Calf Health and Performance During Receiving Is Not Changed by Fence-Line Preconditioning on Flint Hills Range vs. Drylot Preconditioning

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Introduction

Ranch-of-origin preconditioning can improve the welfare and performance of beef calves by decreasing the stress associated with weaning, transport, diet change, and commingling with other calves. Preconditioning methods that involve pasture weaning coupled with maternal contact (i.e., fence-line weaning) have been promoted as possible best management practices for minimizing stress. Prior studies focused on performance and behavior during preconditioning on the ranch of origin. Little information has been published relating to carryover effects of fence-line preconditioning compared with conventional drylot preconditioning on performance and behavior during feedlot receiving.

Our objectives were to measure growth and health during a 28-day ranch-of-origin preconditioning phase and during a 60-day feedlot receiving phase among beef calves subjected to 1 of 3 ranch-of-origin preconditioning programs: (1) drylot preconditioning + dam separation, (2) pasture preconditioning + fence-line contact with dams, and (3) pasture preconditioning + fence-line contact with dams + supplemental feed delivered in a bunk. In addition, we recorded incidences of behavioral distress among these treatments during first 7 days of feedlot receiving.

Experimental Procedures

Angus × Hereford calves (n = 460; initial body weight = 496 ± 77 lb) originating from the Kansas State University commercial cow-calf herds in Manhattan and Hays, KS, were used in this experiment. Calves were weaned at approximately 180 days of age. All calves were dehorned, and steer calves were castrated before 60 days of age. At weaning, calves were weighed individually and assigned randomly to 1 of 3 ranch-of-origin preconditioning methods: (1) drylot weaning + dam separation (Drylot), (2) pasture weaning + fence-line contact with dams (Pasture), and (3) pasture weaning + fence-line contact with dams + supplemental feed delivered in a bunk (Pasture+Feed).

All calves were vaccinated against respiratory pathogens (Bovi-Shield Gold 5; Pfizer Animal Health, Whitehouse Station, NJ), clostridial pathogens (Ultrabac 7; Pfizer Animal Health), and *H. somnus* (Somubac; Pfizer Animal Health). In addition, calves were treated for parasites (Ivomec; Merial Limited, Atlanta, GA). Booster vaccinations were administered 14 days later.

Within location, calves assigned to each treatment were maintained for 28 days in a single native pasture (minimum area = 118 acres). Calves were allowed fence-line contact with their dams for 7 days (minimum frontage = 656 feet; four-strand, barbed-wire fence with the bottom two wires electrified). Cows were moved out of visual and auditory range after 7 days. Fresh water, salt, and mineral supplements were available continuously. Calves assigned to the Drylot treatment were transported (<30 miles) immediately after separation from dams and confined within location to a single earth-surfaced pen (minimum area = 215 ft^2/calf; bunk space = 18 inches/calf).

Calves assigned to the Drylot treatment were fed a diet formulated to promote 2.2 lb average daily gain (ADG) at a dry matter intake equivalent to 2.5% of body weight during the preconditioning phase of the study (Table 1). Calves assigned to Pasture had access to native forage only (Table 2), whereas calves assigned to Pasture+Feed had access to native forage and received a ration of the diet fed to Drylot calves at a rate of 1% of body weight 3 times each week. Calves assigned to Pasture+Feed were sorted into a single pen located adjacent to the fence line shared with dams at 9:00 a.m. on Mondays, Wednesdays, and Fridays during the preconditioning phase. The ration was offered in portable bunks (bunk space = 18 inches/calf).

All calves were monitored for symptoms of respiratory disease twice daily during the preconditioning phase of our study. Calves with clinical signs of bovine respiratory disease were removed from pens or pastures and evaluated. Calves were assigned a clinical score (scale of 1 to 4; 1 = normal, 4 = moribund) and were weighed and assessed for fever. Calves with a clinical illness score >1 and a rectal temperature >104°F were treated with therapeutic antibiotics according to label directions (first incidence = Baytril, Bayer Animal Health, Shawnee Mission, KS; second incidence = Nuflor, Merck Animal Health, Summit, NJ). Cattle were evaluated 72 hours after the initial treatment and re-treated based on observed clinical signs.

After the 28-day preconditioning period, all calves were transported 4 hours from the ranch of origin to the Western Kansas Agricultural Research Center in Hays, KS, and weighed individually upon arrival. At that time, calves were stratified by gender and assigned to 1 of 18 pens by treatment (6 pens/treatment). Animals were fed their receiving diet (Table 3) once daily. If all feed from the previous day was consumed, total feed delivered was increased by approximately 2% of the previous day's feed delivery. Bunks were managed using a slick-bunk management method to minimize feed refusals. Dry matter intake was estimated based on feed delivered to the pen. Calf health was monitored as during the preconditioning phase of the study.

Beginning on the morning after feedlot arrival, animal behavior was assessed 3 times daily for 7 days by two trained observers. The numbers of calves performing specific behaviors (eating, pacing, vocalizing, drinking, resting, and ruminating) were recorded for each pen. Observations were taken 1 hour before feeding, at the time of feeding, and 6 hours post-feeding. In addition, calves were weighed individually on days 30 and 60 of the receiving phase of the experiment.

Results and Discussion

Preconditioning period

Calf ADG during the 28-day preconditioning period tended ($P = 0.08$) to be greater for drylot-weaned calves than for pasture-weaned calves receiving no supplement (Table 4). Based on the chemical analyses of our pasture forage, these results were expected. Another study found that fence-line weaned calves gained more weight than abruptly weaned calves during the first 2 weeks of preconditioning and maintained that difference for 10 weeks postweaning, but calves in that study were fed a single diet across treatments.

Our treatments were designed such that calves assigned to Drylot were on a greater plane of nutrition than calves assigned to the Pasture and Pasture+Feed treatments. This condition is typical of drylot- vs. pasture-preconditioning programs in Kansas. Supplement provided to Pasture+Feed in our study was designed to train pasture-weaned calves how to eat from a feed bunk rather than to promote body weight gains that were competitive with Drylot calves. One causative feature of poor initial feedlot performance is stress associated with learning to eat from a bunk. In our study, incidence of undifferentiated fever was not different ($P = 0.22$) among treatments during the preconditioning phase.

Receiving period

We observed calves at the time of feeding as an indicator of their desire to eat from a bunk during the first 7 days of receiving. A greater (Treatment × day; $P < 0.05$) proportion of Drylot calves compared with Pasture calves came to the bunk at time of feeding during the first 5 days of receiving (Figure 1). Similarly, a greater proportion (Treatment × day; $P < 0.05$) of Drylot calves came to the bunk at time of feeding during the first 4 days of receiving compared with Pasture+Feed calves.

During the receiving period, Drylot calves had greater ($P < 0.01$) ADG from arrival to day 60 and greater body weight ($P < 0.01$) on day 60 than either pasture-weaned treatment (Table 5). This increase in performance was driven by greater ($P < 0.01$) feed intake of Drylot calves compared with the pasture groups. In addition, feed efficiency was greater ($P = 0.01$) for Drylot calves than for Pasture calves, whereas Pasture+Feed calves were intermediate and not statistically different from the other groups. Providing calves with supplement in a bunk on pasture did not improve receiving ADG ($P > 0.05$) or dry matter intake ($P > 0.05$) compared with pasture-weaned calves that received no supplemental feed.

Pasture-weaned calves in our study were supplemented infrequently (3 times weekly for 4 weeks) and ate less feed during receiving that drylot-weaned calves. It may be possible to achieve greater performance and feed intake with pasture-weaned calves during receiving when supplementation is provided more frequently than in our study.

Incidence of undifferentiated fever during the receiving period was small (0.9%); therefore, we did not report summary statistics on these data. Previous work reported greater incidence of disease during receiving in drylot-weaned calves compared with pasture-weaned calves. In our study, the health of drylot-weaned calves was equivalent to that of pasture-weaned calves. Overall, our cattle were healthier than in the aforementioned research, so we were unable to detect health differences among treatments.

Implications

We interpreted these data to suggest that animal performance and welfare during the receiving period were not improved by pasture preconditioning compared with drylot preconditioning. Based on our behavior and performance data, it appeared that previous experience consuming a concentrate-based diet from a bunk paid greater dividends during receiving than reducing stress associated with maternal separation through fence-line contact with dams. Best-management practices for animal welfare may involve initiating diet transitions from forage to grain at the ranch of origin. Pasture-preconditioning systems may be a lower-cost alternative to conventional drylot-preconditioning systems, but may not produce equivalent growth performance during pre-shipment preconditioning and receiving.

Table 1. Composition of the preconditioning diet[1]

Ingredient composition	DM, %
Alfalfa extender pellets	33.0
Corn gluten feed	18.2
Wheat middlings	14.6
Cracked corn	11.5
Cottonseed hulls	10.9
Dried distillers grain	7.8
Supplement	4.0
Nutrient composition	
Crude protein, %	14.28
Net energy for maintenance, Mcal/kg	1.50
Net energy for gain, Mcal/kg	0.93

[1] Diet also contained salt, Zn sulfate, and Rumensin 80 (Elanco Animal Health, Greenfield, IN).

Table 2. Nutrient composition of native pasture forage available to pasture-weaned beef calves (dry matter basis)

Nutrient, %	Manhattan	Hays
Dry matter	89.5	91.3
Crude protein	3.2	4.1
Neutral detergent fiber	74.4	74.8
Acid detergent fiber	51.8	48.6

Table 3. Composition of the receiving diet

Ingredient composition	DM, %
Ground sorghum grain	47.8
Wet distillers grains	11.0
Ground sorghum hay	33.9
Supplement[1]	7.3
Nutrient composition	
Crude protein, %	16.82
Net energy for maintenance, Mcal/kg	1.50
Net energy for gain, Mcal/kg	0.93

[1] Supplement contained Rumensin 80 and Tylan 40 (Elanco Animal Health, Greenfield, IN), limestone, salt, and trace minerals.

Table 4. Performance of beef calves while subjected to 1 of 3 28-day ranch-of-origin preconditioning regimens

	Drylot	Pasture + Supplement	Pasture	SEM
Start weight, lb	498	503	503	31.8
End weight[1], lb	518	485	481	23.4
Average daily gain, lb	0.68[a]	-0.62[ab]	-0.75[b]	0.405
Incidence of fever, %	5.01	0.63	1.91	1.825

[1] Body weight measured immediately upon feedlot arrival.
[a, b] Means within rows without common superscripts tend to differ ($P = 0.08$).

Table 5. Performance of beef calves subjected to 1 of 3 ranch-of-origin preconditioning regimens during a 60-day feedlot receiving period

	Drylot	Pasture + Supplement	Pasture	SEM
Arrival body weight, lb	518	485	481	23.4
Body weight day 30, lb	584[a]	549[b]	534[b]	8.6
Body weight day 60, lb	697[a]	655[b]	644[b]	9.5
Average daily gain (ADG), day 0–30, lb	2.47[a]	2.40[a]	1.96[b]	0.088
ADG, day 0–60, lb	3.13[a]	2.93[b]	2.82[b]	0.130
Dry matter intake, lb/day	17.20[a]	17.02[b]	16.98[b]	0.015
Feed/gain, lb/lb	5.49[a]	5.80[ab]	6.04[b]	0.004

[a, b] Means within rows without common superscripts differ ($P < 0.05$).

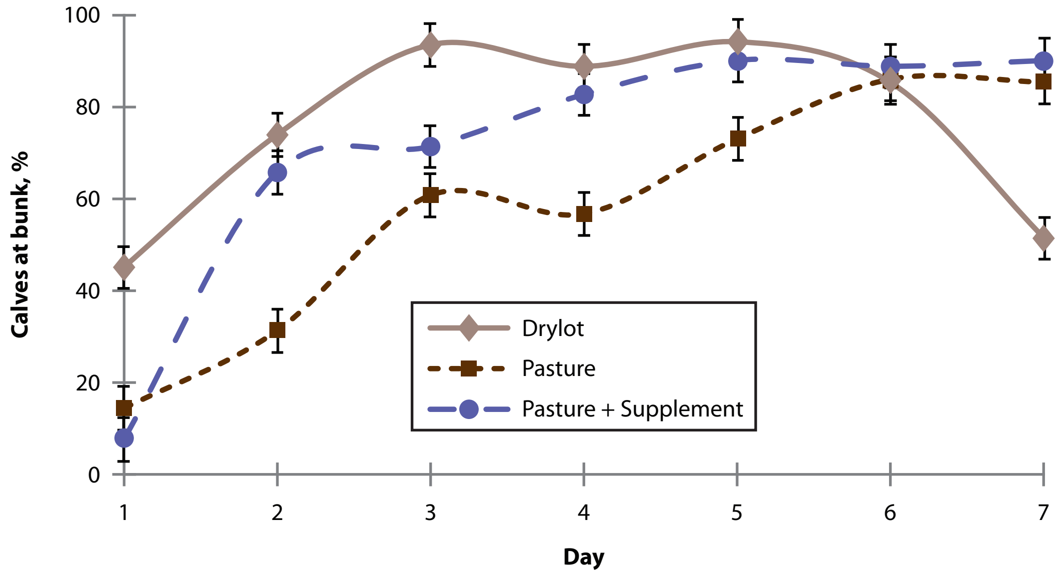

Figure 1. Proportion of calves observed at feed bunks immediately after feed delivery (Treatment × time, $P < 0.05$; maximum SEM = 4.71).