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BRIEF COMMUNICATION: A comparison of aspects of the reproductive success of ewe lamb and mixed age ewes joined over the same period

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Introduction

Ewe lamb breeding at 7 to 8 months of age in extensive production systems, such as utilised in New Zealand, has a number of advantages including higher net profit from lamb production, improved utilisation of spring herbage, improved ewe lifetime performance and improved reproductive rate throughout the flock (Kenyon *et al.* 2012). However, in comparison to mature ewes there are limitations to ewe lamb breeding which include a lower lambing percentage, lower lamb birth weight and lower lamb survival (Annett & Carson 2006; Kenyon 2012).

Ewe lambs are usually joined one month later than mature ewes to provide the young ewe additional time to reach puberty (Kenyon *et al.* 2012). The onset of puberty involves an interaction of age, body weight and hours of day light (Foster *et al.* 1985). Therefore, the later breeding of ewe lambs allows the maximum proportion of ewes lambs to have reached puberty and thus potentially increase pregnancy and lambing rates. As a result of this, previous studies that have compared reproduction of ewe lambs and mature ewes have been undertaken during differing periods thereby confounding the results. In studies that have incorporated separate breeding periods it has been reported that ewe lambs have lower ovulation (Beck *et al.* 1996) and lower pregnancy rates (Annett & Carson 2006; Khan *et al.* 2007) and higher embryonic loss rates (Beck *et al.* 1996) compared to mature ewes.

The objective of the current study was to compare aspects of reproduction of mature ewes and ewe lambs when bred together to aid in identifying where potential is lost in breeding ewe lambs.

Materials and methods

As part of a larger study, to compare where reproductive losses occur between breeding and weaning, mature ewes and ewe lambs were bred to the same rams during the same breeding period (RA Corner, Unpublished data). In 2009, 400 Romney ewe lambs that were seven to eight months of age, and 399 Romney mature ewes that were 3 to 5 years of age, were bred as a single mob. For seventeen days prior to the start of the breeding period (P-17) eight vasectomised rams with mating harnesses were introduced at a ratio of 1:100 to identify ewes that were cycling prior to the introduction of the ram. On 1 May 2009 at the end of this pre-breeding period (P0)

vasectomised rams were removed and mating harness crayon marks on the rump of each ewe were recorded. At this time all ewes were weighed. The mean \pm standard error of the mean of the ewes was 66.7 ± 0.2 kg and of the ewe lambs was 46.1 ± 0.2 kg.

On day P1, 20 entire Romney rams, fitted with mating harnesses, were introduced at a ratio of 1:40. The breeding pattern was determined during a 34 day breeding period between days P1 and P34. Mating harness crayon colours were changed on day P17. Colour marks on the rump of each ewe were recorded on days P17 and P34. On day P81, pregnancy diagnosis was conducted by a commercial technician to identify the number of fetuses present in each ewe.

Observations of vasectomised ram harness marks, entire ram harness marks and pregnancy diagnosis results were analysed using the Genmod procedure (SAS 2011). Fixed effects included age of the ewe as either a lamb or mature ewe, and vasectomised ram harness marks.

Results and discussion

Pre-breeding pattern

Prior to the start of the breeding period, a greater percentage ($P < 0.05$) of mature ewes than ewe lambs were marked by the vasectomised rams at 92% and 3%, respectively. This suggests that very few ewe lambs had reached puberty prior to the breeding period. Within each ewe age class, the number of ewes identified as pregnant and the number of subsequent fetuses present, was not significantly different in the groups that were either marked or not marked by the vasectomised ram. The proportions of mature ewes that were pregnant and were either marked or not marked by the vasectomised rams were 100% and 98% respectively. In the case of the ewe lambs the proportions were 77% and 82% respectively. The numbers of fetuses identified to ewes that were or were not marked by the vasectomised rams were 1.97 and 1.87 fetuses/ewe bred for the mature ewes, and 1.09 and 0.96 fetuses/ewe bred for the ewe lambs, respectively. This finding is in agreement with previous work that has shown that the use of vasectomised rams can increase the proportion of ewe lambs marked in the first 17 days of the breeding period but does increase the proportion diagnosed as pregnant over the entire breeding period, or the number of fetuses that develop subsequently (Kenyon *et al.* 2012).

Table 1 The number and percentage (95% Confidence limits) of mature ewes and ewe lambs that were identified with ram mating harness crayon marks in each of the breeding periods between Day 1 to Day 17 (P1 to P17), between Day 18 to Day 34 (P18 to P34), or that had no mark.

Age class	First breeding period		Second breeding period		Both breeding periods			
	Number of ewes	P1 to P17 (%)	Number of ewes	P18 to P34 (%)	Number of ewes	Both P1 to P17 & P18 to P34 (%)	Number of ewes	No mark (%)
Mature ewe	382	95.7 (93.3–97.3) ^b	13	1.3 (0.5–3.0) ^b	8	2.1 (1.0–4.0) ^a	8	2.0 (1.0–4.0) ^a
Ewe lamb	174	43.5 (38.7–48.4) ^a	124	24.3 (20.3–28.7) ^a	27	6.8 (4.7–9.7) ^b	107	26.8 (22.6–31.3) ^b

^{ab}Means between columns within rows with differing superscripts are significantly different (P <0.05).

Table 2 The number and percentage (95% confidence limits) of mature ewes and ewe lambs that were identified as non-pregnant or bearing a single fetus or multiple fetuses at pregnancy diagnosis 81 days after ram introduction (P81).

Age class	Number of ewes	Non-pregnant (%)	Single-bearing (%)	Multiple-bearing (%)
Mature ewe	399	1.5 (-1.7–4.7) ^a	13.0 (8.8–17.2) ^a	83.9 (80.1–87.8) ^b
Ewe lamb	400	26.5 (23.3–29.7) ^b	50.3 (46.1–54.4) ^b	22.8 (18.9–26.6) ^a

Breeding pattern

During the first 17 days of the breeding period a greater (P <0.05) percentage of mature ewes, than ewe lambs were bred (Table 1). However, in the second 17 days between P17 and P34, a greater (P <0.05) percentage of ewe lambs were bred (Table 1). Mature ewes had higher (P <0.05) pregnancy rates of 98.5% versus 74.5%, respectively, and number of fetuses per ewe presented for breeding of 1.91 versus 1.02, respectively, than ewe lambs. This breeding pattern and reproductive performance is similar to that reported previously (Annett & Carson 2006; Kenyon et al. 2007).

Ewe preference

The breeding rate of ewes that were marked or not marked by the vasectomised ram did not differ significantly at 98.4% and 93.3% for the mature ewes and 64.6% and 73.5% for the ewe lambs. Of those marked by the vasectomised ram, a higher proportion (P <0.05) of mature ewes were bred compared to ewe lambs at 98.4 versus 64.6%. Keane (1976) observed that, when mated separately, mature ewes were mated approximately three times more frequently than ewe lambs and that rams showed a preference for mature ewes. However, ewe lambs also have a shorter duration of oestrus and less opportunity to be bred (Edey et al. 1978).

Returns to service

The percentage of ewes that were mated in both the first and second cycles of the breeding period (returns to service) were higher for ewe lambs than mature ewes at 24.3 versus 1.3%, respectively. While greater returns to service are considered an indicator of poor fertility, they can also be related to post-fertilisation losses of due to inferior ova quality or embryonic mortality (McMillan & McDonald 1983;

Quirke & Hanrahan 1983). Alternatively, Allison et al. (1975) reported that ewe lambs required multiple individual breeding events to ensure that they had semen deposited within their reproductive tracts, indicating poor breeding behaviour.

Conclusion

While the results of this study maybe unsurprising, this study appears to be the first in the New Zealand literature where mature ewes and ewe lambs have been bred together during the same time period and detailed reproductive data collected. The value of this study is that it indicates that the failure to be bred, high return rates and lower pregnancy rates are limiting factors in ewe lamb breeding even when ewe lamb live weights are in the recommended range and breeding does not occur until May. This should help direct further research.

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