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Reduced survival of lambs from maiden ewes exposed to mature ewes pre-lambing

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ABSTRACT

The suboptimal survival of new-born lambs is a major source of reproductive inefficiency, is often lower in maiden (first-lambing) compared with multiparous ewes, and this may be associated with poor maternal behaviour due to inexperience. This study examined whether the survival of lambs from maiden ewes could be increased by exposing maiden ewes to multiparous lambing ewes in the month before lambing. Pregnant maiden Merino ewes (n = 446) which had been mated at 18 months of age were allocated to three replicates of two treatments. During the month prior to the maidens lambing, control groups were grazed in paddocks each with 30 multiparous mature (5.5 and 6.5 years of age) Merino ewes which were due to lamb at the same time as the maiden ewes. The exposed treatment groups also grazed with 30 mature ewes, during which time the mature ewes lambed. All mature ewes and lambs were removed and the groups of maiden ewes grazed in separate 5.3 ha paddocks from 10 days before the maidens were due to lamb. The survival of lambs to marking age was lower (P = 0.035) from maidens exposed to mature lambing ewes (0.73) compared with those that grazed only with pregnant mature ewes (0.81). The number of lambs reared per ewe lambing was not lower (P = 0.274) from the exposed (0.92) compared with the control (0.98) ewes. This study showed that the survival of lambs from maiden ewes was reduced by exposing them to mature lambing ewes, and it is recommended to avoid grazing lambing mature ewes in the same paddock with maiden ewes in the month prior to the maiden lambing.

1. Introduction

Lamb survival is often 10% lower in maiden (first-lambing) ewes than in ewes which have previously lambed (Hall et al., 1995; Kleemann and Walker, 2005). The lower survival is associated with parity, rather than age (Alexander et al., 1993). Factors that contribute are a longer duration of parturition (Alexander et al., 1993), although this is not consistently reported (Dwyer and Lawrence, 2000), and ewe behaviours which can hinder suckling (Dwyer and Lawrence, 2000). Whilst many ewe behaviours are innate and driven by physiological changes around the time of lambing, the expression of maternal behaviour may be altered by environmental factors, including prior experience (Dwyer, 2014). This signifies opportunity for management to improve ewe behaviour and therefore lamb survival.

Maternal experience improves the behaviour of ewes towards their own lambs, with ewes which had previously raised lambs being better able to avoid separation from twin lambs (Alexander et al., 1984). Grooming behaviour does not appear to change with experience, but experience does lead to a reduction in aggression and rejection behaviours, including non-co-operation with suckling attempts (Dwyer and Lawrence, 2000). Dwyer and Lawrence (2000) suggest that fear of the lamb, as a novel creature, may contribute to these rejection behaviours. If novelty is an issue, the behaviour of maiden ewes may be improved if they were given the opportunity to become familiar with lambs and observe mature ewe behaviour, prior to their first lambing. However, there appear to be no published studies evaluating whether such familiarisation can improve lamb survival, nor the time, duration or number of lambing ewes/lambs which might be effective.

Previous studies have shown that the survival of lambs from maiden ewes is not increased where maidens lamb in the same paddock as mature lambing ewes, even when the mature ewes have largely completed lambing before the maidens commence (Robertson et al., 2016). However, it is possible that social dynamics or interference from the mature ewes (Alexander et al., 1993) contributed to the lack of improvement in lamb survival in that study. The aim of this study was to evaluate whether the survival of lambs from maiden ewes could be improved by exposing maiden ewes to mature lambing ewes in the

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month prior to their own lambing, followed by lambing maidens in separate paddocks.

2. Material and methods

2.1. Location and design

The study was conducted with the approval (project A15107) of the Charles Sturt University Animal Ethics committee during 2016. A commercial flock of ewes was used on a property (34°48′S; 147°26′E) 40 km north of Wagga Wagga, NSW.

The experiment comprised three replicates of two treatments: (1) maiden (not previously mated) ewes exposed pre-lambing to mature lambing ewes during the month before lambing (exposed), and (2) maiden ewes exposed pre-lambing to mature pregnant ewes only (control).

A randomised design was used during the period of exposure with replicates 1 and 2 blocked into four paddocks (5.3 ha each) which had been subdivided from a larger paddock. Within each of these replicates, a similar sized paddock which did not contain sheep was present between each treatment, to avoid the control ewes from being adjacent to a paddock containing lambing ewes. Replicate 3 treatments were grazed on similar pastures but not in one block (exposed 42 ha, non-exposed 25 ha), due to paddock availability and the need to keep the control ewes in a paddock not adjacent to lambing ewes. For the period during which the maiden ewes lambed, a randomised block design was used with all ewe groups lambing in 5.3 ha paddocks.

2.2. Management

Two flocks of Merino ewes were used. A flock of 400 mature ewes (5.5 and 6.5 years of age) were joined to Merino rams fitted with crayon harnesses from 3 February until 14 February 2016. Crayon marks were recorded when the rams were removed and the marked ewes identified as early lambing ewes. The rams were returned to the flock on 28 February and remained until 3 April to provide ewes which would lamb later, at the same time as the maiden ewes. A flock of maiden Merino ewes (n = 532, 18 months of age) were joined to Merino rams from 28 February 2016 until 3 April 2016. These maiden ewes had not been grazed in paddocks adjacent to lambing ewes since weaning. Fetal numbers were determined for the maiden ewes only, using trans-abdominal ultrasound 53 days after rams were removed.

On 25 June, one week before the mature ewes were due to commence lambing, 90 mature ewes which were expected to lamb in the next three weeks (based on raddle marks and udder size) were randomly allocated to replicates of the exposed treatment (n = 30 per group). Another 90 mature ewes which were not expected to lamb in the next three weeks were randomly allocated to replicates of the control treatment (n = 30 per group), and the mature ewes were placed in paddocks. These numbers were considered sufficient to produce numerous opportunities for maidens to observe both lambing ewes and young lambs. On 26 June all pregnant maiden ewes (n = 446) were randomly allocated to six groups (replicate 1 n = 72, replicate 2 n = 76 and replicate 3 n = 75 ewes per group), without prior stratification on fetal number. Numbered plates were tied around the necks of the maiden ewes for identification, and the ewes then placed in the appropriate paddocks.

For the period during which the early mature ewes were lambing, all groups were checked daily to ensure the same level of human contact in exposed and control treatments. The number of mature ewes with live lambs present was recorded, but lambs were not tagged. The maiden and mature ewes remained in the paddocks from 26 June until 18 or 19 July. On these dates, all mature ewes and their lambs were removed, and maiden ewes placed in their lambing paddocks. All maiden groups moved to different paddocks from that in which they had been previously. The maiden ewes remained in their lambing paddocks until 4–6 September 2016, 4 days after the last lamb was born. This date was defined as lamb marking age.

2.3. Sheep measurements

The body condition (scale 0 (emaciated) to 5 (obese)) (Jefferies, 1961) of mature and maiden ewes was recorded when placed in paddocks at the start of the exposure period. The unfasted live weight of maiden ewes was also recorded at this time. The live weight and condition score of maiden ewes only was also recorded at the end of the exposure period when they were placed in lambing paddocks, and when they were removed at the end of the trial.

During lambing, the maiden ewes were checked once daily, and lambs identified to dams and tagged. Dead lambs were recorded and removed from paddocks. Dead lambs were weighed, and a post-mortem (McFarlane, 1965) conducted to attribute cause of death. Lambs were classified as born dead if they had not breathed fully. At lamb marking age, lambs were weighed. Lamb survival was calculated from their presence at this time.

2.4. Pasture and weather measurements

The quantity of live pasture available was estimated on 27 June 2015 at the start of the exposure period, on 14 July at the start of the maiden lambing, and on 30 August at the end of the maiden lambing period. The method of Haydock and Shaw (1975) was used, with 60 visual estimates taken in a diagonal transect across each paddock. The estimates were calibrated against 20 quadrats cut at ground level with electric clippers.

Weather data was accessed from the Wagga Wagga airport meteorological station (number 072150) (www.bom.gov.au/climate), approximately 40 km south of the experimental location. A daily chill index was calculated (Donnelly, 1984) using temperature and wind data from that station, and on-farm records of rainfall.

2.5. Statistical analyses

Data was excluded for two maiden ewes which gave birth to triplets, and another two ewes which lambed in the incorrect paddock. Ewes for which no lambing record was available, or lambed after 31 August, were included in analyses of ewe weight, but excluded from analyses of lamb survival and number of lambs born/reared per ewe to allow the opportunity of several days after birth for lambs to die. Data from seven maiden ewes which died during the lambing period were included in analyses of ewe weight and condition, and with the exception of one ewe which died before lambing, were included in analyses of lamb survival. Analyses of lamb survival excluded six lambs born as triplets, one born as a sibling to an aborted fetus, and two with fatal deformities. Also excluded were 15 lambs killed by foxes (8 control, 7 exposed), since these were concentrated in two plots. Records were available for analysis for 436 maiden ewes, with lambing records for 419 ewes and 559 lambs.

Data were assessed for assumptions of normal distribution and homogeneity using Genstat® 16th edition (VSN International, 2013). Lamb survival was analysed using generalised linear mixed modelling using a binomial distribution, with treatment x birth type (single, twin) x week of birth (coded as first two weeks or last four weeks) as the model fitted and replicate as the random effect. Ewe condition score at the start of the maiden lambing period, and ewe weight change over the period of exposure were used as covariates. The survival of single and twin-born lambs was also analysed in separate analyses. Other analyses of proportions (proportion of ewes bearing multiples, proportion lambs dying by 3 days) included only treatment as the fitted effect. The logit transformation meant standard errors for backtransformed means were not available. The number of lambs reared per ewe lambing, changes in ewe weight and condition score and lamb weights were analysed using