Melatonin and Antler Harvest Dates

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1. INTRODUCTION

A number of studies of the influence of melatonin on advancement of reproduction in deer have been reported in previous conference proceedings (Fennessy *et al* 1986, Fisher and Fennessy 1987, 1988, Pearse 1988, Wilson *et al* 1988, Wilson, 1989, 1990). An extensive review of the influence of melatonin on the breeding season of deer has recently been published (Asher *et al* 1992). A number of these reports indicated that treatment of stags with melatonin altered seasonality of antler growth along with reproductive characteristics, and that subject was discussed in detail by Fennessy *et al* (1990). Suttie and Fennessy (1992) describe the relationship between melatonin and insulin-like growth factor 1 and suggested that melatonin may influence antler growth and reproductive cyclicity by different means.

Deer farmers selecting stags for antler production usually do so on the basis of 2-year-old antler weight. This has been shown to be a reasonable predictor of future velvet production (Moore *et al* 1988). To achieve best financial returns for cull stags at 2 years of age, they should be slaughtered before mid-December when the venison schedule is likely to fall and before there is an appreciable risk of down-grading of carcasses due to overfatness. However, given the later casting and growth cycle in 2-year-old stags (Fennessy *et al* 1992), a significant proportion of 2-year-old stags do not have antlers harvested by that date.

This study was undertaken to investigate whether melatonin given to 1-year-old stags would advance the antler growth cycle to enable farmers to select stags for their future velvetting herds at a time when they can capitalise on the seasonal high venison schedule and when carcasses should grade prime. An early and a late melatonin treatment was chosen given that the timing of establishment of seasonality in young stags has not yet been established.

2. MATERIALS AND METHODS

2.1 Farm

The trial was conducted on a large commercial velvetting farm on South Kaipara Head.

2.2 Animals

One hundred and ninety rising 1-year-old red deer stags were chosen for this study which was conducted over a 12-month period.

2.3 Experimental Design

Control, early-treated and late-treated groups were weighed and treated according to the schedule in table 1. Velvet weights, harvest date and grades were recorded for each stag, along with slaughter data for those culled at or shortly after the termination of the trial.

Treatment consisted of the subcutaneous implantation of 2 x 18 mg melatonin implants ("Regulin", Scherring Agro-Chemicals Limited) in the anterior part of the neck near the base of the ear.

Table 1 Experimental design describing treatments and recording events throughout the trial

Group	No.	-1989- Nov 27	Dec 28	1990- Jan 27	Mar 1	Apr 1	May 1	June 1	Oct-Dec
1 (control)	70	W	W	W	W	W	W	W monthly	Record velvet harvest date, weight, and grade
2 (early treatment)	60	WT	WT	WT	W	W	W	W monthly	Bodyweight prior to slaughter
3 (late treatment)	60	W	W	W	WT	WT	WT	W monthly	Date of slaughter, Carcass weights/GR measurement [illegible]

W = Weight
T = Treat - Subcutaneous implantation 36 mg Melatonin ("Regulin")

2.4 Statistical Analyses

Analysis of variance was employed to verify differences between treatment groups for velvet weight, velvet grade, velvet worth, velvet harvest to date, liveweight and carcass weight.

3. <u>RESULTS</u>

3.1 Bodyweights

The pattern of bodyweights is presented in figure 1. The bodyweight gain pattern was similar in all groups to the end of February. At the end of March the early treatment group weighed significantly less ($p < 0.01$). The May, June and July bodyweights of this group also were significantly lower ($p < 0.01$-0.02). There were no significant differences in bodyweight after August.

3.2 Velvet Harvest Dates

Numbers of animals harvested from each group at intervals from commencement of velvet harvesting are presented in Figure 2. Velvet harvesting of the early treated group commenced September 6, whereas velvet harvesting of control or late treated animals did not commence until October 30. By mid-December 89% of early treated stags had been velvet harvested, whereas 59 and 56% of control and late treated animals had been harvested by that date. The advancement in velvet harvesting date was significant ($p < 0.01$).

Figure 1. Liveweights of control, early- and late-treated groups

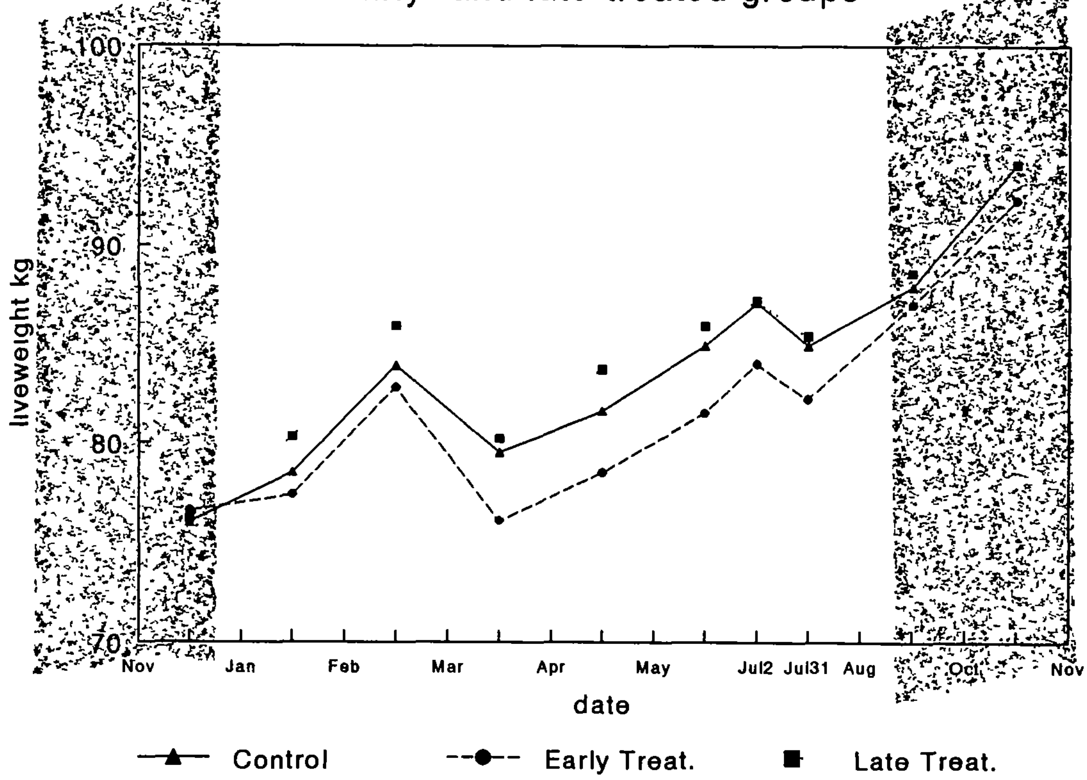
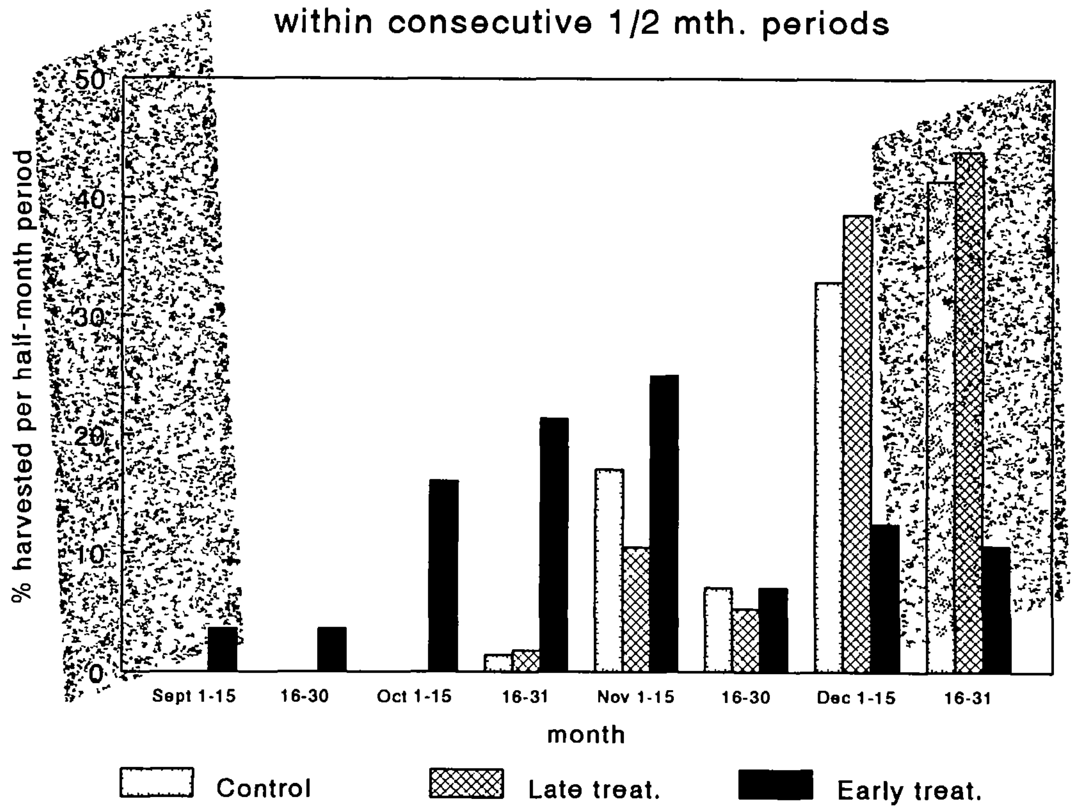


Fig 2. % of stags with velvet harvested within consecutive 1/2 mth. periods



3.3 Other Variables

Velvet weight, velvet grade, velvet worth and carcass weights for each of the three groups were not significantly different.

4. DISCUSSION

It is now well established that melatonin modulates the seasonal sexual cycles of both male and female deer. The link between the sexual cycle and antler growth cycle has been well documented (Suttie and Fennessy, 1992). This trial set out to determine whether manipulation of the antler growth cycle in young stags using melatonin could be of commercial benefit to the deer farmer. Previous studies involving melatonin treatment were undertaken in stags 2 years of age or older (Fennessy *et al* 1990). In treated adult deer, casting of hard antlers may occur as early as May instead of in the spring. In some instances two antler growth cycles may occur in the one year. While resulting individual antler yields were lower, overall annual production was considerably higher. The effect of melatonin in advancing antler casting date was greater in older animals. In some instances where a duplicate antler growth cycle did not occur, regrowth was more common after melatonin treatment, thus increasing overall velvet weights per stag.

There was a significant advancement of velvet harvest dates in the early treatment group. The median harvesting date for this group was November 14, whereas the median harvest date for both the control and late-treated groups was December 12; an advancement of 28 days. Eighty nine percent of stags in the early treated group were velvet harvested before mid-December compared with 59 and 56% for control and late-treated groups, respectively. Thus, after early melatonin treatment of yearling stags the farmer could expect approximately 27% more stags to be velvetted prior to the mid-December date, after which there is a risk that the venison schedule would fall.

The timing of initiation of seasonal cyclicity in deer is under investigation (Suttie pers com). A late-treatment group was introduced into this study to increase overall knowledge of the influence of melatonin in establishment of seasonality in stags. It would appear from the response, both in bodyweight and antler harvesting date patterns that the only early melatonin treatment regime has influenced seasonality in one year-old stags in a similar manner to that in older stags. However, the extent of advancement of antler harvesting was not as great as that reported for older stags, which is consistent with the observation of Fennessy *et al* (1990) of an age effect on melatonin response. The significant reduction in bodyweight during autumn in early-treated stags is consistent with the earlier fall in bodyweight observed in treated older stags (Fennessy *et al* 1990). In adult stags however, treated and control animals were similar in bodyweight during winter. In the present trial early-treated stags took some time to regain bodyweight parity with untreated or late treatment cohorts.

Despite the biological response to melatonin treatment, calculations based on assumptions presented in Table 2 suggest that the cost involved to achieve the response exceeded the financial return. Added to this is the variability in the seasonal pattern of venison schedule price e.g. the fall in schedule has been as late as early February on one occasion in the last four years, while in the 1991/92 season the venison schedule did not fall at all during the summer period. Thus, despite producing a response in antler harvest date without effecting antler weight, grade, value or carcass weight, this procedure would appear to be uneconomic for the deer farmer.

<u>Table 2</u> **Financial returns following the use of melatonin (early treatment) in yearlings to advance antler harvest using a hypothetical herd example**

<u>General Assumptions</u>:

No. stags	100
Cost of implants	$18/deer

Labour - 6h @ $20
Interest $1800, 12 months @ 7%
27 more stags available for slaughter before fall in schedule
Fall in schedule after mid-Dec 70c/kg
Ave carcase wt 55 kg

COSTS:

	$
Implants	1800
Labour	120
Interest	126
	2046

RETURNS:

27 stags, increased value $38.50 each = **$1,039.50**

Net surplus (deficit) = ($1,006.50) per 100 stags.

Furthermore, there is a growing awareness within the industry of the need for a clean green product image as discussed elsewhere (Wilson 1989) which has been endorsed by the Game Industry Board marketing team. There is therefore a reluctance to use products which could be used by the market place to discriminate against venison or velvet from this country.

5. ACKNOWLEDGEMENTS

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