The effect of ewe and lamb post-parturient behaviour on lamb survival to weaning: A comparative study of Finns and Texels

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ABSTRACT

Post parturient behaviours of twinning Finn and Texel ewes and their lambs were monitored under commercial conditions and a relationship sought between this and lamb survival to weaning. Texel lamb survival to weaning was greatest when Texel ewes quickly made contact with their lamb following birth (within 2 minutes) and for lambs that located their dam's udder within 30 minutes from birth. Finn lamb survival to weaning was improved when Finn lambs were more vocal after birth, when Finn ewes had higher MBS and when Finn ewes spent a greater proportion of time grooming their lambs. Variation in perinatal behaviour within and across breeds was large and therefore potential exists for improving the ability of the ewe and lamb to bond successfully at parturition by selecting for some of the behaviours identified in this study that encourage lamb survival to weaning.

Keywords: lamb survival; post-parturition; ewe behaviour; lamb behaviour.

INTRODUCTION

Lamb mortality is regarded as a major constraint to efficient sheep production in New Zealand (Geenty, 1997). Poor maternal care by ewes producing large litters may be an important factor contributing to high lamb mortality both at birth and up to weaning (Holmes, 1976). The first hour post-partum is the most important for the establishment of an exclusive mother-young bond (Alexander *et al*., 1986) and the behaviour of the ewe before, during and after parturition has a major influence on lamb survival (Nowak, 1996).

The behaviour of the lambs and the ewe is important and failure of the lamb and ewe to interact properly can result in lamb death and a reduction of profit to the farmer (O'Connor and Lawrence, 1992). Maternal behaviour at parturition is critical to lamb survival (O'Connor *et al*., 1985; Astroshi and Osterberg, 1979) but Poindron *et al*. (1980) emphasised the importance of lamb behaviour and reported that the behaviour of the neonatal lamb influences the maternal responsiveness of the ewe. However Dwyer and Lawrence (1999) reported that the ewe shows only a small responsiveness towards behavioural changes in her lamb and that ewe attachment behaviours are controlled by intrinsic factors and are insensitive to the lamb.

Some studies have demonstrated breed differences in perinatal ewe behaviour and neonatal lamb behaviour (Dwyer and Lawrence, 1999; Fahmy *et al*., 1996) but studies investigating ewe and lamb behaviour conjointly are scarce and research involving ewe lambing at pasture is even more infrequent as detailed behavioural studies at parturition require a high labour input (Cloete *et al*., 2002).

The aim of this study was to monitor the behaviour of twinning primiparous Finnish Landrace and Texel ewes and their lambs immediately after birth under commercial conditions and relate these behaviours to lamb survival to weaning.

MATERIALS AND METHODS

Animals and measurements

The behaviour of straightbred Texel and Finnish Landrace (Finn) primiparous 2 year old ewes and their straightbred progeny were monitored at parturition in spring 2001 on a commercial sheep farm in the Hawkes Bay. Approximately 100 ewes of each breed were included in the study, however post-parturient behaviours were only observed for a sample of Finns (12 ewes and 24 lambs) and Texels (9 ewes and 18 lambs). Ewes were pregnancy scanned at about day 75 of pregnancy and litter size was known. Ewes were ear-tagged and could be individually identified.

The two breeds were separated for the duration of the study (from the 8th of August to the 30th of September). Ewes were set-stocked at ten ewes per hectare across five paddocks and were observed under pastoral grazing conditions. Finn and Texel ewes were separated prior to lambing so that their behaviour could be observed independent of the effects of the other breed. Mean lambing date was 1st September and 8th September for Finns and Texels respectively (day 243 ± 2.4 SE and day 250 ± 2.5 SE, $P<0.05$).

Two shepherds monitored the ewes on foot between 7am and 6pm daily for two weeks prior to lambing and throughout lambing to allow the ewes to become habituated to human presence.

Close observation during daylight hours ensured that the parturition process could be predicted and subsequently observed from a distance of approximately 20m and recorded. The observation period began at the expulsion of the first lamb and ended 30 minutes after the last of the litter was born. The observation period for

ewes varied and was dependant on the time taken between expulsion of the first and second twin. Physical markings were used to identify individual lambs during the observation period. Date of parturition and paddock were recorded for each ewe and time of parturition was recorded for each lamb.

The time to first contact the lamb, time spent grooming each lamb and their maternal behaviour score (MBS) was recorded for each ewe. The time from expulsion to stand and locate their ewe's udder was recorded for each lamb (Table 1). Frequency of lamb bleats was also recorded.

The MBS of ewes was determined within two hours of birth on the basis of their response to the shepherd spray marking their lambs on a 6-point scale from 1 (ewe leaves her litter and does not return) to 6 (ewe contacts her litter) (O'Connor, 1996). The MBS is normally evaluated when lambs are between 12 and 24 hours old, however in this study MBS was evaluated at the end of the observation period, between thirty minutes and two hours, after birth.

Lamb survival was recorded from parturition to weaning (16 January, 2002). Lambs that survived to weaning were given a score of '1' and lambs that died were given a score of '0'.

Statistical analyses

This study is a comparison between breeds as the number of ewes and lambs restricted the rigour of statistical analyses that could be applied. The effect of paddock nested within breed was not significant for production traits measured from birth. Differences between surviving and dead lambs, within breed, for continuous behaviour traits were tested using the MIXED procedure which uses restricted maximum likelihood (REML) methods to estimate the random effect (SAS, 2002).

The LIFETEST procedure (SAS, 2002) was used to compute and plot a survival distribution function (SDF) of ewe and lamb time related behaviours after parturition, such as ewe-lamb contact time, time for lamb to stand and to locate the udder. These behaviour observations are right-censored due to the termination of the experiment (i.e. thirty minutes after the birth of the second twin) but LIFETEST correctly uses the censored observations as well as the non-censored. The SDF evaluated at time (*t)* (i.e. 30 minutes) is the probability that a lamb of a particular breed and litter size will have a 'behaviour' time exceeding *t*, that is: $S(t) = Pr(T>t)$, where $S(t)$ denotes the survival distribution function and T is the behaviour time of a randomly selected lamb. The cumulative distribution functions for each of the behaviour traits are graphically plotted and are defined as $1-S(t)$, that is the probability that a behaviour time does not exceed *t* (i.e. 30 minutes). To determine whether the curves plotted are homogenous across breeds and or survival status to weaning ($P>0.05$), PROC LIFETEST provides two rank tests (log-rank and Wilcoxon). The Wilcoxon test places more weight on early times and the log-rank test places more weight on larger times. The association between covariates and the behaviour time variable were investigated using the Wilcoxon Test and reported if significant at $P<0.05$. The covariate tests are pooled across treatments and it is not possible to calculate the directional effect the covariate is having on the dependent variable.

RESULTS

The mean observation period differed between Finn (0.74 hours ± 0.14 SE) and Texel (1.21 hours ± 0.16 SE) ewes ($P<0.05$). Time between the birth of the first and second born twin, was significantly longer for Texels than for Finns (0.70 hours ± 0.24 SE compared with 0.24 hours ± 0.05 SE, $P<0.05$). All Finn ewes had given birth to twin litters within 35 minutes from the birth of their first lamb whereas some Texels took nearly 2 hours.

Finn and Texel lambs took about 15 minutes to stand from birth and a further 5 minutes to locate their dam's udder. Ewe-lamb contact time after birth was similar for Finns regardless of whether the lamb survived to weaning or died (Table 2, Figure 1). Texel ewe-lamb contact time was significantly longer for lambs that did not survive to weaning. Only 50% of ewes made contact with their lambs in the first 2 minutes after birth compared to nearly 100% of ewes whose lambs survived to weaning (Table 2, Figure 1).

TABLE 1: Definitions of ewe and lamb behaviours recorded after birth.

Behaviour	Description
1. Ewe behaviours	
Lamb contact	Time from birth to first physical contact with lamb (nose the lamb).
Grooming [DL]	Licking and nibbling of the lamb.
2. Lamb behaviours	
Stands [DL]	Lamb supports itself on all four feet for at least five seconds
To udder [DL]	Lamb's head nudging ewe in udder region. Lamb standing.
Bleats	The number of bleats was recorded for each lamb.

[DL] as described by Dwyer and Lawrence (1999).

TABLE 2: The effect of behaviour after parturition on twin lamb survival to weaning (Wilcoxon mean ± standard error).

Behaviour	Breed	Died	Survived	Wilcoxon P	Log-Rank P
Ewe-lamb contact time (minutes) Figure 1	Finn	0.4 ± 0.23	0.9 ± 0.29	ns	ns
	Texel	4.2 ± 2.25	0.7 ± 0.37	ns	*
Time to stand (minutes) Figure 2	Finn	16 ± 3.5	12 ± 3.13	ns	ns
	Texel	17 ± 5.29	14.5 ± 1.56	ns	ns
Time to locate udder (minutes) Figure 3	Finn	19 ± 2.72	12 ± 2.33	ns	ns
	Texel	ns	19 ± 1.73	ns	ns

ns=not significant at P<0.05; * P<0.05.

Time for each lamb to stand after birth was not significantly related to survival to weaning (Table 2, Figure 2). Texel lambs that did not locate the udder within thirty minutes from birth did not survive to weaning (Figure 3). The time taken for Finn lambs to locate their dam's udder did not significantly affect survival to weaning (Table 2, Figure 3).

FIGURE 1: The effect of ewe-lamb contact time after birth and the proportion to make contact on twin lamb fate at weaning.

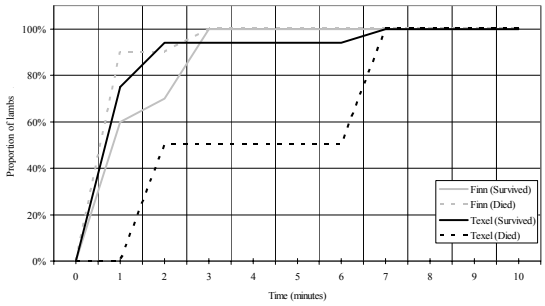
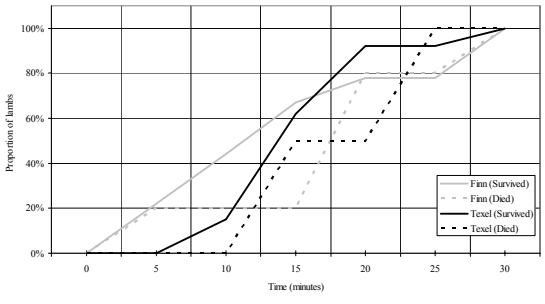
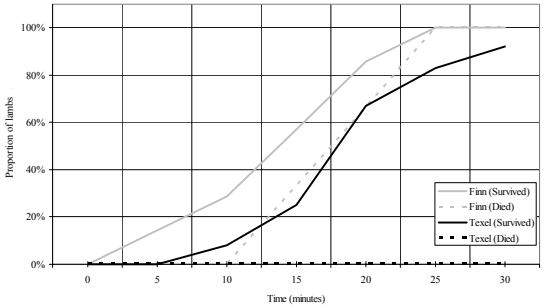


FIGURE 2: The effect of twin lamb time to stand after birth and the proportion of lambs to stand on lamb fate at weaning.



Grooming time and maternal behaviour score did not significantly differ between ewe breed and between ewes with surviving lambs and lambs that died before weaning (Table 3). Finn and Texel ewes with surviving lambs tended to have slightly higher MBS and Texel ewes appeared to groom their surviving lambs for longer (Table 3). Finn lambs that did not survive to weaning bleated significantly less after birth compared to Texel lambs that died. Surviving Finn lambs appeared to bleat more than Finn lambs that died before weaning (Table 3).

FIGURE 3: The effect of time to locate ewe's udder after birth and the proportion of lambs to locate the udder on twin lamb fate at weaning.



DISCUSSION

The time interval between the birth of the first and second born twin lamb was longer for Texels, allowing Texel ewes more time to bond with their first born before the birth of the second twin. Fahmy *et al*. (1996) reported a shorter time interval between births of lambs for prolific sheep compared to non-prolific sheep. The following post-parturient behaviours were the most effective indicators of survival to weaning for twin lambs:

- Texel lambs that located their ewe's udder within 30 minutes from birth had a significantly improved chance of survival to weaning.
- Texel ewes that quickly made contact with their lamb following birth (within 2 minutes), improved the lamb's chance of survival to weaning.

TABLE 3: The effect of ewe grooming time, ewe maternal behaviour score and lamb bleating frequency on lamb survival to weaning (least squares mean ± standard error)

Ewe Litter size	Breed	Died	Survived	P
Grooming time (minutes)	Finns	34 ± 5.3	26 ± 9.18	ns
	Texels	18 ± 11.24	41 ± 6.01	ns
	P(breed)	ns	ns	
Maternal Behaviour Score	Finns	3.6 ± 0.29	4.3 ± 0.38	ns
	Texels	4.0 ± 0.46	4.8 ± 0.29	ns
	P(breed)	ns	ns	
Lamb bleating frequency (tally)	Finns	24 ± 30	135 ± 49	ns
	Texels	200 ± 61	133 ± 32	ns
	P(breed)	*	ns	

ns=not significant at P<0.05; * P<0.05.

- Finn ewes that showed less flocking behaviour as indicated by MBS, were more likely to produce surviving lambs at weaning.
- Vocal Finn lambs had an improved chance of survival.

Dwyer and Lawrence (2000) suggest that the behaviour of a primiparous ewe is reasonably predictive of her behaviour in subsequent pregnancies, therefore potential exists for improving the ability of the ewe and lamb to bond successfully at parturition by selecting for some of the behaviours identified in this study that encourage lamb survival to weaning.

Published estimates of genetic (co)variances are scarce as neonatal behaviour is difficult to measure (Cloete *et al*., 2002). Cloete *et al*. (2002) showed that time to stand from birth and time to suck from standing do have a genetic component and that it differs between breeds.

Breeding programmes designed to increase the number of lambs born per ewe mated should take into consideration the mother-offspring social relationship and employ selection criteria and management practices to improve ewe-lamb bonding. However before this can be done effectively more research is required to identify a behavioural indicator that is easy to measure under New Zealand farming conditions and has a significant genetic component.

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