THE EFFECT OF PLANE OF NUTRITION AND TESTOSTERONE TREATMENT ON SUSCEPTIBILITY OF MERINO WETHERS TO FLEECE-ROT DEVELOPMENT

R.S. COPLAND* and P.J. CHENOWETH*

SUMMARY

A factorial experiment to study the effects of high (HP) and low (LP) plane of nutrition in the presence (T+) or absence (T-) of exogenous testosterone on fleece-rot (FR) development was conducted with four groups of 6 recently shorn Merino wether hoggets. Groups were exposed to simulated rain (100mm per day) over two five-day periods at 24 and 36 weeks following commencement. Fleece rot development was assessed at 28 weeks and 38 weeks, and measured as the width of the FR "band" (mm) and severity of wool discolouration (score 1 to 6). At completion of the experiment (40 weeks) FR development was also assessed by area of affected skin (square cm), and weight of FR affected wool (kg).

Six sheep developed clinical FR after the first wetting, and a further three after the second wetting (total 9). FR development was significantly higher in the HP/T+ than any other group as assessed by all methods. Of the five sheep judged to have severe FR lesions, four were in the HP/T+ group.

From the results obtained, it would appear that testosterone treatment in the presence of a high plane of nutrition increased FR development.

INTRODUCTION

Fleece-rot (FR) is a disease of the skin and wool of sheep which is induced by wetting (Hayman 1953, Nay and Watts 1977). Those strains of Merino sheep with a small fibre diameter and short staple have demonstrated a high resistance to fleece rot (Hayman 1953, Atkins et al. 1979). Individuals within a strain also vary in susceptibility to fleece rot; those with a high variation in fibre diameter are susceptible (Watts et al. 1981), while those with a high wax and low suint content of the wool are resistant (Lipson et al. 1982). These and other characters associated with susceptibility are determined genetically (Atkins et al. 1979, Evans and McGuirk 1983), but the contribution of environmental factors to susceptibility to FR is not well documented.

Plane of nutrition is the most important environmental factor affecting wool characters such as staple length and fibre diameter (Allden 1979). The skin which produces the wool is probably also affected by the plane of nutrition, and this may change its sensitivity to contact with water and thus susceptibility to fleece-rot (Hayman 1953). The fleeces of medium peppin type Merinos subjected to nutritional deprivation would therefore have some of the characters associated with resistance to fleece rot which are normally attributed to fine wool type Merinos.

Androgens tend to increase the wax content of the fleece, although this may be minimal at physiological levels (Slen and Connell 1958, Ferguson et al. 1965). Fibre diameter is larger in rams than wethers (Ferguson et al. 1965), so this could also represent an androgenic effect.

The factorial design of this experiment enables the effects of the plane of nutrition and testosterone treatment to be measured and quantified.

*Pastoral Veterinary Centre, PO Box 168, Goondiwindi, Qld 4390.
MATERIALS AND METHODS

Twenty-four recently shorn 12 month old medium peppin type Merino wethers were selected at random from a larger flock of 500 in the Goondiwindi district. These wethers were randomly allocated into four treatment groups (six each), in a two by two factorial design. The treatments were plane of nutrition ("LP"=paddock feed, "HP"=supplement of 250g good quality hay per day), and testosterone ("Banrot", Coopers; "T+"=150mg per wether; "T-"=untreated controls).

All wethers were exposed to 100mm simulated rain (Copland 1982) daily for 5 days at 24 and 36 weeks after commencement of the trial to induce FR. Fleece-rot development was assessed at 28 and 38 weeks by measuring the width of the fleece-rot band (mm), and scoring (on a 1 to 6 scale) the fleece for discolouration at the withers. The scores were assessed as follows:-

1: bright white colour over the entire staple
2: slight yellow localised stain
3: generalised yellow stain
4: small area of green discolouration
5: generalised green discolouration
6: severe green colour over whole staple (wethers with scores 5 or 6 were considered to have severe FR).

At completion of the trial, 40 weeks, all sheep were shorn and fleece-rot development was further assessed by measurement of the area of affected skin and the weight of fleece-rot affected wool.

RESULTS

The results of fleece-rot development measurements after each wetting period for the four treatment groups are presented in Table 1.

After the first wetting, the width of the fleece-rot band was significantly wider in the HP/T+ group than any other group, but after the second wetting period it was significantly wider in both the HP/T+ and HP/T- groups. After the second wetting, testosterone treatment significantly increased FR band width in the HP groups, and decreased FR development in the LP groups with a significant interaction between treatments.

The mean colour score was higher in the T+ than the T- groups (both HP and LP), but these differences were not significant. The area of skin and the weight of wool affected with fleece rot were significantly higher in the HP/T+ group than any other group.

DISCUSSION

Nutritional deprivation decreases wool production, particularly fibre diameter and fibre length, but wax production remains relatively constant, and so increases proportionally (from 40.4% to 48.2%, Daly and Carter 1955). Thus it may be postulated that the LP sheep had a higher proportion of wax in the wool. This could aid water shedding (Lipson 1978), and may explain the lower development of FR in the LP groups.
Table 1 Fleece rot development in wethers treated with testosterone and nutritional supplement after two wetting periods of five days

<table>
<thead>
<tr>
<th>Observation</th>
<th>Nutrition</th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>High plane</td>
<td>Low plane</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Testosterone 150mg</td>
<td>control</td>
<td>Testosterone 150mg</td>
</tr>
<tr>
<td>Number of sheep</td>
<td>6</td>
<td>6</td>
<td>6</td>
</tr>
<tr>
<td>a) After first wetting</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Fleece-rot band width (mm)</td>
<td>10.3**</td>
<td>3.0</td>
<td>0.0</td>
</tr>
<tr>
<td>Colour score (1 to 5)</td>
<td>4.6</td>
<td>2.1</td>
<td>3.0</td>
</tr>
<tr>
<td>Affected sheep (N)</td>
<td>4</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td>b) After second wetting</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Fleece-rot band width (mm)</td>
<td>20.5**</td>
<td>10.8*</td>
<td>3.3</td>
</tr>
<tr>
<td>Colour score (1 to 6)</td>
<td>4.0</td>
<td>3.1</td>
<td>3.1</td>
</tr>
<tr>
<td>Affected sheep (N)</td>
<td>4</td>
<td>2</td>
<td>1</td>
</tr>
<tr>
<td>c) At shearing</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Area affected skin (cm²)</td>
<td>117.5**</td>
<td>34.1</td>
<td>41.6</td>
</tr>
<tr>
<td>Total weight of wool (kg)</td>
<td>4.8</td>
<td>4.1</td>
<td>3.9</td>
</tr>
<tr>
<td>Weight of affected wool (kg)</td>
<td>1.6**</td>
<td>0.4</td>
<td>1.1</td>
</tr>
<tr>
<td>Sheep with body strike (N)</td>
<td>2</td>
<td>0</td>
<td>0</td>
</tr>
</tbody>
</table>

*P < 0.05; **P < 0.01

Ferguson et al. (1965) reported that testosterone had little effect on wax production, but Slen and Connell (1958) found that 150mg testosterone increased wax production. This variable effect could be due to the increase in nitrogen retention and tissue demand which results from testosterone treatment (Corbett 1979).

In an HP situation, testosterone causes an increase in wax and wool production, but in an LP situation, testosterone causes an increase in tissue demand, and may in fact cause a proportional decrease in wool production. The net result in the LP/T+ group could be a higher wax content, a shorter staple, and a smaller fibre diameter. Such a fleece would resist water penetration during wetting, and dry out rapidly afterwards. Observations on water penetration and drying of the fleece confirm this proposition (Copland, unpublished data).

Sheep with a high wax content of the fleece may be more resistant to fleece-rot than sheep with a low fleece wax if exposed to moderate periods of rain, but this could be reversed if sheep are exposed to prolonged periods of rain, as the wax may be degraded by bacterial action (Goodrich and Merritt 1978).

The findings presented in this study suggest that rams may in fact be more susceptible to fleece-rot and body strike than wethers or ewes, since rams usually
receive preferential nutritional treatment, and have higher endogenous androgen levels. Rams would therefore require a higher degree of surveillance for fleece-rot development.

A period of high rainfall may bring together a number of factors associated with a high prevalence of fleece-rot and body strike. The rain induces fleece-rot directly, and increases pasture growth, thus improving nutrition, wool growth, and susceptibility to fleece-rot development. As well, pasture and soil conditions are favourable for free living stages of the primary sheep blowfly, Lucilia cuprina.

Much research has been directed towards the selection of sheep for resistance to fleece-rot (Atkins et al. 1978, Evans and McGuirk 1983), but the findings presented in this paper indicate that the nutritional conditions under which selection takes place are vital to the interpretation of results.

Although a flock is resistant to fleece-rot may be developed through selection and application of genetic principles, progress would be slow and uncertain. However, it could be possible to change fleece or wax characters through nutritional or endocrine treatment. Such an approach may be a useful short term measure to provide resistant sheep while selection programmes are developed. The results of this study indicate that susceptibility to FR may be manipulated by nutritional or endocrine treatment, but further work needs to be carried out to determine the desired treatment combination which will give high resistance to FR and acceptable wool production.

REFERENCES


