SELECTION AS AN AID TO IMPROVING SURVIVAL OF MERINO LAMBS

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SUMMARY

Comparison of lamb mortality to weaning in Merino flocks selectively line-bred from maternal ancestors with high or low lifetime rearing ability indicated significantly lower mortality of both singles and twins in the High flock. The differences in mortality arose mainly from higher mortality in the Low flock during, and within two days of birth. It was concluded that rearing ability was heritable and that selection for rearing ability offers excellent prospects for reducing perinatal lamb mortality.

INTRODUCTION

A major causative maternal or fetal role in lamb mortality has been indicated by the repeatable (Haughey and George 1982) and heritable (Atkins 1980; Donnelly 1982; Piper et al. 1982) nature of rearing ability in Merinos. This report presents preliminary results from a selective breeding experiment comparing the survival to weaning of Merino lambs born of ewes descended from maternal ancestors with high or low lifetime rearing ability.

MATERIALS AND METHODS

In 1975 two female lines were established from medium Peppin Merino ewes whose rearing ability to lamb-marking over four lambings was known. A High Efficiency (HE) flock was established from foundation ewes which had reared at least one lamb on three or all occasions. A Low Efficiency (LE) flock was established from foundation ewes which had failed to rear their progeny on two, three or all occasions. Between 1975 and 1979 the flocks were proliferated by natural mating and embryo transfer. In 1975 and 1976 both flocks were mated to rams born of ewes of unknown rearing ability, purchased from the original flock-owner. Since 1977 there has been selective breeding on both maternal and paternal sides as the rams used were selected from within the respective flocks. Rams were usually used for one season only. All surviving female progeny have been retained.

Both ewe flocks grazed together except during mating and lambing, detailed records of which were kept throughout. Prior to 1980 the flocks lambed under 24 h surveillance and suspected dystocias were assisted early in parturition to maximise survival of lambs. Since 1980 there have been sufficient ewes of breeding age (F1, F2 and F3 generations) to allow an early assessment of the response to selection. Obstetrical assistance was given only to ewes unable to deliver dead fetuses. Severe drought necessitated total feeding with oat grain and hay for most of the period, 1980-1982 inclusive.

Mortality rate, birth to weaning, was calculated as the total number of deaths expressed as a percentage of lambs born dead or alive. Age-specific mortality rate was calculated as the number of deaths occurring during the period, expressed as a percentage of lambs alive at the beginning of the period. Statistical significance of the differences in mortality were examined by the Chi-square test.

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TABLE 1  Lamb mortality between birth and weaning, 1980-1982 inclusive, relative to the total number born, type of birth and lifetime rearing ability of maternal ancestors

<table>
<thead>
<tr>
<th></th>
<th>Single births</th>
<th>Twin births</th>
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</thead>
<tbody>
<tr>
<td></td>
<td>HE*</td>
<td>LE†</td>
</tr>
<tr>
<td>Total lambs born</td>
<td>298</td>
<td>230</td>
</tr>
<tr>
<td>Total deaths to weaning</td>
<td>58</td>
<td>74</td>
</tr>
<tr>
<td>Mean mortality rate (%)</td>
<td>19.5</td>
<td>32.2</td>
</tr>
<tr>
<td>Significance of difference, p &lt;</td>
<td>0.001</td>
<td>0.01</td>
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<tr>
<td>Range of mortality between years (%)</td>
<td>12.1-27.8</td>
<td>31.4-32.9</td>
</tr>
</tbody>
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* - HE flock; † - LE flock

RESULTS

Lamb Mortality, Birth to Weaning

Mean weaning age ranged from 71.5 ± 7.41 days to 82.8 ± 9.92 days. Mean mortality rate, 1980 to 1982 inclusive, of both single and twin lambs in the LE flock was higher than in the HE flock (Table 1). There were between-year within-flock differences in the mortality of HE single lambs (p<0.025), HE twins (p<0.001) and LE twins (p<0.001). In contrast, mortality of LE singles remained remarkably constant.

Age-Specific Mortality Rate

Fewer single lambs died in the HE flock during and within a few hours of birth (p<0.01), and less twins died both during birth and shortly thereafter (p<0.05), and between a few hours of birth and two days of age (p<0.025) compared to the LE flock (Figure 1). At all ages, except 3-7 days and 8 days to lamb-marking, mortality of both singles and twins tended to be higher in the LE flock. The relatively high mortality in both flocks between eight days and lamb-marking included lambs which disappeared from the paddock between birth and marking, and whose age at death could not be specified. Their disappearance was due to the predatory and scavenging activity of foxes. As 85.7% of the carcases of total deaths occurring between birth and weaning were retrieved within seven days of birth, it is likely that most of the unaccounted-for lambs died between delivery and seven days of age.

DISCUSSION

The increasing severity of the three-year drought undoubtedly contributed to the wide between-year, within-flock variation in mortality. Mean mortality rate was significantly higher in the LE flock during, and within two days of birth. The viability of LE lambs may have been lower overall as their age-specific mortality was higher in most periods. The phenomenon can only be explained by genetically determined differences in the "fitness" of the respective mother-offspring units for survival, notably in the perinatal period, as the flocks were similar in all respects except the rearing ability of their maternal ancestors. These results confirm experimentally recent reports of the heritable nature of rearing ability of Merinos (Atkins 1980; Donnelly 1982; Piper et al. (1982).
Maternal and fetal factors likely to be implicated in perinatal mortality include: feto-pelvic disproportion due to small maternal pelvic size, fetal oversize, or both, leading to birth injury to the fetal central nervous system, stillbirth, and neonatal death (Haughey and George 1982; Haughey 1973, 1982); aberrant maternal or neonatal behaviour (Stevens et al. 1982); heritable low tolerance of the neonates of some breeds to cold (Slee 1981); inadequate milk supply, and teat and udder abnormalities (Moule 1954). At least some of these defects are heritable (Slee 1981; G. Alexander, pers. comm.). In this experiment perinatal death was often associated with a heritable post-maturity and fetal oversize (K. G. Haughey, unpublished data).

Despite attempts to improve fertility, fecundity and lamb survival of New South Wales flocks, lamb-marking percentage increased only marginally from 67% to 76% between 1951 and 1981 (M. Wood, Australian Bureau of Statistics, pers. comm.), a situation giving little cause for satisfaction. The rise was also probably associated with extensive pasture improvement and a major shift in breed structure away from the Merino to the more fecund Border Leicester X Merino ewe. Between 1955 and 1981 the proportion of New South Wales ewes joined to Merino rams fell from 78% to 51%. High perinatal mortality places severe constraints on our ability to improve reproductive rate as, on average, 22% of pregnant ewes in New South Wales lose their lambs prior to lamb-marking (Luff 1980), mainly during and within a few days of birth (Moule 1954; Alexander et al. 1955).
Recent indications that rearing ability in Merinos is repeatable and heritable, and that performance at first lambing is a useful index of subsequent rearing performance (Haughey and George 1982) suggest that selective breeding offers excellent prospects for alleviating the intractable problem of perinatal lamb mortality.

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REFERENCES