanisms that control wool growth has stemmed from the inability to study the wool follicle in isolation from systemic metabolic influences. Because of this it has not been possible to understand the mechanisms that convey the superior potential for wool growth in some animals. Therefore a long term goal of wool biologists has been to establish an *in vitro* system to study wool follicle metabolism.

This has now been changed with the initial report of Philpott *et al.* (1990) of the successful growth of human hair follicles under defined culture conditions. This advance has provided new impetus to investigate the growth of wool follicles *in vitro.* We have now successfully developed a procedure for the isolation of individual wool follicles from fine woolled Merino wether skin and defined the culture conditions required for follicles to grow a fibre *in vitro.* Initial experiments were designed to optimise the composition of the culture medium to promote fibre growth.

Follicles maintained in Williams E medium with foetal calf serum (FCS; 5%) grew at 25.2 ± 24.6 µm per day (n=11; mean ± s.e.m.) while those maintained in 5% FCS with hydrocortisone, insulin, transferrin and trace minerals grew at 66.3 ± 14.4 µm/day (n=15). Increasing the FCS concentration to 10% further increased growth rate to 81.9 ± 9.2 µm/day. Histologically follicles did not show degenerative morphological changes after 5 days of culture as assessed by light microscopy.

Growth responses to changes in concentrations of both insulin and cortisol were also measured. Increasing concentrations of insulin (0, 5, 10 and 20 ng/mL) stimulated mean growth rates (± s.e.m.) from 4.3 ± 18.6 to 31 .0, ± 10.9, 61.8 ± 11.4 and 66.7 ± 17.1 µm/day respectively. By contrast incubation with higher levels of cortisol inhibited follicle growth from 49 with no cortisol to 44, 18 and 20 mm/day with 10, 50 and 100 ng/mL respectively. This latter effect mimics the known response of wool growth to high circulating levels of glucocorticoids *in vivo* (Chapman and Bassett 1970). The treated follicles showed the characteristic regression of the bulb and the formation of a small brush typical of a follicle in telogen. At present we are characterising the pattern of wool keratins synthesized *in vitro* and the rate of cell division within the follicles. This technique may provide a novel means of assessing the metabolic efficiency of wool follicles from sheep of different genotypes and of identifying possible rate limiting factors for wool growth.

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