STRATEGIC FEEDING OF MERINO EWES IN LATE PREGNANCY TO INCREASE COLOSTRUM PRODUCTION

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SUMMARY

The production of colostrum in 3 1 Merino ewes was estimated immediately after parturition. The ewes varied from 2 to 6 years of age. They were of 2 genotypes (Australian Merino Society and Meridale) and all produced single lambs. Ewes were allocated to a supplemented group (1 kg/ewe.day lupins and lush pasture) or unsupplemented group (lush pasture) in the final week of gestation. The supplementation significantly increased the amount of colostrum produced before birth to nearly twice that of the unsupplemented ewes. No significant differences were found between the genotypes or between the ages of the ewes in the volume of colostrum produced before the birth, although colostrum production tended to increase with increasing age of the ewe. The birth weights of the lambs were not influenced by the short-term feeding of their mothers in late gestation.

High costs of supplements and increased chances of birth difficulties preclude their long-term use for pregnant ewes, but short-term supplementation such as we have described here has great potential as a valuable tool for the reduction of lamb mortalities by ensuring that adequate volumes of energy and immunoglobulins are available to the lamb after birth.

Keywords: Merino ewes, colostrum production, nutrition, late pregnancy

INTRODUCTION

Ten to 25 per cent of all lambs born in Australia die before weaning age (Watson 1972; Alexander 1984) and this is arguably the largest single source of inefficiency in sheep production. The survival of Merino lambs depends upon the successful interaction of the ewe and lamb soon after birth (Poindron *et al.* 1984) and the rapid intake of energy and immunoglobulins via the colostrum. Insufficient colostrum can affect the chances of survival of the lamb, since it is the major source of energy after birth and the only source of immunoglobulins and water. This is especially the case where the proportion of multiple births is high (McCance and Alexander 1959), or the weather is inclement (Mellor and Murray 1985). Production of colostrum in Scottish Blackface ewes has been shown to be sensitive to the nutrition of the animals near parturition (Mellor and Murray 1985) and the onset of lactation in Merinos is delayed by poor nutrition (McCance and Alexander 1959; McNeil1 *et al.* 1988). Strategies that increase the volume of colostrum available for the lamb after birth and increase the subsequent production of milk therefore have the potential to improve lamb survival. This study was designed to test the hypothesis that short term supplementation of Merino ewes with lupin grain in late pregnancy can improve colostrum production and potentially improve lamb survival.

MATERIALS AND METHODS

This experiment was conducted during June, 1988 at The University of Western Australia's research farm in Wundowie, (latitude 31° 53' south and longitude 116° 29' east). Thirty one single-bearing Merino ewes that had been joined over 5 days to Merino rams were selected at 50 days post fertilization by scanning with real time ultrasound (Toshiba SAL 32B) and an external linear array probe (508mHz). The selected ewes were then kept together at pasture until allocated to treatments 7 days before parturition. The flock included ewes of 4 age groups (2, 3, 4 and 6 years). Twenty three of the ewes were of the Australian Merino Society genotype (AMS) and 8 were Meridales (AMS with a variable infusion of British breeds). The 2 treatment groups were; (1) unsupplemented - maintained on lush grass and subterranean clover pasture (n=17) and (2) supplemented - maintained on a similar lush pasture with lupin grain (*Lupinus angustifolius)* provided at a rate of 1 kg/ewe.day in the last 7 days of gestation (n=14). All of the ewes lambed over 7 days. The ewes were penned at the first signs of imminent parturition and the left side of the udder was hand milked following the injection of 5 IU of oxytocin intravenously ("Syntocin™" Herriot) within 10 minutes of the lamb being expelled. The right side of the udder was left undisturbed for the lamb, so as not to jeopardise its chances of survival. The total colostrum accumulated in the udder before birth was estimated as twice the amount obtained from the left side of the udder. Iambs were weighed and tagged 6 hours after birth and all ewes with lambs were then drifted to a larger paddock. Data for survival of lambs were not recorded since they were likely to have been biased by the fact that the ewes and lambs were penned together, disturbed after birth and the lambs were denied some of the colostrum during measurements. The ewes from this experiment were subsequently used by Bencini and Purvis (1990) to determine the production and the composition of milk during their entire lactation of 13 weeks.

Data were analysed by Least Squares Means analysis of variance.

RESULTS

Ewes fed the supplement of lupins in the last 7 days of gestation produced nearly twice the volume of colostrum by parturition as the unsupplemented ewes (Table 1). However, the birth weights of these single-born lambs were not influenced by the supplementation of their mothers.

Table 1. The volume of colostrum (mL ± SE) collected from the udder at parturition and the birth weights (kg ± SE) of lambs in groups supplemented or unsupplemented with lupins

Treatment group	Number of ewes	Colostrum produced	Lamb birthweight
Unsupplemented	17	283 ± 65.5[a]	4.9 ± 0.19[a]
Supplemented	14	502 ± 70.6[b]	4.9 ± 0.18Aa

Values in the same column with different superscripts are significantly different ($P < 0.02$).

The volume of colostrum tended to increase linearly with the age of the ewe (Table 2), with the 6 year old ewes producing some 79% more than the 2 year old ewes. The genotype of the ewes did not influence the volume of colostrum accumulated before parturition.

Table 2. Effects of age (year) and genotype of ewe on the volume of colostrum (mL ± SE) collected at parturition

	Number of ewes	Colostrum produced[A]
Age of ewe		
2	6	267 ± 90.9
3	5	380 ± 110.7
4	7	447 ± 96.9
6	13	477 ± 63.0
Genotype		
AMS	23	347 ± 48.7
Meridale	8	439 ± 91.8

[A] No significant differences ($P < 0.05$).

DISCUSSION

The results show that supplementation of Merino ewes with lupins in the last 7 days of gestation can markedly increase the volume of colostrum produced before birth. This supports the hypothesis that short-term, strategic feeding with high quality grain can affect the potential of ewes to feed their lambs immediately after birth. It is important to emphasise that these ewes were consuming lush pasture at the time of parturition and the fact that their lambs weighed nearly 5 kg at birth indicates that they had been well fed throughout pregnancy. Hence access to high quality pasture was not enough to satisfy the potential for synthesis of colostrum by the ewe. In a similar study, but with Scottish Blackface ewes undernourished during pregnancy, Mellor and Murray (1985) also showed that increasing the feed to a high plane of nutrition in the last 5-10 days of gestation increased the volume of colostrum produced prior to birth plus that secreted from birth to 18 hours post-pat-turn. Most of the increase was confined to the accumulation of colostrum before birth, as in our study.

It is estimated that the lamb requires 180-210 mL colostrum per kilogram of liveweight in the first 18 hours of life in order to obtain sufficient nutrients for the maintenance and development of body tissues and heat production (Shubber *et al.* 1979; Mellor and Murray 1986). According to the requirement values cited, McNeil1 *et* al. (1988, and unpublished data), estimated that more than one third of Merino ewes did not have sufficient colostrum for their lambs after birth even though their ewes, like ours, were grazing lush pasture. Colostrum accumulated at a mean rate of 380 mL, prior to and up to 1 hour after birth. Secretion rates were 78 mL/hour in the interval from 1 to 6 hours after birth. These values extrapolate to a mean production of available colostrum in the order of 300 mL/kg of lamb birth weight for the first 18 hours after birth. The supplemented ewes in our study produced more colostrum than those of McNeil1 *et al.* (1988) and few of their lambs would have been at risk due to inadequate colostrum. However, the unsupplemented ewes had similar amounts of colostrum, or less, than those of McNeil1 *et al.* (1988) and therefore many of their lambs would not have had sufficient available for their needs. These experiments emphasise that lush pasture alone may not be sufficient to meet the high demand for nutrients to produce sufficient colostrum and early milk. Poor pasture is likely to be even more inadequate. Supplementation to provide more energy and protein using lupins (this study, with Merinos) or protected sunflower-seed meal (Hall *et al.* 1992a, Border Leicester x Merino crossbreds) for short periods can significantly improve the production of colostrum to adequate levels.

It was not possible to demonstrate that a greater volume of colostrum was associated with improved lamb survival in the present study, as the ewe/lamb bonding process was disturbed by the penning and milking of the ewes at parturition. However, the likelihood that this prevails was recently strengthened by the findings of Hall *et al.* (1992b). They found that for pasture-fed ewes a lupin grain supplement (400 g/ewe.day) fed for 9 days prior to parturition led to a 12% improvement in the proportion of lambs weaned, while in a follow-up study, 17 days of pre-parturition supplementation with lupin grain improved the survival rate of twin-born lambs by about 40%.

Production of immunoglobulin in the colostrum is closely correlated with the volume of colostrum produced; the greater the volume, the greater the amount of immunoglobulins available for the lamb (Shubber *et al.* 1979). By increasing the volume of colostrum available to the lamb after birth, both its available energy and its chances of resisting disease might be expected to be enhanced. Maximum colostrum intakes by lambs have been recorded as high as 267 mL/kg every 2 hours when fed to appetite (Mellor and Murray 1986).

Our supplemented ewes, when milked weekly after parturition up to 13 weeks (Bencini and Purvis 1990), produced about 20% (0.25 L/day) more milk than the unsupplemented ewes even though all of the ewes were subsequently kept together as 1 flock. Management that increased colostrum production in this case also increased the milk produced throughout the lactation and available for consumption by the lamb. Lamb growth rates were not recorded in this study, but the lambs belonging to ewes supplemented in late gestation could have been expected to have higher growth rates than the lambs from unsupplemented ewes.

Older ewes produced more colostrum than younger ewes but this is not surprising. Epstein (1985), for example, showed that the production of milk in Awassi sheep was significantly related to the age of the ewe. This indicates that short-term supplements may be more important for younger ewes than for older ones.

The genotype of the ewes did not influence the volume of colostrum produced before parturition. This result was a little surprising because the Meridale genotype was developed by crossbreeding the Australian Merino Society ewe to a number of British breeds to produce a sheep with better maternal qualities.

Long-term feed supplementation of pregnant ewes is considered to be uneconomic in this country and can lead to the production of large lambs that are more likely to cause birth difficulties and dystocia. By contrast, short-term supplementation of ewes with high protein lupin grain in late gestation may be an economical method of better equipping the ewe to improve the survival of her lambs.

ACKNOWLEDGEMENTS

This work was funded by the Australian Livestock and Meat Research Development Corporation.

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