GROWTH PROMOTANTS FOR DEER

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Introduction

Hormonal growth promotants are widely used both in New Zealand and overseas to increase the liveweight gain of domestic animals, particularly cattle. Even under optimal conditions deer growth is highly seasonal and it may be appropriate to alter it to utilise pasture better or to spread the killing season through the DSP's. This paper considers whether hormonal growth promotants are an alternative for growth manipulation in deer. It does not address marketing issues as it is believed the deer industry as a whole must consider these.

Hormonal growth promotants, which are normally presented as an implant in the base of the ear, fall into 2 categories.

1. Exogenous - substances which are not normally found in the animal (e.g. zeranol, Ralgro). They often have a steroid like action.

2. Endogenous - substances normally produced by the animal. These may be steroidal (e.g. testosterone) or peptide (e.g. growth hormone).

This paper mainly deals with the implantation of anabolic substances into red deer. At present in New Zealand, Ralgro (zeranol, International Minerals and Chemical Corporation, Indiana, USA) is widely used in cattle. Implants of 36 mg, lasting 70-100 days are placed at the base of the ear of cattle. A witholding period of 65 days before slaughter is mandatory. Finaplix (Trenbolone acetate, Roussel Uclaf, Paris, France) is a synthetic androgen which is used overseas particularly in heifers.

Natural hormones, none of which are commercially available as growth promotants in New Zealand, which may have some relevance for deer are testosterone, oestradiol and growth hormone. Overseas research in cattle has shown that oestradiol (marketed as Compudose by Eli Lilly Group Indianapolis USA) is a potent growth promotant. Research on growth hormone is restricted by lack of availability of the hormone and lack of a suitable implanting vehicle, but preliminary results suggest that increases in liveweight gain and food conversion efficiencies are possible.

It was decided to commence trials on hormonal treatment of deer at Invermay to evaluate any effects and to identify any health or management difficulties associated with hormonal growth promotion, particular to deer.

It was felt that deer would respond favourably to implanting with steroids because it was known that castrate male deer were smaller than entire stags (Table 1).

Table 1: Liveweight and carcass weight (kg) of entire and castrate deer (Data from Drew, K.R. *et al.* (1978) Proc. N.Z. Soc. Anim. Prod. 38: 142-144).

	Entire (n)		Castrate* (n)	
Liveweight:				
Weaning (3 mo age)	31.7	(10)	31.6	(11)
16 mo	83.8	(10)	76.1	(11)
27 mo	118.1	(5)	98.4	(6)
Carcass Weight:				
16 mo	43.8	(5)	40.6	(5)
27 mo	67.6	(5)	55.8	(6)

*Stags were castrated at 5 months of age.

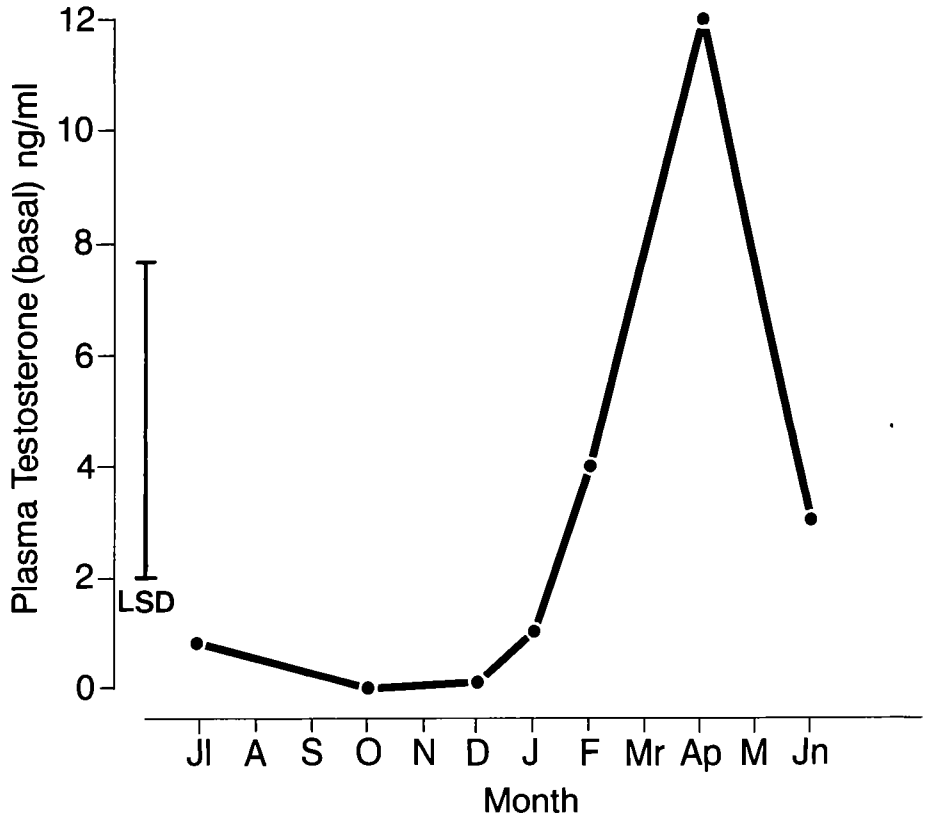
The stags in recent growth promotion trials run by Invermay have been treated from September-December because this is the time of year when natural steroid levels are lowest in intact stags (Figure 1).

This period also coincides with velvet antler growth. The age group selected has been rising 2 year old stags because these currently find favour with the DSP's as carcasses if slaughtered at 24-29 months of age.

Exogenous Growth Promotants

Ralgro. In 1978 Fennessy and Moore (Unpublished data) treated nine 22 month old red deer stags with 12 mg of Ralgro placed subcutaneously in the neck, while 8 were not treated (controls). All stags were run together at pasture and implants were removed in December after 56 days. The control stags gained 330 g/day in contrast to the Ralgro treated stags who gained 394 g/day - a clear result in favour of Ralgro. However Ralgro treatment inhibited antler casting in stags and reduced antler growth in stags who had cast their antlers. Consequently the treatment was not repeated.

Figure 1: Plasma testosterone levels in a group of 12 red deer stags during one year.



Finaplix (Trenbolone acetate) might also be useful as a growth promotant in deer but no data are yet available.

Endogenous Growth Promotants

In 1984 two trials commenced, one at Invermay, the other in Southland designed to investigate the growth promoting action of testosterone or oestradiol in 20 month old red deer stags.

(a) Invermay:

Thirty one red deer stags were randomly allocated in October to treatment with either none, 1, 2 or 4 silastic implants packed with crystalline testosterone. The implants were placed subcutaneously in the groin. The stags were weighed fortnightly. The trial closed 53 days later in December. The results are shown in Table 2.

Table 2: Liveweight gain (g/day) and antler weight (g) of stags treated with 0 (T0), 1 (T1), 2 (T2) or 4 (T4) testosterone implants. All antlers were removed when they were cleaned of velvet in February. "Cast" refers to stags where prevous hard antlers were cast prior to implanting, "Not Cast" refers to stags whose antlers were not cast at that time. LSD means least significant difference for $P<0.05$.

Treatment	n	Liveweight Gain (g/day)	Antler Weight (g)	
			Cast	Not Cast
T0	8	203	1624	1277
T1	8	205	1849	0
T2	8	264	1545	508
T4	7	264	1423	0
LSD		30	460	350

At the two higher levels of testosterone implant growth rate was higher. There was little difference in antler weight in stags who had cast their antlers before the trial began, but testosterone either prevented antler casting or greatly reduced antler weight in those stags who cast their antler after implanting of testosterone.

(b) Southland:

Sixty 20 month old red deer stags none of whom had cast their previous hard antler were randomly allocated to one of 6 treatments as follows:

1 Entire
2 Entire + Testosterone implant (equivalent to T1 in Invermay Trial)
3 Entire + Oestradiol
4 Castrate
5 Castrate + Testosterone
6 Castrate + Oestradiol

Hormones in a silastic tube as for the Invermay trial were implanted subcutaneously in the neck and castrations carried out in October. All animals were weighed in December and their antlers and the implants were removed. They were slaughtered at Kennington DSP in April 1985. Carcass weight and GRD, a measure of tissue depth (an indicator of fatness) over the 12th rib was recorded. The results are presented in Table 3 and Table 4.

Table 3: Liveweight gain over the trial and from implantation - slaughter and velvet antler weight for red deer stags 10 per group. T stands for testosterone, E for oestradiol. No stags had cast their previous antlers before the trial began.

Treatment	Liveweight gain Oct-Dec (g/day)	Liveweight gain Oct-Apri g/day	Velvet weight g
Entire	159	78	617
Entire + T	175	78	0
Entire + E	159	95	586
Castrate	95	61	788
Castrate + T	175	100	0
Castrate + E	175	61	759
LSD (5%)	31	18	150

Table 4: Carcass weight, tissue depth and percentage graded prime for 28 month old red deer stags.

Treatment	Carcass Weight (kg)	GRD (mm)	Percentage prime
Entire	73.2	10.0	70
Entire + T	71.2	8.5	90
Entire + E	70.5	9.2	90
Castrate	65.5	9.0	90
Castrate + T	70.8	11.6	70
Castrate + E	68.9	11.1	90
LSD	2.7	1.0	

During the trial all groups grew significantly faster than the unimplanted castrate group, underlining the importance of steroids for growth promotion. There was a significant carry over effect in the castrate + testosterone group which grew faster over all than all but the entire + oestradiol group.

Testosterone abolished antler development, but oestradiol did not inhibit it, perhaps because the dose was too low. At slaughter the castrate unimplanted was smaller than other groups. The entire + testosterone group was leannest of all, in contrast the implanted castrates were fatter than the unimplanted castrates probably as a consequence of their greater size. In general the doses of both testosterone and oestradiol were probably too low for clear cut effects but growth effects nonetheless occurred.

Taken together the results of the trials at Invermay and Kennington make it clear that:

1. Growth can be enhanced in deer treated with natural steroids.

2. At low levels, testosterone inhibits casting and stunts antler growth.

3. Testosterone implanted stags may be slightly leaner than unimplanted stags, and thus may grade better.

Growth hormone has not been used to treat deer; indeed deer growth hormone is as yet unavailable. However recombinantly derived human growth hormone has been used successfully in cattle to increase growth. Were its use to become commonplace then it represents an important possibility, as any effects of steroid residues and deleterious effects on antlers are eliminated.

Discussion

This paper has considered only the treatment of cull stags at about 27 months with single implants of growth promotants. Clearly other possibilities exist:

(a) Cull hinds could be treated.

(b) Multiple implantation could commence weaning until ultimate slaughter at 15 or 27 months of age.

(c) Velvetting stags could be treated during the roar to prevent fighting, pasture damage or fence damage, if these are a problem. Implants might require to be removed before the next velvet antler growing season and the stag might not be used for breeding purposes.

(d) It may be possible to suppress the rut in yearling animals, allowing continuous growth and slaughter in early winter.

(e) If hinds could calve in October, then calves weaned at Christmas could be treated. If they reached say 100 kg in June-July then a commercial slaughter weight would have been achieved without wintering costs.

(f) Ralgro has already been used on fallow weaners to block antler development. (G.W. Asher, Personnal Communication).

There appears to be a future for growth promotants in deer although further research is necessary to fully evaluate the possibilities but to balance this account a few problems must be mentioned.

1. Steroidal growth promotants prevent or reduce velvet antler growth. The significance of this can only be placed in the context of the relative importance of velvet antlers as against venison in the deer farming industry. Clearly the producer has to make a decision as to whether a stag is to be kept for velvet or venison and this will depend on the relative value of each of these products. If 5 kg extra carcass weight could be achieved with growth promotion at present rates this would be worth an extra $35. A 2 year old stag cuts about 750 g velvet antler, if velvet was worth $100 per kg, then each 2 year old is worth $75 if left unimplanted. In this system there would be no advantage to implant stags. However it is simplistic as $100 is high for 2 year old velvet and is not paid every year, while many 2 year old stags break or damge their velvet, making it unsaleable. At least carcass gains are predictable and prices per kg paid to the consumer have been firmer than velvet prices.

   The fact that Ralgro inhibits velvet antler growth has been used by Geoff Asher in young fallow deer - they grew pedicles but no antlers. This may be of relevance to red deer farmers who do not wish to require to remove hard antler from 15 month old deer prior to slaughter.

2. Ralgro treatment of breeding animals is not recommended. This means that, at weaning, the producer may have to make a decision as to whether stock are potential sires or are to go for meat. Already in N.Z. an instance has come to light where a "sire" stag proved infertile and early treatment with Ralgro was implicated as a possible cause. Clearly all potential breeding stock should not receive any growth promotant.

3. The final problem concerns the ultimate fate of the venison from animals treated with growth promotants. Regulations on witholding periods are strict but the problem of residues remains (although these are nonexistant with natural hormones). This can be studied and exhaustive tests carried out, but do we wish the image of New Zealand farmed venison as a naturally produced healthy food possibly compromised? This is a matter for public discussion and it is likely that a final decision will be made by marketing authorities rather than meat producers.

In conclusion growth promotants seem to be appropriate for altering growth in deer as they are in cattle. Anabolic preparations are available or are likely to be available in the future. The industry should be aware of the interference with velvet growth and fertility of steroid and Ralgro treatment. There may well be a future for growth promotion in many areas of deer husbandry.

Acknowledgements

I have referred to an unpublished report by Mr J.R. McKenzie Gorrie Downs Greta Valley North Canterbury entitled Growth Promotion Systems for Sheep and Cattle : Their effective usage safety and future developments. Mr J. Mathieson of Kennington Invercargill gave me access to slaughter information from Kennington DSP.