This paper is from the New Zealand Society for Animal Production online archive. NZSAP holds a regular annual conference in June or July each year for the presentation of technical and applied topics in animal production. NZSAP plays an important role as a forum fostering research in all areas of animal production including production systems, nutrition, meat science, animal welfare, wool science, animal breeding and genetics.

An invitation is extended to all those involved in the field of animal production to apply for membership of the New Zealand Society of Animal Production at our website www.nzsap.org.nz

The New Zealand Society of Animal Production in publishing the conference proceedings is engaged in disseminating information, not rendering professional advice or services. The views expressed herein do not necessarily represent the views of the New Zealand Society of Animal Production and the New Zealand Society of Animal Production expressly disclaims any form of liability with respect to anything done or omitted to be done in reliance upon the contents of these proceedings.

This work is licensed under a Creative Commons Attribution-NonCommercial-NoDerivatives 4.0 International License.

You are free to:

**Share** — copy and redistribute the material in any medium or format

Under the following terms:

- **Attribution** — You must give appropriate credit, provide a link to the license, and indicate if changes were made. You may do so in any reasonable manner, but not in any way that suggests the licensor endorses you or your use.
- **NonCommercial** — You may not use the material for commercial purposes.
- **NoDerivatives** — If you remix, transform, or build upon the material, you may not distribute the modified material.

http://creativecommons.org.nz/licences/licences-explained/
Melatonin for cashmere production

A.J. LITHERLAND, D.J. PATERSON, A.L. PARRY, H.B DICK AND L.D. STAPLES

MAF Technology, Flock House Agriculture Centre, Private Bag, Bulls

ABSTRACT

One hundred and eighty cashmere wethers were divided into 11 treatment groups with 9 groups receiving a single melatonin implant at various dates staggered 6 weeks apart throughout the year commencing on 22 January 1988 and finishing on 22 December 1988. The tenth group received a melatonin implant at each of the treatment dates. The control group received no implant. Down lengths were collected at 1 to 6 weekly intervals to monitor growth patterns.

The continuous melatonin treatment resulted in lower peak down lengths than controls in August while down lengths were higher than controls from October to January. However the period of down growth was unchanged.

Shedding of down occurred 19 weeks after melatonin treatment in all groups except those treated on 15 April, 7 July and 18 August where the interval to shedding was shorter and in phase with the natural shedding cycle. Cashmere growth was only initiated following melatonin treatment from 18 August to 22 December. Treatment on 10 November increased cashmere production by 32%. This was the only treatment which increased cashmere production harvested in one season.

Keywords: Goat, wether, cashmere, melatonin, timing

INTRODUCTION

The role of the pineal hormone, melatonin, in interpreting seasonal changes in light patterns is well documented. Cashmere goats exhibit a seasonal pattern of fibre growth (McDonald et al., 1987; Mitchell et al., 1989) which potentially can be manipulated by exogenous melatonin. In the natural cashmere cycle, new down fibres reach measurable lengths in January and longer fibres moult from August resulting in a decline in length until all fibres have disappeared in November. This experiment defines the response in down length, down weight and fibre quality to exogenous melatonin when administered to cashmere wethers at various times of the year.

MATERIALS AND METHODS

One hundred mixed age and eighty 15 month old cashmere wethers were allocated to 11 treatment groups (Table 1). Single 18 mg melatonin slow-release implants (Regulin Ltd., Melbourne, Australia) were administered behind the left ear of groups of goats (C to K) at various dates at six weekly intervals throughout the year (Table 1). Group B was implanted repeatedly every 6 weeks ceasing on 3 February 1989 and Group A was an untreated control.

Measurements of stretched down length and guard hair length were taken at 4 sites on the goat (neck, front shoulder, midside and hind shoulder). Measurements commenced 6 weeks after treatment and continued at weekly intervals until moulting of down. The onset of a moult and hence date of harvest was quantified as three consecutive weeks of constant or decreasing mean treatment down length. At harvest a randomly selected side of the goat was shorn while the other side was hand combed at weekly intervals until all shed fibre had been harvested.

A full season of cashmere growth is defined as that growth which occurs from 1 November to 31 October in the following year. In all treatments except treatment B, fleeces harvested at the time of the first moult after treatment were measured for percentage yield by weight of cashmere (yield). In some treatments goats produced two fleeces in one season. In these treatments mean down length for each fleece was accumulated and if the total was greater than that for the control group then yield was measured. Percentage yield of cashmere (w/w) was determined on a random 10 g sample of the fleece using a Shirley trash separator.

1 Regulin Ltd., Melbourne, Australia
and down weight was then calculated. A projection microscope was used to measure fibre diameter on the dehaired cashmere.

The effects of treatment on fibre production was analysed using generalised linear models. Treatment effects on down length at each time of measurement were compared and the control with initial down length was fitted as a convariate.

**RESULTS**

**Down Length**

Cashmere moult

Goats treated on 10 November 1989 (J), 22 December 1988 (K), 22 January 1988 (C) and 4 March 1988 (D) moulted 19 weeks after treatment and were shorn (Table 1). In treatment K, C and D the net reduction in down length associated with the moult began earlier and finished at the same time as controls (Figure 1). The moult in treatment J did not appear to progress to completion (Figure 2).

![FIG 1](image-url)

**TABLE 1** Mean (se) down length, down weight (se), fibre diameter (se) and yield by weight of down (se) of half fleeces at time of shearing for the 1988 and 1989 season. Comparison with control goats * (p<0.05), ** (p<0.01), *** (p<0.001).

<table>
<thead>
<tr>
<th>Group</th>
<th>Treatment Date</th>
<th>Shearing Date</th>
<th>Down Length (mm)</th>
<th>Down Weight (grams)</th>
<th>Fibre Diameter (microns)</th>
<th>Yield (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1988 Season</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>A</td>
<td>Control</td>
<td>18 Aug</td>
<td>78 (5)</td>
<td>43 (6)</td>
<td>19.2 (0.4)</td>
<td>26 (3)</td>
</tr>
<tr>
<td>C</td>
<td>22 Jan</td>
<td>3 Jun</td>
<td>43 (4)</td>
<td>36 (4)</td>
<td>18.2 (0.4)</td>
<td>22 (2)</td>
</tr>
<tr>
<td>D</td>
<td>29 Sep</td>
<td>15 Jul</td>
<td>78 (4)</td>
<td>44 (4)</td>
<td>21 (2)</td>
<td></td>
</tr>
<tr>
<td>E</td>
<td>4 Mar</td>
<td>18 Aug</td>
<td>40 (4)</td>
<td>40 (5)</td>
<td>18.6 (0.2)</td>
<td>22 (3)</td>
</tr>
<tr>
<td>F</td>
<td>15 Apr</td>
<td>11 Oct</td>
<td>52 (5)</td>
<td>24** (4)</td>
<td>19.6 (0.4)</td>
<td>20 (3)</td>
</tr>
<tr>
<td>G</td>
<td>7 Jul</td>
<td>11 Oct</td>
<td>49 (5)</td>
<td>31* (4)</td>
<td>19.5 (0.4)</td>
<td>21 (2)</td>
</tr>
<tr>
<td>H</td>
<td>18 Aug</td>
<td>11 Oct</td>
<td>48 (5)</td>
<td>28** (4)</td>
<td>19.5 (0.4)</td>
<td>44 (5)</td>
</tr>
</tbody>
</table>

| 1989 Season |
| A | Control | 16 Aug | 81 (5) | 44 (5) | 19.4 (0.4) | 30 (3) |
| I | 30 Sep | 10 Mar | 16 (5) | 5*** (1) | 19.0 (0.4) | 6*** (2) |
| J | 16 Aug | 57 (6) | 39 (4) | 25*** (5) | 19.5 (0.4) | 44 (5) |
| K | 22 Dec | 12 May | 56 (3) | 36 (3) | 21 (2) |

![image-url]
Following treatment with melatonin the moulting cycles for treatments on 15 April (E), 27 May (F) and 7 July (G) were similar to the control goats (Figure 3). The apparent delay in shedding in treatment F and G is an artifact of the experimental design caused by combing which started on 18 August in controls but not until 11 October in F and G. Treatment I did not show a decline in down length.

Cashmere growth

Treatment with melatonin on 18 August (H), 30 September (I), 10 November (J) and 22 December (K) increased down lengths relative to controls during December and January (p<0.01) with the increase in treatment J and K (p<0.01) persisting to March 1989 (Figure 2). Subsequent down lengths in the same season however were suppressed (p<0.05).

Cumulated mean down length from both harvests within one season for treatment J (102 mm) was greater (p<0.001) to that of the single harvest of the control (81 mm).

Down length measured in the following season (14 April) was unaffected by melatonin treatment in the 1988 season in C and D but lower in E by 5 mm (p<0.04), F by 3 mm (p<0.13), and G by 11 mm (p<0.01) (Figures 1 and 3).

The continuous supply of melatonin treatment, (Figure 4) depressed peak down lengths on 18 August 1987 by 22 mm (p<0.01) while down lengths were between 8 and 19 mm higher than controls over the November to January period (p<0.05).

Down weight

The mean down weights harvested at the first post treatment shearing in treatments F, G, H, I and J were lower (p<0.01) (Table 1) than that harvested from the control goats. All other treatments however produced...
similar amounts of down. The cumulated down weight from both fleeces produced in the 1988/89 season in treatment J was 32% greater than that produced by the control goats (p<0.07).

**Fibre Quality**

There was no effect of melatonin treatment on fibre diameter however the reduction of 1 micron in treatment C approached significance (p<0.07). The yield of cashmere in control goats and treated fleeces generally ranged from 20% to 44% (Table 1) with only treatment I being unusual with a yield of 6% (p<0.01).

**DISCUSSION**

Cashmere growth was initiated in response to melatonin treatment during the period 18 August through to 22 December. This supports experiments where spring administration of melatonin have increased cashmere growth (Betteridge et al., 1987; Scheurman et al., 1987; Moore et al., 1989).

Treating goats in spring with melatonin results in the growth of two fleeces in one season. This experiment has shown that, cashmere must be harvested 19 weeks after treatment with Regulin melatonin implants to prevent excessive losses of cashmere due to moulting. At the time of the first moult, cashmere growth and moulting was occurring simultaneously unlike the natural moult where there is a two month delay between the moult and regrowth of cashmere.

Duration of implant secretion in these goats was 6 weeks (Parry et al., 1990). It can be hypothesised that the removal (Betteridge et al., 1987) or in this case the depletion of the implant provides the shedding stimulus. In this experiment moulting of cashmere occurred 13 weeks after implant depletion. Treatment with melatonin from April to July was unable to alter the timing of the natural moult lending credence to the hypothesis (Ryder, 1966; McDonald et al., 1987) that the natural shedding stimulus is triggered by the autumn solstice but takes approximately 13 weeks to result in visible signs of moulting of the cashmere fleece. In contrast to these results Betteridge et al. (1987) found that does treated for 11 weeks with melatonin from September shed within 6 weeks of removal or loss of implant.

Treatment on 10 November was the only treatment which proved likely to result in an economic increase in cashmere production from 2 fleeces shorn per season. Research in Australia found shearing twice in one season will increase the amount of down harvested in cashmere goats (McDonald, 1989) and this effect may have contributed to the difference in down weight.

A prerequisite for the sale of cashmere is attaining a minimum down length of 40 mm in both first and second fleeces. The mean down length of the first fleece produced on 10 November was 39 mm at shearing on 31 March 1988. However the maximum down length achieved on this treatment was in fact 45 mm on 23 March 1988. By shearing the goats a week earlier in this experiment it would have been possible to achieve a mean down length of greater than 40 mm.

**ACKNOWLEDGEMENTS**

The authors wish to thank Nihal Desilva for assistance in analysis of this experiment and Guy Hamilton for assistance in collecting the field data and Don Wright for assistance in the planning of this experiment. Regulin Ltd are acknowledged for their financial support.

**REFERENCES**


Scheurmann E.; McPhee S.; Staples L.; Galloway D. 1987. The effect of exogenous melatonin on reproductive and fleece parameters when administered to Australian goats prior to the