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Changes in the fur quality of caged brushtail possums (*Trichosurus vulpecula*) maintained in captivity

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**ABSTRACT**

Sixty-four wild possums, housed in individual cages, were divided into four groups based on sex and colour phase (dark or grey). The animals were assessed for fur quality and growth in March and were pair-matched for sex, colour phase, fur quality and growth. One possum from each pair was implanted with an 18 mg melatonin implant. By June there was a small improvement in fur quality which was independent of the localised regrowth of patches of missing fur. No overall change in the level of fur growth representing seasonal pelage renewal was recorded. The younger possums had a higher fur quality than older animals (p<0.001) but over the course of the experiment the difference (p<0.05) diminished as the older, poorer quality pelts improved. The quality of the pelts from female possums were consistently graded more highly (p<0.05) and improved more rapidly (p<0.05) than male pelts. Melatonin had no effect, either on pelt characteristics or on live weights.

**Keywords** Possum; opossum; fibre; fur growth; melatonin; pelt quality

**INTRODUCTION**

For about 150 years, since the introduction of the brushtail possum (*Trichosurus vulpecula*) from Australia, the New Zealand fur industry has been substantially based on the trapping of wild possums (Pracy, 1974). In the last 50 years the average skin quality is believed to have deteriorated in many areas as possum populations have peaked and animal condition and size have declined (Batchelor and Cowan, 1988). The variable and prolonged pattern of possum fur replacement (Nixon, 1990) is also an important factor in the comparatively low quality of wild possum fur compared with pelts produced from farmed fur bearers such as mink and fox (MacGibbon, 1986; Batchelor and Cowan, 1988).

As a consequence of the ease with which fur is lost from the pelt in this species there is frequently an uneven topographical distribution of fibre growth over the body. Patches of local regrowth occur independently of areas of less intense fur growth which represent a seasonal pelage growth cycle (Nixon, 1989). Pelt damage most commonly results from mating and fighting in the wild, and by inappropriate pelt handling by inexperienced trappers.

The quality of the top 5% of pelts from wild possums is sufficiently high to suggest that pelts produced under controlled conditions have a significant price potential (MacGibbon, 1986). One method to achieve consistently high pelt quality is to house wild possums in individual cages for 3-4 months until fur regrowth results in the elimination of pelt blemishes (Pearson, 1987). This practice is termed fur finishing or ranching.

An induced stimulation of possum fibre growth would have potential as a management tool in fur finishing, especially since the seasonal pelage replacement pattern in possums is slow and diffuse. In ferrets, treated with melatonin in February, plasma melatonin levels remained elevated for a period of several months and resulted in the advancement of winter coat growth by up to 6 weeks compared with untreated controls (Pearson et al., 1989).

A investigation was undertaken with the objectives of:

(a) studying the effects of holding wild possums in captivity on fur quality and fur growth

(b) investigating any relationship between fur quality and growth with sex, age and colour phase

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(c) determining whether exogenous melatonin administered in autumn affects either the rate of localised or seasonal fur growth.

METHODS

The trial was carried out on a large possum finishing farm in the central North Island between March and June 1988. The animals were maintained in individual cages and fed a formulated mash and lucerne diet. Sixty four possums which had been in captivity from 8 to 14 weeks were weighed and shifted to a block of adjacent cages on the 2nd of March. Six days later they were anaesthetised, aged on teeth wear (Winter, 1980) and graded by an experienced farmed fur grader for fur quality and growth.

Fur quality was graded on an eleven point scale (1 for highest quality to 11 for lowest quality) taking into account fur eveness, density, lustre, softness and length. The quality grading was based on these subjective attributes alone and was independent of any faults that were noted (patches of bare skin, partly regrown fur, localised staining). Possum hair follicle growth is indicated by a blue colouration in the skin due to generation of melanin granules in active follicles (Nixon, 1989). A 5-point fur growth scale (1 for no pigmentation to 5 for strong uniform pigmentation) was assigned after a close examination of the skin.

The possums were divided into four groups based on sex and colour phase (dark or grey). Within each sex-colour group animals were pair-matched for fur quality and growth. One possum from each pair was implanted with an 18 mg Regulin melatonin implant. The possums were slaughtered, weighed and pelted on 28 June, 112 days after melatonin treatment. The fur side of the fifty-eight dry pelts (after losses due to deaths and escapes) were again graded for quality and growth. All the possums were weighed at the beginning and the conclusion of the experiment.

Regression analyses were performed on the live weight and fur quality data to test for effects of sex, age, colour and melatonin treatment. Non-parametric statistics were used to examine the non-normally distributed fur growth data for significant differences between the experimental groups.

RESULTS

Fur Growth

Most possums, with one exception, showed either slight or no visible signs of fur growth in March (Figure 1).

![Distribution of the fur growth scores assigned to the possum pelts on the 8th of March and the scores assigned to the same pelts 112 days later. Growth score 1 was assigned to skins with no follicle growth pigmentation and growth score 5 was assigned to skins with strong fur growth.](image)

FIG 1

TABLE 1  Mean fur quality and growth scores for sex-colour subgroups (±SEM) at the start and the end of the experiment.

<table>
<thead>
<tr>
<th></th>
<th>March</th>
<th>June</th>
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<tbody>
<tr>
<td><strong>Fur Quality</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>dark males</td>
<td>15 6.3 ± 0.3</td>
<td>5.5 ± 0.6</td>
</tr>
<tr>
<td>dark females</td>
<td>14 4.8 ± 0.7</td>
<td>3.4 ± 0.7</td>
</tr>
<tr>
<td>grey males</td>
<td>15 5.9 ± 0.3</td>
<td>6.5 ± 0.5</td>
</tr>
<tr>
<td>grey females</td>
<td>14 5.2 ± 0.2</td>
<td>4.5 ± 0.3</td>
</tr>
<tr>
<td><strong>Fur Growth</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>dark males</td>
<td>15 2.0 ± 0.1</td>
<td>1.9 ± 0.2</td>
</tr>
<tr>
<td>dark females</td>
<td>14 1.9 ± 0.3</td>
<td>2.0 ± 0.3</td>
</tr>
<tr>
<td>grey males</td>
<td>15 1.4 ± 0.1</td>
<td>2.3 ± 0.2</td>
</tr>
<tr>
<td>grey females</td>
<td>14 1.8 ± 0.2</td>
<td>2.0 ± 0.2</td>
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</tbody>
</table>
TABLE 2  Multiple linear regression coefficients (±SE) relating fur quality and liveweight to sex, colour, age and melatonin treatment.

<table>
<thead>
<tr>
<th></th>
<th>sex (female)</th>
<th>colour (grey)</th>
<th>age (years)</th>
<th>melatonin (treated)</th>
<th>R</th>
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</thead>
<tbody>
<tr>
<td>fur quality (March)</td>
<td>-1.31 ± 0.34</td>
<td>0.31 ± 0.34</td>
<td>0.53 ± 0.13</td>
<td>0.36 ± 0.34</td>
<td>0.58</td>
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<tr>
<td>fur quality (June)</td>
<td>-2.23 ± 0.56</td>
<td>1.25 ± 0.56</td>
<td>0.46 ± 0.23</td>
<td>0.13 ± 0.56</td>
<td>0.54</td>
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<tr>
<td>Change in quality (March to June)</td>
<td>-0.907 ± 0.455</td>
<td>0.998 ± 0.454</td>
<td>-0.076 ± 0.184</td>
<td>-0.224 ± 0.450</td>
<td>0.40</td>
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<td></td>
<td>*</td>
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<tr>
<td>live wt (March)</td>
<td>-160 ± 93</td>
<td>-271 ± 92</td>
<td>74 ± 34</td>
<td>-180 ± 92</td>
<td>0.51</td>
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<td></td>
<td>ns</td>
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<td>*</td>
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<tr>
<td>live wt (June)</td>
<td>-405 ± 152</td>
<td>-180 ± 152</td>
<td>95 ± 62</td>
<td>-72 ± 151</td>
<td>0.41</td>
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<td></td>
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<tr>
<td>Change in live weight (March to June)</td>
<td>-177 ± 117</td>
<td>105 ± 116</td>
<td>-9 ± 47</td>
<td>84 ± 116</td>
<td>0.29</td>
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</table>

There were no significant differences between fur growth scores of the four sex-colour groups either at the commencement or at the end of the experiment (Kruskal-Wallis test) (Table 1).

Little change in fur growth pattern was apparent in June although among the grey males growth increased over the trial (p<0.005, Mann-Whitney U test). There was no correlation between the growth and quality scores assigned at the beginning of the experiment within any of the four sex-colour groups (Spearman rank correlation test).

Fur quality

In March the quality of the pelts varied from 1 to 11 but 78% fell into grades 4, 5 and 6. Pelts from female possums were graded higher than pelts from male possums both in March and June (p<0.001) (Table 2). Age was significantly related to fur quality both at the beginning (p<0.001) and at the end (p<0.05) of the experiment. However the decrease in quality with age was small (half a grading unit per year) and a considerable variation in fur quality within age groups was apparent. Over the course of the experiment the quality difference was reduced as the older, poorer pelts improved. Fur quality improved by half of a quality score on average between March and June (Table 1). Female possums improved faster than the males (p<0.05) while dark possums improved in comparison with the greys (p<0.05). Seven of 15 grey males declined in fur quality.

Body Weights

The average weight of the possums at the commencement of the experiment was 2.46 ± 0.11 kg with dark possums heavier than grey possums (p<0.01) and and the older possums heavier than the younger animals (p<0.05) (Table 2). Live weights increased over the experiment by an average of 0.54 ± 0.16 kg. Weight changes were not significantly associated with age, colour phase or melatonin treatment but the males tended to gain weight more rapidly than the females (p<0.10).

Melatonin Treatment

There were no measurable effects of melatonin treatment on either fur quality (Table 2) or growth over the period of the experiment. Nor did inspection of fur
growth in areas of localised fur loss indicate any difference in the rate of growth between treatment groups.

**DISCUSSION**

The principal purpose of possum fur finishing is to allow the repair of localised fur loss. Pelt free from these faults have a significantly higher market value (MacGibbon, 1986; Batchelor and Cowan, 1988). The period of the experiment was sufficient to allow near-complete fur regrowth over the few bare skin patches noted at the first pelt assessment.

Apart from localised fur repair other processes can occur simultaneously during cage finishing. In this experiment there was a small improvement in overall fur quality and increases in pelt size may also have occurred. The level of follicle activity may change over the holding period depending on the time of the year and the individual possum. The autumn is a period where fur growth in the possum is at a seasonal minimum (Nixon, 1990) and the low level of skin pigmentation in the present experiment is consistent with this finding.

There were suggestions in these data that changes in fur quality and fur growth were influenced by the sex, colour and pelt condition of the possums at the commencement of the experiment. The pelts from female possums (particularly dark females) were consistently graded higher than male pelts. This could be related to differences between the sexes in fibre structure including longer average fibre length (Nixon, 1989). The possum has an unusual fur replacement mechanism in that only a small percentage of the total fibres are renewed annually (Nixon, 1990). The finding of an association of age with decreased quality may reflect an increased proportion of older, worn fibres in the pelage of the more mature animals.

Melatonin is a pineal hormone that is involved in the control of seasonal physiological changes including the onset of oestrus in the brush tail possum (Gemmell, 1987). In this experiment melatonin was found to have no effect in stimulating follicle activity. It is unlikely that melatonin is involved in localised fur replacement. A study of captive male possums has shown that the rate of hair regrowth, stimulated by patch shaving, is independent of the time of the year (Oldham, 1986).

Melatonin administered outside of a relatively limited period of the year has also been found to have little or no effect on fibre growth cycles in other species (e.g. Litherland et al., 1990). Recent histological analysis of the seasonal follicle activity in the possum (Nixon, 1990) suggests that if fur growth is influenced by photoperiod then increasing day length in the spring is more likely to entrain follicle activity than the decreasing day length in the autumn.

The control of possum follicle activity is likely to be complex given the marked variation between animals and the low proportion of simultaneously active follicles. To optimise returns from possum fur finishing a careful animal selection policy is necessary, based on an understanding of the annual fibre growth pattern in this species. Given the highly heterogeneous nature of the wild possum populations further work to assess pelage changes within age-sex-colour subclasses would be warranted.

**ACKNOWLEDGEMENTS**

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