Can lambs compensate for less milk by grazing more often?

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Abstract

Lamb behaviour was investigated where varying stocking rates and rearing rank indirectly induced differences in ewe milk production. 24 Romney x Poll Dorset ewes, with either twin or single lambs, were stocked at either 25 or 15 ewes per hectare, three weeks after lambing (2 August ± 1.0 days). Lamb activity (grazing, otherwise active, or inactive) was determined by instantaneous scan sampling at 3-min intervals over 4 hours at 3, 6, 9 and 12 weeks of age. Milk production, estimated by machine milking and lamb live weights were also measured at these ages, on the day prior to observations. Ewes with twin lambs produced slightly more milk than ewes with singles (213 vs. 183 ml per 4 hours, respectively). Ewes on the high stocking rate produced an average of 181 ml milk per 4 hours compared with 216 ml per 4 hours in the low stocking rate group. Twin lambs spent significantly more time grazing than did single lambs (52.3% vs. 41.0% overall, respectively) and lambs on the higher stocking rate spent on average 10% more time grazing, than those stocked less densely. These results suggest that lambs with access to less milk spend more time by grazing, but this does not adequately compensate for the lower milk supply which resulted in reduced lamb growth rates. This raises the possibility of enhancing lamb growth rates prior to weaning by providing high quality, lamb-specific forage to the lamb independently of the ewe.

Keywords: ewe milk production, grazing, lamb behaviour, lamb growth rate

Introduction

Milk is essential to the lamb during the early stages of life and milk intake and liveweight gains are highly correlated. However as the lamb grows, the necessity for milk decreases and this is reflected in the increase of herbage intake by the lamb (Wallace 1948; Treacher 1983). While high milk production is generally assumed to produce high lamb growth rates, in some circumstances the relationship between milk volume and lamb growth rate is unclear (Muir *et al.* 1998). Factors such as the time lambs spend grazing and the interaction between the ewe and lamb in the effort to obtain milk, may be particularly important. Thus lamb behaviour (grazing, playing etc) might reflect or be influenced by the dams milk availability.

The objective of this study was to document lamb behaviour where differences in milk availability were indirectly induced by varying the stocking rate and by comparing different litter sizes or rearing rank.

Materials and methods

The study used a subset of animals from a large experiment investigating the relative importance of milk and pasture to lamb growth during lactation under a high performance lamb production system (PD Muir, unpublished data). All ewes had been artificially inseminated. Three weeks after lambing (2 August ± 1ay), 24 Romney x Poll Dorset ewes, with either twin or single lambs, were set stocked in ryegrass/white clover dominant farmlets at either 25 or 15 ewes per hectare, with two replicates of each (twin and single rearing ewes were run together).

Lamb activity (grazing, active or inactive) was determined by instantaneous scan sampling at three minute intervals over two two-hour periods (a.m. and p.m.) at 3, 6, 9 and 12 weeks of age. Observations were undertaken from within a vehicle outside the paddock after a settling down period of at least 10 minutes after the observers had arrived in the vehicle. Identification of the lambs was assisted by the use of individual raddle markings and binoculars. Lamb live weights were recorded at birth, 3, 6, 9 and 12 weeks of age. Milk production was estimated at 3, 6, 9 and 12 weeks after lambing (on the day prior to observations) by machine milking after administration of oxcytocin to stimulate milk let down (McCance 1959; Corbett 1968). The ewes were then separated from their lambs for 4 hours and then milked again and this data was used as an estimate of milk production.

The proportion of time a lamb spent grazing or otherwise in each 2-hour observation period was calculated and this value used in the analyses. The data were examined in a 2x2 factorial design (high or low stocking rate and twin or single lambs) by analysis of variance. The results are expressed as means with standard errors.

Results

Lambs were observed grazing at all ages, increasing from 20% of observations at 3 weeks of age to more than 50% between 6 and 12 weeks of age (Table 1). There was a

corresponding decrease in inactive behaviour (lying down), with time spent active (e.g. suckling, standing, playing) remaining similar (6-10%) throughout the duration of the experiment. Stocking rate (Table 2) significantly affected time spent grazing (high 54.4 ± 2.1% and low 43.8 ± 2.3%, P<0.01) as did rearing rank (twin 53.0 ± 1.9 and single 41.3 ± 2.6%, P<0.001). The interaction between stocking rate and rearing rank was not significant.

The volume of milk obtained by machine milking ranged from 160 ml to 430 ml/ewe/4h at 3 weeks of age, decreasing to 20 to 180 ml at 12 weeks of age (Table 1). When milk production was combined for all periods (Table 2), mothers of twin lambs produced slightly, though not significantly, more milk than mothers of singles (212.8 ± 14.3 vs. 183.4 ± 9.4 ml/4 h; respectively). Ewes on the high stocking rate produced an average of 215.5 ± 13.2 ml/4 h, significantly (P<0.05) more than the 180.7 ± 10.2 ml/4 h the low stocking rate group produced. The interaction between stocking rate and rearing rank on milk production was not significant.

Over the period of the experiment, lambs growth rates averaged 145-395 g/day. Growth rates (Table 2) were significantly affected by stocking rate (high 208.2 ± 10.6 vs. low 267.1 ± 11.6 g/day; P<0.001) and rearing rank (twin 217.2 ± 8.8 vs. single 278.4 ± 16.0 g/day; P<0.001), but the interaction was not significant.

lambs could not, however, compensate fully and grew slower than those with access to more milk. These results concur with those of Joyce & Rattray (1970) and Penning & Gibb (1979), who demonstrated that herbage intake reflected the availability of milk, in experiments undertaken indoors or with artificially reared lambs.

In the present study, differences in milk availability were investigated indirectly by comparing rearing rank and stocking rate. For instance, though ewes with twin lambs produced more milk than those with singles, assuming both lambs had equal access then each twin could only receive 60% of the milk to which single lambs had access. Similarly, lambs on the higher stocking rate had access to only 80% of the milk available to lambs on the lower stocking rate. Though the design of this experiment has induced differences in milk availability, it is noted that the apparent effects on lamb growth rates are probably also due to a direct effect of stocking rate. Thus lambs had to compete against each other and their dams, especially at the higher stocking rate. It would be interesting to consider how lamb behaviour and growth rates vary with differences in milk availability, but without the confounding effects of competition for forage. This is now being investigated by modifying lamb nutrition independently of the ewe, for example by using a creep feeding system (Hyslop & Moffat, 2001). It raises the possibility of providing high quality, lamb-specific forage

Table 1 Mean (± SEM) time spent on various behavioural activities, lamb liveweights, and ewe milk production, from 3 to 12 weeks after birth.

Age (weeks)	Lamb live weight (kg)	Time on various lamb behavioural activities (%)			Ewe milk production (ml/4 h)
		Grazing	Active	Inactive	
3	11.0 ± 0.5	20.1 ± 1.8	6.1 ± 0.6	72.7 ± 2.1	284.8 ± 14.4
6	15.7 ± 0.6	54.8 ± 2.	7.8 ± 0.8	37.2 ± 2.4	235.6 ± 13.0
9	21.2 ± 0.7	63.0 ± 2.4	8.6 ± 0.8	28.3 ± 2.3	167.3 ± 11.0
12	25.0 ± 0.9	58.4 ± 2.9	6.3 ± 0.7	35.0 ± 2.9	118.0 ± 8.8

Table 2 The effects of stocking rate and rearing rank on mean (± SEM) lamb grazing behaviour, ewe milk production and lamb growth rate.

Stocking rate		Rearing rank	
		Twin	Single
High	Grazing (%)	59.0 ± 2.5	45.3 ± 3.7
	Milk production (ml/4h)	185.6 ± 13.5	175.8 ± 16.2
	Lamb growth (g/day)	164.8 ± 5.6	242.7 ± 22.5
Low	Grazing (%)	47.0 ± 2.8	37.3 ± 3.6
	Milk production (ml/4h)	248.0 ± 23.0	189.5 ± 12.4
	Lamb growth (g/day)	232.7 ± 10.2	278.9 ± 17.5

Discussion

This study has clearly demonstrated that lambs with reduced milk availability alter their behaviour. When stocking rate was increased and when the lambs were twins, they spent more time grazing than those with access to more milk. Though they altered their behaviour, these to promote lamb growth independently of the ewe, prior to weaning which would benefit lamb growth especially when milk availability is limiting.

The way animals behave reflects the complex of innate and environmental conditions. In this study, we have merely grouped their behaviour as being either grazing,

active or inactive, categories that probably do not do justice to more subtle changes in behaviour. It would be interesting to monitor such behaviour in greater detail. For instance, do lambs with access to *ad libitum* milk play more or even differently, to those with access to less milk? Conversely, do hungry lambs begin grazing at an earlier age, or alter their patterns of grazing behaviour, and do they select different forage species? Other factors, such as maternal behaviour and learning activities from flockmates, might also be important.

Conclusion

In this study, it was estimated that twin lambs and those lambs on the high stocking rate, had access to only 60-80% of the milk available to their singleton and low stocking rate flockmates. Although these lambs altered their behaviour, grazing on average 10% more than their flockmates, they were unable to fully make up for the reduced milk availability and their growth rates were only 80% of those with access to more milk. Reduced lamb growth rates are the penalty of increasing stocking rates and fecundity. In high performance sheep farming systems, it may therefore be beneficial to investigate providing lamb-specific forage so that the ability of the lamb to compensate for reduced milk can be fully captured.

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