Sheep & Goat Research Journal
Volume 30, 2015 - December

Effects of Fenceline or Traditional Weaning Methods in Drylot on Performance and Behavior by Katahdin Crossbred Lambs

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Lincoln University Cooperative Research Manuscript # 20150010.

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Summary

Traditional weaning, characterized by abrupt and complete separation of offspring from their dam, is a common management practice utilized by sheep producers; however, animal performance and behavior may be negatively impacted. Fenceline weaning, an alternative method that has been extensively examined and generally accepted to be effective in cattle, may mitigate the negative effects associated with weaning in sheep. Therefore, our objective was to evaluate the effects of traditional compared with fenceline-weaning methods in drylot, on performance and behavior of Katahdin crossbred lambs. Over two consecutive years, 168 Katahdin crossbred ram and ewe lambs (17 kg ± 0.32 kg initial BW; 74 d ± 4.4 d of age) were stratified within litter size by BW, DOB, and sex and were allocated randomly to one of two weaning treatments: 1) traditional (TRAD) or 2) fenceline (FEN). Lamb BW and BCS were taken on d 0, d 14, and d 43 (year 1) or d 45 (year 2) of the study. Behavioral measurements were taken for 10 min at 12 h, 24 h, 48 h, and 72 h post-weaning. Lamb performance and behavior did not differ ($P \geq 0.28$) between treatments. A time effect was detected ($P < 0.01$) for percentage of lambs vocalizing, running, standing, and lying down. A treatment × time interaction ($P < 0.01$) was detected for percentage of lambs vocalizing with FEN vocalizing more at 12 h compared with all other treatment and time combinations. Therefore, fenceline weaning in drylot may not improve lamb performance and behavior in Katahdin-crossbred lambs.

Key Words: Behavior, Fenceline, Lambs, Weaning

Introduction

Traditional weaning typically involves abrupt separation of ewes and offspring without visual or audible contact and affects lambs twofold by discontinuing social companionship from their dam and eliminating a major source of nutrients (Orihuela et al., 2004; Enríquez et al., 2011). Consequentially, traditional weaning in sheep has been reported to decrease animal performance (Knights et al., 2012) and negatively affect behavior (Orgeur et al., 1998; Orihuela et al., 2004; Schichowski et al., 2008). One alternative is fenceline weaning, which has been extensively examined in cattle and has been reported to improve performance (Price et al., 2003; Boyles et al., 2007; Ness et al., 2012) and behavior (Stookey et al., 1997; Price et al., 2003; Boland et al., 2008; Ness et al., 2012). Under this strategy, offspring and dams are separated with some form of a barrier that prevents the offspring from nursing their dams, but allows for social contact; however, fenceline weaning has not been well-evaluated in sheep. In an earlier study (Backes et al., 2015), our research group evaluated the effects of weaning strategy and time weaning was initiated in spring-born Katahdin lambs and found no improvement in animal performance or behavior in fenceline weaning compared to traditional weaning. However, that study was designed similar to cattle experiments, whereby traditional weaned lambs were maintained in drylot completely separate from their dams while fenceline weaned lambs grazed pasture adjacent to their dams. Therefore, the objective of this study was to evaluate performance and behavior by Katahdin-crossbred lambs using fenceline or traditional weaning in drylot.

Materials And Methods

Animal Management

This study was conducted at the Lincoln University Carver Farm located in Jefferson City, Mo. Animals were raised in accordance with the *Guide for the Care and Use of Animals in Agricultural Research and Teaching* (FASS, 2010), and their care was approved by the Lincoln University Animal Care and Use Committee. Over two consecutive years, 119 Katahdin and Katahdin-Dorper ewes and their Dorper- or Texel-sired, spring-born ram and ewe lambs (n = 168; year 1 = 72; year 2 = 96; 17.0 kg ± 0.32 kg initial BW; 74 d ± 4.4 d of age) were used to determine the effects of weaning strategy on lamb performance and behavior. Four Dorper sires were used in year 1 and four Texel sires were used in year 2. Each year, ewes were lambed on pasture and remained on pasture with their lambs until weaning. In year 1, lambs were born from April 24 to May 10, 2012 and in year 2 lambs were born from April 24 to May 20, 2013. All lambs had access to a dry distillers grain with solubles/corn-based supplemental creep feed (CP = 24.8 percent; NDF = 35 percent; ADF = 7.4 percent; Table 1). Prior to weaning, lambs were stratified within litter size by BW, DOB, and sex into one of six groups per year. At weaning, groups were assigned randomly in replicate to one of two weaning treatments consisting of: 1. traditional (TRAD; n = 6 replications) or 2. fenceline (FEN; n = 6 replications) for a 14-d weaning period. At weaning, lambs were vaccinated for *Clostridium Perfringens types C and D* and *Tetnus Toxoid* (Bar-vac© CD/T; Boehringer Ingelheim, Inc., St. Joseph, Mo.) and dewormed (Cydectin©; Boehringer Ingelheim, Inc., St. Joseph, Mo.). Weaning was initiated at approximately 0730. Traditionally weaned lambs were placed in a 37.2 m^2 drylot completely separated from their dams without audible or visual contact. In a completely separate area, fenceline weaned lambs were also placed in a 37.2 m^2 drylot, but adjacent to their dams. During the weaning period, all lambs had *ad libitum* access to endophyte-infected tall fescue hay ([*Lolium arundinaceum* (Schreb.) Darbysh]; CP = 8.3 percent; NDF = 67.2 percent; ADF = 36.2 percent; IVDMD = 62 percent) placed in a feeder (Sydell, Inc, Burbank, S.D.) that was in close proximity to the boundary fence, water, sheep trace mineral (ADM Alliance Nutrition, Inc., Quincy, Il.), and were offered the same grain-based supplement that was offered prior to weaning at 1 percent BW at approximately 0930 daily. Supplement was placed in a 2.4 m grain feeder (Sydell, Inc., Burbank, S.D.) that was located centrally in the pen. At the end of the 14-d weaning period, lambs were revaccinated, were comingled into one group, and grazed tall-fescue-based pastures without supplementation for a total of 43 d (year 1) or 45 d (year 2) after weaning. Lamb BW and BCS (year 1 only; 1 to 5 scale; 1 = emaciated; 5 = obese; Russel et al., 1969) were determined at weaning (d 0), at the end of the weaning period (d 14) and end of the study. Lamb behavior was evaluated according to Ness et al. (2012). Briefly, each replication was evaluated at 12, 24, 48, and 72 h post-weaning to determine the percentage of lambs that were vocalizing, walking rapidly, running, standing, and lying down during a 10 min observation period. Behavior measurements were taken in the AM prior to feeding and were taken by one of two of the same trained observers each year. Any of the aforementioned behavior measurements could be expressed during the 10 min observation period; however, each animal was recorded once per exhibited behavior measurements. To determine the percentage of animals exhibiting each behavior measurement during each observation time, pen averages were calculated by dividing the number of individuals that exhibited the respected behavior measurement by the total number of individuals in the pen and then multiplying that number by 100.

Statistical Analyses

Lamb performance was analyzed using the PROC MIXED procedure of SAS (SAS Inst., Inc., Cary, N.C.). Group of animals was considered the

Table 1. Percentage of feedstuff in the supplemental diet (DM).

Feedstuff	Percentage
Cracked corn	42.0
Dry distillers grain with solubles	53.8
Soybean meal	3.0
Ammonium chloride	0.2
Calcium carbonate	1.0

Table 2. Effects of fenceline or traditional weaning method in drylot on performance by Katahdin crossbred lambs.

Item	Treatments[a] TRAD	FEN	SEM[b]	*P*-value
Body weight, kg				
At weaning	16.9	16.7	0.60	0.88
End of weaning	19.5	19.2	1.20	0.70
End of study	22.8	22.5	3.10	0.79
Wean ADG, kg/d[c]	0.18	0.18	0.066	0.91
Wean gain, kg[d]	2.6	2.5	0.92	0.91
ADG, kg/d	0.14	0.13	0.067	0.84
Total gain, kg	5.8	5.7	2.96	0.82
BCS[e]				
At weaning	2.9	3.0	0.12	0.37
End of weaning	2.9	2.9	0.08	0.76
End of study	2.9	3.0	0.16	0.65
Wean BCSch[f]	0.06	-0.09	0.090	0.28
BCSch[g]	0.11	0.01	0.100	0.52

[a] TRAD = Traditional weaning; FEN = Fenceline weaning.
[b] SEM = Pooled standard error of the mean.
[c] Wean ADG = ADG gain over the 14-d weaning period.
[d] Wean gain = Gain over the 14-d weaning period.
[e] BCS = Body condition score; 1 to 5 scale; 1 = emaciated; 5 = obese (Russel et al., 1969); year 1 data only.
[f] Wean BCSch = Body condition change over the 14-d weaning period.
[g] BCSch = Body condition score change over the duration of the study.

experimental unit, year was considered the random effect, and pen(treatment) as the error term. To remove sire variation, sire(pen) was included in the random statement. Significance level was set at $P \leq 0.05$. All treatment means are reported as least squares means.

Lamb behavior measurements were analyzed using the PROC MIXED procedure of SAS for repeated measures of ANOVA. Group of animals was considered the experimental unit and time was considered a repeated measurement. Pen(treatment) was considered as the error term and year the random effect. If a treatment × time interaction was observed, then means were separated using an F-protected *t*-test; however, if an interaction was not detected ($P > 0.05$), then the interaction was removed from the model and only main effects were reported. Significance level was set at $P \leq 0.05$. All treatment means are reported as least squares means.

Results And Discussion

Over the study period, lamb mortality was not observed for any treatment. Lamb body weight at weaning (d 0), end of weaning (d 14), and end of study (d 43 or d 45) did not differ ($P \geq 0.70$) between treatments (Table 2). Average daily gain and total gain over the weaning period and ADG and total gain over the duration of study did not differ ($P \geq 0.82$) between TRAD and FEN weaned lambs. Body condition scores at weaning (d 0), at the end of weaning (d 14), and at end of study and change in BCS from d 0 to d 14 and from d 0 to the end of study did not differ ($P \geq 0.28$) between treatments. Similar results were reported in spring-born Katahdin lambs that were traditionally or fenceline weaned in the AM or PM (Backes et al., 2015) and in crossbred tropical hair lambs that were weaned using restricted-suckling mechanisms (Orihuela et al., 2004). However, in cattle, Price et al. (2003) and Boyles et al. (2007) reported higher gain over the weaning period in fenceline compared with traditional weaning. The advantageous benefits associated with fenceline weaning in cattle may not be evident in spring-born, weaned crossbred-Katahdin lambs, thus possibly indicating species-specific differences associated with the weaning process.

Percentage of lambs vocalizing, walking rapidly, running, standing, or

Table 3. Effects of fenceline or traditional weaning method in drylot on behavior by Katahdin crossbred lambs.

Item	Treatments[a] TRAD	FEN	SEM[b]	*P*-value
Vocalization, %	23	29	4.3	0.33
Walking rapidly, %	0	0	0.3	0.84
Running, %	2	0	0.8	0.22
Standing, %	88	88	3.6	0.94
Lying down, %	49	43	4.8	0.34

[a] TRAD = Traditional weaning; FEN = Fenceline weaning.
[b] SEM = Pooled standard error of the mean.

Table 4. Time effect for behavior by Katahdin crossbred lambs weaned with fenceline or traditional methods in drylot.

	Observation time[a]				
Item	12	24	48	72	SEM[b]
Vocalization, %	39[c]	27[c]	27[c]	12[d]	4.1
Running, %	6[c]	0[d]	0[d]	0[d]	1.2
Standing, %	98[c]	72[d]	94[c]	88[c]	7.7
Lying down, %	15[e]	63[c]	41[d]	63[c]	6.3

[a] Behavior measurements were observed for 10 min and were recorded at 12, 24, 48, and 72 h post-weaning for each pen.
[b] SEM = Pooled standard error of the mean.
[c-e] Means within a row without common superscript differ ($P < 0.05$).

lying down did not differ ($P \geq 0.22$) between treatments (Table 3). In contrast to our findings, it has been reported that fenceline weaned lambs vocalized more compared with lambs weaned via restricted suckling (Oriheula et al., 2014) or lambs weaned traditionally (Backes et al., 2015). Ness et al. (2012) reported that in cattle, the percentage of calves vocalizing was greater from traditionally weaned compared with fenceline weaned calves. However, Boland et al. (2008) and Ness et al. (2012) reported no differences in standing and lying down between fenceline and traditionally weaned calves. A time effect was detected ($P < 0.01$) for percentage of lambs vocalizing, running, standing, and lying down (Table 4). Lambs vocalized more at 12 h, 24 h, and 48 h compared with 72 h post-weaning. Percentage of lambs running was greatest, and lying down was lowest at 12 h compared with 24 h, 48 h, and 72 h. Lambs were standing more at 12 h, 48 h, and 72 h compared with 24 h. A treatment × time interaction ($P < 0.01$) was detected for percentage of lambs vocalizing with FEN lambs vocalizing more at 12 h compared with all other treatment and time combinations (Table 5). Therefore, it seems that after 48 h post-weaning, lamb behavior associated with weaning is minimal.

Conclusion

Based on these results in Katahdin-crossbred lambs, implementing fenceline weaning relative to traditional weaning in a drylot situation may not be warranted. It seems that breaking of the ewe-lamb bond and subsequent development of a new social hierarchy either with or without fenceline comfort from the dam was not sufficiently meaningful to affect lamb performance or behavior. Consequently, benefits associated with fenceline weaning in cattle were not found with sheep in the present study, suggesting species-specific differences associated with the weaning process.

Table 5. Percentage of Katahdin crossbred lambs vocalizing after being weaned using fenceline or traditional methods in drylot at 12, 24, 48, and 72 h post-weaning.

	Treatment[a]	
Observation time[b]	TRAD	FEN
12	25[de]	52[c]
24	23[de]	30[d]
48	30[d]	24[de]
72	14[e]	10[e]

[a] TRAD = Traditional weaning; FEN = Fenceline weaning.
[b] Behavior measurements were observed for 10 min and were recorded at 12, 24, 48, and 72 h post-weaning for each pen.
[c-e] Means without common superscript differ ($P < 0.05$).

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