AN EFFECT OF PREVIOUS NUTRITIONAL TREATMENT ON THE OVULATION RATE OF MERINO EWES

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**summary**

Three groups of Merino ewes were fed at either high, moderate, or low levels of nutrition between Mar. and Sept. inclusive. All ewes were then run together until the following Feb.

The numbers of ewes detected in oestrus by vasectomized rams during each month between Aug. and Feb. were recorded. Ewes fed at the low level showed a depressed incidence of oestrus during Oct., but there were no significant differences between the three groups at other times.

Ovulation was recorded in Feb., one month after the mean live weights of the three groups of ewes had returned to similar levels. The mean ovulation rate of ewes previously fed at the low level (1.28) was significantly lower than that of ewes previously fed at moderate (1.57) or high (1.61) levels.

**I. INTRODUCTION**

The expression of oestrus in ewes may be influenced by previous nutritional history. Smith (1966) reported that restricted nutrition during the spring delayed or reduced the expression of oestrus in Merino ewes during the following autumn, even though nutrition had been improved and ewe live weights had recovered before the rams were introduced. Hunter (1962) and Smith (1962) have also suggested that oestrous activity in Merino ewes during autumn is influenced by level of nutrition during the preceding winter and spring.

The present investigation was planned to determine whether ovulation rate in ewes is similarly affected by previous nutritional treatment.

**II. MATERIALS AND METHODS**

In Feb. 1969, 132 5+ year-old South Australian strong-wool Merino ewes were allotted at random, after stratification on the basis of live weight, into three groups of 44 ewes. The ewes lambed during June and July, and their lambs were weaned in mid-Sept.

For a period of 7 months between 27 Feb. and 29 Sept. 1969, the three groups of ewes grazed annual grass/clover pasture at either high (H), moderate (M), or low (L) levels of nutrition. During the first 2 months, feed intake was regulated by controlling grazing time: H ewes were allowed to graze continually, M ewes for three days out of every four, and L ewes on every second day. For the remaining 5 months, differences in feed intake were imposed by variations in stocking rate (approximately 3, 7.5, and 11 ewes/ha for H, M and L ewes respectively).

After 29 Sept the three groups of ewes were run as a single flock on the areas of abundant pasture previously grazed by H and M ewes. However, in

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In order to hasten the return to uniform mean live weights ultimately required among the three groups, H and M ewes were run on the area of sparse pasture previously grazed by L ewes for a 4-week period during Dec.

Two vasectomized rams fitted with Sire-Sine harnesses and marking crayons (Radford, Watson and Wood 1960) were put with each group of ewes at the end of July, and the number of ewes detected in oestrus each month was recorded. Different rams were put with the ewes each month.

Ovulation was recorded by mid-ventral laparotomy (Lamond and Urquhart 1961) during Feb. 1970. Ewe live weights were taken at about monthly intervals throughout the experiment.

III. RESULTS

Ten ewes died during the experiment. The results shown below represent means from all animals present at the particular times that the various observations were recorded.

Changes in mean live weight for the three groups of ewes throughout the experimental period are shown in Figure 1a. Differences in live weight reached a maximum of 10.8 kg between L and M ewes, and 4.8 kg between M and H ewes, during Aug. and Sept. Mean live weights had returned to a similar level by the end of Dec., and remained constant for a further month before ovulation was recorded.

The proportions of ewes detected in oestrus each month are shown in Figure 1b. L ewes showed a slightly lower incidence of oestrus than M or H ewes during Aug., Sept. and Oct., but only during Oct. was the difference significant (H + M versus L, \( \chi^2 = 5.69, \) d.f. = 1, \( p < 0.05 \)).

Results recorded at laparotomy are shown in Table 1. There were no significant differences between groups in mean live weight at laparotomy, but the incidence of multiple ovulation was significantly lower in L ewes than in M or H ewes. One L ewe showed no evidence of recent ovulation, one ewe from each group had three corpora lutea, and all other ewes had either one or two recently formed corpora lutea. Thus differences in mean ovulation rate were largely due to differences in multiple ovulation. The similar incidence of multiple births at the previous (1969) lambing indicates that there were initially no inherent differences in fecundity between the three groups of ewes.

TABLE 1.

<table>
<thead>
<tr>
<th>Treatment group</th>
<th>H</th>
<th>M</th>
<th>L</th>
<th>Significance</th>
</tr>
</thead>
<tbody>
<tr>
<td>No. of ewes</td>
<td>41</td>
<td>42</td>
<td>39</td>
<td></td>
</tr>
<tr>
<td>Live wt. at laparotomy (kg)</td>
<td>57.4</td>
<td>54.6</td>
<td>55.9</td>
<td>N.S.</td>
</tr>
<tr>
<td>Mean ovulation rate</td>
<td>1.61</td>
<td>1.57</td>
<td>1.28</td>
<td></td>
</tr>
<tr>
<td>Multiple ovulations (%)</td>
<td>59</td>
<td>55</td>
<td>28</td>
<td>( p &lt; 0.01 )</td>
</tr>
<tr>
<td>Multiple births at previous lambing (%)</td>
<td>23</td>
<td>32</td>
<td>32</td>
<td>N.S.</td>
</tr>
</tbody>
</table>

\[ \chi^2 = 0.12, \text{ d.f. = 1, N.S.}; \chi^2 = 8.59, \text{ d.f. = 1, } p < 0.01 \]
IV. DISCUSSION

The incidence of oestrus was significantly depressed by a low level of nutrition in only one month, during the period immediately after the end of restricted nutrition while ewe liveweights were still at a low level. This was probably a consequence of suppressed ovulation or ovulation without oestrus, both of which may be directly associated with a submaintenance diet or emaciated body condition (Hafez 1952). Previous nutritional treatment had no effect on the incidence of oestrus after ewe live weights had returned to similar levels.

A low level of nutrition between Mar. and Sept. influenced ovulation rate in the following Feb., even though the effect of restricted nutrition, as measured by ewe live weight, was no longer apparent. The similarity in ovulation rate between M and H ewes shows that there was no uniformly graded effect of different levels of previous nutrition on subsequent ovulation. Rather, it seems that there was a threshold level of previous nutrition below which subsequent ovulation was adversely affected, and above which there was no effect. The degree of undernutrition imposed on L ewes in this experiment
was severe. Mean live weight fell to a minimum of 44 kg, only about 2 kg above the mean live weight at which mortality from emaciation begins to rise rapidly in this strain of Merino ewe (Fletcher 1971).

Several points need further investigation. Differences in nutrition in this experiment were imposed for a period of 7 months, and it is open to question whether shorter periods of nutritional stress would have had a similar effect. Further, it is not known whether the effect of restricted nutrition was temporary or permanent, or whether younger ewes than those used here would have been affected similarly. Obviously, such an effect would be of considerable economic importance if a period of nutritional stress early in the productive life of ewes depressed the incidence of multiple ovulation throughout subsequent years.

It is concluded that a period of severe nutritional stress during winter and spring may adversely affect ovulation rate in the following summer, but further investigation is needed to determine whether this is an important consideration in commercial sheep production.

V. ACKNOWLEDGEMENTS

Thanks are due to the late Mr. R. Hutchinson for general care of the sheep, to Mr. I.N. Cutten for assistance in recording ovulation, and to Drs. D.E. Taplin and J.R. Gallagher for criticism of the manuscript. Financial support from the Wool Research Trust Fund is gratefully acknowledged.

VI. REFERENCES