THE RELATIONSHIP OF EARLY LAMB GROWTH WITH EWE AGE AND MILK PRODUCTION

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SUMMARY
This experiment examined the preweaning growth of 184 lambs from 119 first cross ewes that were 1, 2 or 3 years old at Cowra in 2000 and 2001. The ewes were sired by 3 link rams (a Border Leicester, Coopworth and Finnsheep) from the Maternal Central Progeny Test. Lamb growth rate in Period 1 (birth to 4 weeks) was significantly slower (P<0.001) from 1 year old than 2 and 3 year old ewes (290 vs 321g/d). Single born/raised lambs from all ewe age groups had higher growth rates than multiple born lambs (regardless of being raised as single or multiple) and lambs with higher birth weight had higher growth rate (regression, 31.9 ± 4.6 g/d/kg). There were significant interactions of ewe milk yield at 3-4 weeks with ewe sire and season. Lambs from Border Leicester and Coopworth sired ewes had increased growth rate with increased ewe milk yield, while lambs from Finnsheep sired ewes had decreased growth rates with increasing milk yield. Lamb growth rate in period 2 (4 weeks to weaning) was not affected by ewe age or ewe milk production in late lactation. There was also no effect of ewe age on milk yield in late lactation. There was a significant increase in lamb growth rate in Period 2 with increasing ewe weight in mid pregnancy (1.4 ± 0.5 g/d/kg).

Keywords: lamb growth, ewe age, milk yield, milk composition

INTRODUCTION
Growth rate of lambs from maiden ewes are often lower than those from adult ewes. Higher birth weight of lambs and higher milk production from adult ewes are inferred as the cause of this age of ewe effect. In dairy ewes lactation yield increases with ewe age (Treacher 1978), although the effects of parity on milk composition are more complex (Bencini and Pulina 1997). Reports of the effect of age on milk yield and composition in non-dairy ewes have been equivocal. This experiment examined the effect of age of ewe on preweaning lamb growth and the relationship with milk yield and composition among crossbred ewes of the same genotype ranging in age from 1 to 3 years old.

MATERIALS AND METHOD
The 119 crossbred ewes were progeny of Merino ewes and 3 sires (Border Leicester, Coopworth and Finnsheep) that were links in the Maternal Central Progeny Test (MCPT, Fogarty et al. 2001). The ewes were born in July/August of 1997 (n=39), 1998 (n=42) and 1999 (n=38) at the Agricultural Research and Advisory Station Cowra. The ewes were joined to Poll Dorset rams in autumn 2000 to lamb in late winter or joined in spring 2000 to lamb in autumn 2001 for their first, second or third parity. Ewe milk production and composition was measured at approximately 3, 4, and 12 weeks of lactation using the 4-hour milk test (McCance 1959). The ewes and their lambs grazed sub-clover/grass pastures (including phalaris, cocksfoot and barley grass), with a pasture availability of
1500-1800kg DM/ha for ewes lambing in July/August 2000. Ewes lambing in March/April 2001 had less pasture available and were supplemented (wheat/oats/lupins mix, 40:30:30, 1.6 kg/d). Lambs were weighed at birth and on the milking days.

**Statistical analysis.** Lamb growth rate was analysed over 2 periods, from birth to approximately 4 weeks (average of weights at 3 and 4 week milking, Period 1) and from 4 to 12 weeks (Period 2). The linear mixed model using ASReml (Gilmour et al. 2002) included fixed effects for type of birth/rearing, year, season and all the 2 and 3 way interactions. Covariates were fitted for milk yield and composition (fat, protein, lactose) for periods 1 and 2, ewe mid pregnancy weight, ewe weight change (ewe weight at lamb weaning minus mid-pregnancy weight), and lamb birth weight. Ewe was fitted as a random term. The analysis included 184 lambs with one deleted due to its extremely low growth rates to weeks 3 and 4 and its death before weaning. Ewe milk yield and composition for Period 1 were the average of measurements at weeks 3 and 4, while those at week 12 were used for Period 2.

Milk yield and composition data for each ewe from each milking day was analysed by fitting a linear mixed model that included the fixed effects of sire, ewe age, season, type of birth/rearing, days of lactation and all the 2 and 3 way interactions. Ewe weight change (ewe weight at lamb weaning minus mid pregnancy weight) and ewe mid pregnancy weight were included along with the random terms of ewe, the interaction of ewe with days of lactation and spline (days of lactation). The number of lambs born the previous year and the number of previous lactations were also included in the model along with their interactions with the main effects. Milk yield data required transformation (log, (yield +0.07)) for analysis but no transformation was required for milk composition data.

**RESULTS**

For lamb growth rate in Period 1, type of birth/rearing, sire, ewe age and the covariate of birth weight were all highly significant (P<0.001). Lambs from 1 year old ewes had significantly lower growth rates than lambs from 2 and 3 year old ewes (290 ± 321 g/d, Figure 1). Single born/raised lambs grew significantly faster than multiple born/single raised lambs which grew significantly faster than multiple born/raised lambs (353 ± 271 g/d, Figure 2). Lamb growth rate increased significantly with lamb birth weight (regression = 31.9 ± 4.6 g/d/kg). There were significant interactions of ewe milk production in Period 1 with sire and season. Lamb growth rate increased with increasing milk yield from ewes by Border Leicester and Coopworth sires (14.5 ± 6.3 and 9.3 ± 5.2 g/d/kg milk respectively), while lamb growth rate declined with increasing milk yield from ewes by Finnsheep sired ewes (-15.7 ± 6.9 g/d/kg milk). Lamb growth rate increased with increasing milk yield from ewes joined in the spring (11.6 ± 4.9 g/d/kg milk), whilst there was a tendency for growth rate to decline from ewes joined in the autumn (-6.2 ± 5.3 g/d/kg milk).

In Period 2 there was no effect of ewe age on lamb growth, although there was a significant interaction of ewe age with season (P<0.01), due to lower lamb growth from 3 year old spring joined ewes. The effect of sire of the ewe was highly significant (P<0.001), with lamb growth rate in Period 2 being higher from the Border Leicester than the Coopworth and the Finnsheep sired ewes (276 ± 8, 263 ± 8 and 250 ± 8 g/d respectively). The effect of type of birth/rearing was significant (P<0.01), with single raised lambs (including multiple born) having faster growth rates than multiple raised...
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lambs (275 ± 10 vs 248 ± 10 g/d). Lamb growth rate in Period 2 significantly increased (P<0.01) with mid pregnancy weight of the ewe (1.4 ± 0.5 g/d/kg).

![Graph 1](image1.png)  ![Graph 2](image2.png)

**Figure 1.** Predicted lamb growth rate in Period 1 for the 3 age groups of ewes (se=9.3, lsd=18.5).

**Figure 2.** Predicted lamb growth rate in Period 1 for the effect of type of birth/rearing (se=11.5, lsd=22.7).

Ewe milk yield was significantly (P<0.001) affected by days of lactation, sire and type of birth/rearing and the interaction of sire with days of lactation. Ewes by the Border Leicester sire produced significantly more milk than the ewes by the Coopworth and Finnsheep sires at 90 days of lactation and for the total lactation yield as well as had greater persistence of lactation, although the differences in milk yield were not significant at 21 days (Table 1). Ewes with multiple born/raised lambs produced significantly (P<0.01) more milk than ewes with single born/raised or multiple born/single raised lambs. The effects of season and ewe age were not significant and there was no evidence of any effect of the number of lambs born at the previous lambing. The random ewe effects were not significant. Ewe weight change had a significant (P<0.001) effect on ewe milk yield with yield at 21 days decreasing as ewe weight increased from mid pregnancy to lamb weaning (regression -21 g/d/kg). Ewe age was significant for fat % (P<0.05), with milk from 1 year old ewes having higher fat % than older ewes (10.5 vs 9.8 %). Ewe age was also significant for milk protein % and lactose % (P<0.001), with significant interactions with days of lactation. Protein % at 21 days of lactation increased with ewe age from 3.60 ± 0.06 % for 1 to 4.13 ± 0.06 % for 3 year old ewes. Lactose % at 21 days of lactation decreased from 6.17 ± 0.03 % for 1 to 5.88 ± 0.06 % for 3 year old ewes. There was little effect of ewe age for protein or lactose % at 90 days of lactation. Days of lactation, sire and season were significant (P<0.01) for protein % and lactose % but had no effect on fat %. Type of birth/rearing had a significant effect on lactose % (P<0.05).

**DISCUSSION**

Growth rate of lambs from the 1 year old ewes was about 10% lower than for lambs from the 2 and 3 year old ewes during their first 4 weeks (Period 1), although there was little effect of ewe age on lamb growth rate from 4 weeks to weaning at 12 weeks (Period 2). Lamb growth rate during Period 1
Table 1. Predicted means (± se) for daily milk yield at 21 and 90 days, total lactation yield and persistence of lactation for ewes by 3 sires and number of lambs born and raised

<table>
<thead>
<tr>
<th>Ewe sire</th>
<th>Yield 21 d (kg/d)</th>
<th>Yield 90 d (kg/d)</th>
<th>Total yield (kg)</th>
<th>Persistence^A (days)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Finnsheep</td>
<td>2.04 ± 0.15</td>
<td>0.49 ± 0.05</td>
<td>123 ± 5</td>
<td>80 ± 4</td>
</tr>
<tr>
<td>Coopworth</td>
<td>2.06 ± 0.14</td>
<td>0.78 ± 0.07</td>
<td>137 ± 5</td>
<td>107 ± 11</td>
</tr>
<tr>
<td>Border Leicester</td>
<td>2.40 ± 0.16</td>
<td>0.97 ± 0.08</td>
<td>158 ± 6</td>
<td>122 ± 10</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Lambs born/raised</th>
<th>Yield 21 d (kg/d)</th>
<th>Yield 90 d (kg/d)</th>
<th>Total yield (kg)</th>
<th>Persistence^A (days)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Single born/single raised</td>
<td>1.9 ± 0.11</td>
<td>0.63 ± 0.04</td>
<td>124 ± 4</td>
<td>92 ± 4</td>
</tr>
<tr>
<td>Multiple born/single raised</td>
<td>2.08 ± 0.16</td>
<td>0.69 ± 0.06</td>
<td>135 ± 7</td>
<td>98 ± 6</td>
</tr>
<tr>
<td>Multiple born/multiple raised</td>
<td>2.44 ±0.12</td>
<td>0.81 ± 0.05</td>
<td>159 ± 5</td>
<td>109 ± 4</td>
</tr>
</tbody>
</table>

^A Days for milk yield to decline to 600 g/d

increased with increasing ewe milk yield for the spring joined ewes that had limited pasture and were supplemented with grain during lactation. There was little effect of ewe milk yield on lamb growth for the autumn joined ewes. There was an increase in lamb growth rate with ewe milk yield from the Border Leicester and Coopworth sired ewes in contrast to the Finnsheep sired ewes. Lambs with higher birth weight had significantly higher growth rate during Period 1. During Period 2 there was no effect on lamb growth rate of ewe age or milk production in late lactation. Lamb growth rate during this period was greater from heavier ewes in mid pregnancy. There was no significant effect of ewe age on milk production. The sire, lamb birth/rearing and ewe weight change effects found here are consistent with the results from a larger study of 1 year old ewes (Morgan 2004). Overall the results suggest that ewe milk production in early lactation may affect early lamb growth, although other factors also contribute to the slower lamb growth from 1 year old ewes. Differences in milk production of ewes in late lactation appear to have little effect on lamb growth as presumably lambs compensate by varying pasture intake. No effects of ewe age on milk yield were found, although there were some effects on milk composition.

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REFERENCES