Anim. Prod. (1984) 27 ;

EXPERIMENTAL MANIPULATION OF ANTLER GROWTH IN RED DEER STAGS BY TREATMENT WITH EXOGENOUS STEROIDS

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The farming of red deer stags in New Zealand is based partly on the sale of 'velvet' antlers. Antlers are bony projections which grow from the frontal bones each year and are termed 'velvet' antlers during the early stages of their growth when they are relatively soft and have undergone only partial hardening (calcification). Such antlers begin to grow immediately after the previous year's hardened antlers, or their remnants, have been cast off. This occurs in spring.

The annual cycle of antler growth is closely linked to reproductive function. For instance premature casting of antlers can be achieved by castration (1), by immunisation against gonadotrophin releasing hormone (2) or by treatment with a synthetic progestagen (3). On the other hand, calcification of the cartilaginous and partially mineralized 'velvet' antlers, which converts them to hardened bony antlers, coincides with the annual summer rise in testosterone secretion (4,5) and can be evoked artificially by treatment of stags with exogenous steroids. Oestradiol-17ß is particularly effective for stimulating such antler calcification (6). This study records the induction of two crops of 'velvet' antlers in a year by treatment of stags with exogenous steroids.

Six 18-month-old red deer stags were treated with an intramuscular injection of a depot form of medroxyprogesterone acetate (MPA, 'Promone E', Upjohn N.Z.) at a dose of 0.8 mg/kg on 4 May and again on 8 June. (The latter dose was given only to stags which had not cast antlers by this date.) This procedure caused premature casting of the naturally-hardened antler remnants between 27 May and 29 June. Casting was followed immediately by growth of 'velvet' antlers. After removal of these antlers between 43 and 66 days of growth (at the usual stage for commercial utilisation) each stag was left with partially mineralized antler remnants (or stumps). Previous studies at Lincoln College (unpublished) have shown that such antler stumps do not completely calcify until endogenous testosterone secretion rises in the following summer, and thus are unable to be cast off until spring in the year following MPA treatment (over 12 months later). In the present study, calcification of the antler stumps was achieved by providing each stag with a subcutaneous inplant of approximately 100 mg of crystalline oestradiol (ß-estradiol, Sigma, made into a tablet by compression in a cylindrical mould, 7 mm in diameter). Calcification of the antler stumps was assessed by visual observation to be complete within 3 weeks, so the tablets were removed after 24 days. Each implant had decreased in weight by 8.4 ± 0.80 mg (i.e. approximately 350 µg per day absorption rate).

Casting of the hard antler stumps in these stags occurred in October, as it did for untreated control stags of the same age. Subsequent growth and production of 'velvet' antler was identical in both treated and untreated stags.

This study showed that an antler growth and calcification sequence can be produced in entire red deer stags outside the normal seasons for these events by providing steroid hormones. Since MPA causes suppression of testosterone secretion in stags (3) and oestradiol has similar effects to testosterone in stags (7) these results emphasize the importance of testosterone in the regulation of the natural antler cycle. In addition this study establishes a technique with possible application in the deer farming industry.

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