THE EFFECT OF TESTOSTERONE ON THE COMPONENTS OF FLEECE WEIGHT IN MERINO WETHERS

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Summary

The subcutaneous implantation of testosterone propionate increased the greasy fleece weight of grazing Merino wethers. The response was modified by the frequency of implantation and the age of the wethers at first implantation: older wethers generally produced a smaller response than younger wethers. Treatment invariably reduced the degree of skin folding and increased the surface area estimated from live-weight relative to the untreated sheep but there was not always a net increase in wool growing surface. Increased fibre diameter usually accounted for a large part of the increase in production per unit area although increased staple length and fibre density were important in some treatments. Increased secretion of wax and suint was observed in all treatments but the magnitude of this response appeared to be dependent upon the age of first treatment, *so* that the implantation of testosterone into wethers six months old or less produced a larger increase in the clean fleece weight than that obtained from wethers first implanted at twelve months of age.

I. INTRODUCTION

The greasy fleece production of a wether is a function of its size, the weight of wool produced per unit area of skin surface and the weight of wax and suint secreted into the wool by the sebaceous and suderiferous glands. The variety of physiological effects attributed to testosterone suggests that it would be capable of influencing greasy fleece production by all these routes. Increased liveweight is a frequently observed consequence of testosterone implantation and, in young wethers, may result from enhanced skeletal development (Osborne 1966b) as distinct from increases in the musculature and viscera. Increased wool production per unit area has been reported following both the subcutaneous implantation and the topical application of testosterone (Osborne 1966*a*, 1966b). Increases in the wax and suint content of the fleece could be predicted from the general effect of testoterone on mitotic activity in the epidermis (Ebling 1964).

This paper describes an experiment conducted at Narromine, N.S.W., to measure changes in the components of fleece weight induced by testosterone implantation.

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TABLE 1

Percentage deviations (with their standard deviations) in fleece weight and components between testosterone treated and untreated wethers.

Treatment frequency	Age at first treatment (months)	Greasy fleece Weight W	Surface area S = Liveweight$^{0.66}$	Skin fold score R	Fibre density per unit area N	Fibre cross-sectional area A	Fibre length L	Reciprocal of clean scoured yield Y	Constant K
HIGH	2	+ 8.9 ± 2.6	+ 8.8 ± 2.7	− 6.3 ± 2.6	+ 1.6 ± 3.5	+ 1.7 ± 3.0	+ 3.7 ± 2.9	+ 0.4 ± 1.2	+ 0.3
(4 implants	6	+ 9.3 ± 2.6	+ 8·5 ± 2.7	− 6.9 ± 2.6	− 1.3 ± 3.5	+ 11.1 ± 4.1	− 0.8 ± 2.5	+ 3·3 ± 1.4	− 2.6
per year)	12	+ 4.5 ± 2.5	+ 6.6 ± 2.6	− 6.9 ± 2.6	− 11·5 ± 3.6	+ 5.1 ± 3.4	+ 0.2 ± 2.5	+ 3.0 ± 1.3	+ 11.3
LOW	2	+ 7.5 ± 2.6	+ 4.1 ± 2.5	− 5.7 ± 2.5	+ 7.4 ± 3.6	+ 3.2 ± 3.2	+ 0.4 ± 2.5	− 2.6 ± 1.2	− 3.2
(2 implants	6	+ 7.1 ± 2.6	+ 4.3 ± 2.5	− 5.9 ± 2.5	− 2.6 ± 3.5	+ 0·7 ± 2.0	− 0.3 ± 2.5	+ 2.3 ± 1.2	+ 10.1
per year)	12	+ 5.7 ± 2.5	+ 4.3 ± 2.5	− 5.9 ± 2.5	+ 10.3 ± 3.6	+ 1.4 ± 3.0	+ 0.7 ± 2.5	+ 3.4 ± 1.4	− 6.5

per unit area in groups High 6 and Low 12, in groups High 12 and Low 6, the increase resulted from a larger wool bearing surface.

In the groups High 2 and Low 2, unit area production increases accounted for most of the increased greasy fleece weight. By reference to Table 1, it can be seen that increased fibre diameter was largely responsible for increased unit area production in High 6, whereas in group Low 12, increased fibre density accounted for most of the increase. The contribution of scourable material to the increased greasy fleece weight was inconsequential in group High 2, but considerable in groups High 12 and Low 12.

IV. DISCUSSION

It is known that testosterone treatment stimulates mitotic activity in the epidermis of rat, mouse, rabbit and human, and leads to increased skin thickness and sebaceous gland secretion (Bullough and van Oordt 1950; Ebling 1957 and 1964; Montagna, Kenyon and Hamilton 1949; Strauss and Pochi 1963).

It seems likely that testosterone implantation stimulates sebaceous gland secretion in wethers, thus resulting in lower clean scoured yields as reported here. This effect appeared to be most marked in the wethers first implanted at twelve months of age but in the group first implanted at two months was notably slight following high frequency treatment.

It might reasonably be concluded that, as a consequence of greater liveweight, treated wethers have a larger wool bearing surface. Such a conclusion would be supported by the exponential relationship between surface area and liveweight, viz., $A = kW^{0.66}$ in which k is a constant. It is generally assumed that the value for k will not change from one group of sheep to another so that, in computing percentage deviations, it is often ignored. However, in view of the probable direct effects of testoterone on the epidermis of the wether, it seemed likely that k would have different values for the several treatment regimes. The sum of the percentage deviations in skin surface due to both Iiveweight and skin folds plus the constant k illustrate the fact that treatment has not uniformly resulted in a larger wool growing surface: in three cases (groups High 6, Low 2 and Low 12) there appears to have been a relative loss of surface, whilst relative gains are apparent in other groups. These changes in wool growing surface were partly compensated by changes in fibre density per unit area in the wethers first treated at twelve months of age, whilst amongst those first treated at two or six months of age, there were changes in density unrelated to changes in wool growing surface. These results illustrate a complex series of interactions between age of first treatment and frequency of treatment. It is possible that treatment of two-month-old wethers stimulated the maturation of secondary follicles (Schinckel and Short 1961) as it seems likely that testosterone therapy may improve the nutritional status of the wether by promoting retention of nitrogen (Butler et. *al.* 1945; Kinsell, Hertz and Reifenstein 1944; Lamming 1963; Osborne and Widdows 1967).

Reports of a negative correlation between follicle density and cross sectional area (Schinckel 1957) are supported by the results from the High frequency groups 6 and 12, while in group 2, increased density was associated with increased staple length and a smaller, non-significant increase in fibre cross sectional area.