Impact of Relocation and Weaning Stress on the Feedlot Performance of Steer Calves During the Receiving Period

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Summary

The effect of ranch management on weaning and relocation stress was investigated using spring born steer calves from a single source. Steers on mature (≥ 4 yr of age) dams were weaned at shipment (NW) whiles steers on young (< 4 yr of age) dams had been weaned and on feed at the ranch for 1 mo prior to shipment (PW). At shipment tympanic temperature (TT) loggers, an indicator of body temperature, were placed in 13 steers from each management group at shipment. Steers were transported together to the SDSU Research Feedlot (365 mi). Body weight after 21 d in the feedlot (670 vs 673 lb) and DMI (14.7 vs 14.9 lb) were similar (P > 0.10) between PW and NW steers, respectively. Average daily gain (2.66 vs 3.17 lb) and feed efficiency (5.53 vs 4.74 lb) were higher (P < 0.05) in NW steers. NW steers recorded higher TT (1.2 ºF; P < 0.05) than PW steers duing loading and transportation from the ranch, indicating a greater initial stress associated with NW. During the first 4 d at the feedlot DMI was lower for NW steers (11.2 vs 6.1 lb) and was slightly below maintenance.
There were no differences (P > 0.05) in TT associated with this period of negative energy balance. Results indicate that pre-transit weaning, as a part of feedlot transition, did not add sufficient stress to alter TT compared to previously weaned calves.

Introduction

Today's modern beef production systems present challenges for young feeder calves. Significant among these challenges are weaning stress and relocation from the ranch to feedlot.

Animal observations of stress often require invasive procedures limited to confined or restrained animals. These procedures could interfere with the true response by the animal to the stressor. Body temperature has been used as indicator of animal stress, and the rectum has long served as the traditional site of internal body temperature measurement. The ear canal adjacent to the tympanic membrane (ear drum) is an alternative site for measuring body temperature. Tympanic temperature has been previously used as an indicator of animal stress, and can be collected continuously in the unrestrained animal. Tympanic temperature is very responsive to external stimuli and is generally 0.8 to 1^{o} F lower than rectal temperature. Therefore, deviations from homeostatic conditions can be monitored using tympanic temperature.

The objective of this research was to assess the impact of relocation and weaning stress on the feedlot performance of receiving calves using tympanic temperature as an indicator of animal stress.

Materials and Methods

Spring born Angus steer calves (n = 196) from a single source were used in the 21 d receiving study. Steers were allocated into two groups based on ranch management practices. Steers on mature dams (≥ 4 yr of age) were weaned at shipment (NW) while steers on young dams (< 4 yr of age) had been weaned and on feed at the ranch for 1 mo prior to shipment (PW).

Tympanic temperature loggers were placed into 13 randomly selected steers from each management group. This procedure occurred 20 h prior to shipment for PW steers and as part of the gathering process 1 h prior to shipment for NW steers.

Steers were transported together to the SDSU Research Feedlot (365 mi). Upon arrival steers were allocated to a pen of either 10 or 11 hd as

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they were unloaded, while maintaining management groups separately. After resting (36 h) calves were individually weighed and processed, and the body weights recorded were considered the weaning weights.

Initial processing included vaccination against IBR, BVD, PI_3, BRSV, Haemophilus (Resvac-4, Pfizer, Exton, PA), 7-way clostridia (Ultrabac-7, Pfizer, Exton, PA) and treatment for parasites (Dectomax, Pfizer, Exton, PA). Interim body weights (unshrunk) were collected on all steers on d 4 and a final body weight was recorded on d 21.

After 7 d, tympanic temperature loggers were retrieved and the data were downloaded to a computer. The loggers were set up to record tympanic temperature every 2 min continuously for the 7 d period. Although loggers were not placed in both management groups at the same time, data included for analysis for PW management group was started at the time loggers were placed in NW management group.

A cracked corn – grass hay/oat silage diet was fed (Table 1) for the entire 21 d receiving period. Steers had access to long-stem grass hay during the resting period (initial 36 h) and the receiving diet was delivered on top of the hay for 2 d. Steers were fed once daily in the afternoon.

Weather information was collected hourly throughout the 21 d receiving period by a wireless weather station (Davis Instruments, CA) located centrally within the feedlot facility.

Time series analysis was used to analyze the tympanic temperature data. Performance data were compared using methods appropriate for a completely randomized design using the GLM procedure of SAS (1996).

Results and Discussion

This study was designed to evaluate the relative transit and feedlot stress responses in calves when the ranch weans calves from young cows earlier in the fall. It would be inappropriate to interpret these results in the context of bunk broke vs freshly weaned calves. Those comparisons are represented here to aid feedlots in determining appropriate management processes for a single source of calves comprised of both bunk broke and freshly weaned calves.

During the 21 d receiving study ambient temperature ranged from 12.8° F to 60.9° F with a mean of 32.3° F (Table 2). Mean relative humidity was 77.7% and ranged from 34% to 100%, while wind speed ranged from 0 mph to 13 mph with a mean of 3.8 mph. Mean daily minimum and maximum ambient temperature at the feedlot facility from the day of transit to d 5 on feed ranged from 12.8° F to 41.2° F (Figure 1).

Weaning weights and final body weights did not differ ($P > 0.05$) between management groups (Table 3). Body weights at d 4 were greater for the PW group ($P < 0.05$) than for NW. The NW group lost 5 lb of body weight during the first 4 d. This is likely due to the PW calves being acclimated to a total mixed diet that was offered daily, while the NW were not. Average daily gain during d 5 to 21 was greater ($P < 0.05$) for the NW group than the PW group. This effect on ADG would be in part a result of compensatory gain. During this period NW calves had a higher DMI ($P < 0.05$) than PW calves. This difference in DMI diminished over the entire 21 d receiving period where cumulative DMI did not differ between management groups ($P > 0.05$). However, over the entire 21 d receiving period NW gained more and converted feed more efficiently than PW calves ($P > 0.05$).

Mean tympanic temperature during transit to 0800 h the following day was 0.77° F higher ($P < 0.05$) for NW calves than PW calves. Mean hourly tympanic temperature (Figure 2) reflects the initial stress involved in gathering calves from pasture and separating calves from their dams immediately prior to transporting. It appears that the diurnal patterns for tympanic temperature of the NW group began to mimic those of the PW management group within 1 h of arrival at the feedlot facility or 12 h post weaning (Figure 2).

Intake on d 4 was higher for PW calves when compared to NW calves, 14.2 lb and 7.6 lb respectively. Even though intake by NW calves was slightly below maintenance requirement on that day, mean tympanic temperature did not differ between the two management groups (Figure 3; $P = 0.79$). This suggests that additional stress for calves weaned at transit in combination with a negative energy balance was not sufficient to impede maintaining of normal diurnal tympanic temperature patterns.

Conclusion

The merits of weaning and adapting calves to feed at the home ranch have been debated for years. It could be argued that calves on young cows are more susceptible to the stress associated with transition to the feedlot by virtue of typically having lighter BW and lower body condition at weaning. In the specific production system evaluated here, the primary objective of weaning young cow's calves early was to improve cow body condition prior to winter. Results of this study indicate that in doing this and adapting those calves to feed, feedlot arrival BW were similar to BW of calves reared by mature cows and weaned on the trucks. Tympanic temperatures, 21 d post arrival feed intake, BW and health status were also similar. Based on these findings this appears to be an acceptable management option for ranch and feedlot operations. Yet to be determined is the appropriateness of co-mingling these single source calves within the first three weeks at the feedlot.

Table 1. Composition (DM basis) of dietary treatments

	Diet	
Item	Grass hay/cracked corn	High moisture ear corn
Ingredient, %		
Grass hay	44.0	-
High moisture ear corn	-	86.0
Cracked corn	44.2	-
Soybean meal	9.0[a]	10.0[b]
Wheat middlings[c]	1.4	2.2
Limestone[c]	1.1	1.3
Trace mineral salt[d]	0.3	0.3
Premix	0.2[e]	0.2[f]
Nutrient Analysis		
Crude protein, %[g]	11.6	13.2
NDF, %[g]	33.52	20.85
ADF, %[g]	17.70	7.19
Ash, %[g]	6.73	4.42
Ca, %[h]	0.54	0.55
P, %[h]	0.32	0.33
K, %[h]	1.23	0.90
NEm, Mcal/kg[h]	1.88	2.04
NEg, Mcal/kg[h]	1.09	1.27

[a]2.311% soybean meal included as pelleted dry supplement.
[b]2.858% soybean meal included as pelleted dry supplement.
[c]Included as pelleted dry supplement.
[d]Trace mineral salt contained no less than 94% NaCl, 37% Na, 0.35% Zn, 0.20% Fe, 0.20% Mn, 0.03% Cu, 0.007% I, and 0.005% Co.
[e]Premix contained 169.3 grams of monensin per kilogram.
[f]Premix contained 171.5 grams of monensin per kilogram.
[g]Based on laboratory analysis.
[h]Calculated values.

Table 2. Mean climatic conditions during the study

Item	Mean	Minimum	Maximum	SD
Days 0-4				
Ambient temperature (°F)	29.2	12.9	48.5	7.02
Relative humidity (%)	80.3	49.0	99.0	12.05
Wind speed (mph)	3.9	0.0	11.0	2.95
Wind chill (°F)	25.7	5.3	48.0	7.76
Days 5-21				
Ambient temperature (°F)	32.9	12.8	60.9	9.54
Relative humidity (%)	78.3	34.0	100.0	14.70
Wind speed (mph)	3.9	0.0	13.0	3.17
Wind chill (°F)	29.9	9.2	60.2	10.59
Days 0-21				
Ambient temperature (°F)	31.9	12.8	60.9	9.09
Relative humidity (%)	78.8	34.0	100.0	14.08
Wind speed (mph)	3.9	0.0	13.0	3.11
Wind chill (°F)	28.8	5.3	60.2	10.09

Table 3. Steer performance during the receiving phase by management group

	Treatment		
	PW[a]	NW[b]	SEM
Weaning weight, lb	587	580	2.3
Day 0-4			
BW on d 4, lb	610[c]	575[d]	2.2
DMI, lb	11.16	6.08	0.000
ADG, lb	5.53[c]	-1.25[d]	0.200
F/G	1.44	-2.17	2.580
G/F, lb/cwt	49.1[c]	-20.6[d]	0.026
Day 5 - 21			
BW on d 21, lb	643	646	3.5
DMI, lb	15.58[d]	17.02[c]	0.116
ADG, lb	3.57[d]	5.79[c]	0.106
F/G	4.39[d]	2.95[c]	0.062
G/F, lb/cwt	22.9[d]	34.0[c]	0.005
Day 0 -21			
DMI, lb	14.74	14.94	0.094
ADG, lb	2.66[d]	3.17[c]	0.084
F/G	5.53[d]	4.74[c]	0.058
G/F, lb/cwt	26.8[d]	29.8[c]	0.005

[a] Previously weaned management group.
[b] Weaned at shipment management group.
[cd] Means differ (*P* < 0.05).

Figure 1. Daily minimum and maximum ambient temperature recorded at the feedlot facility

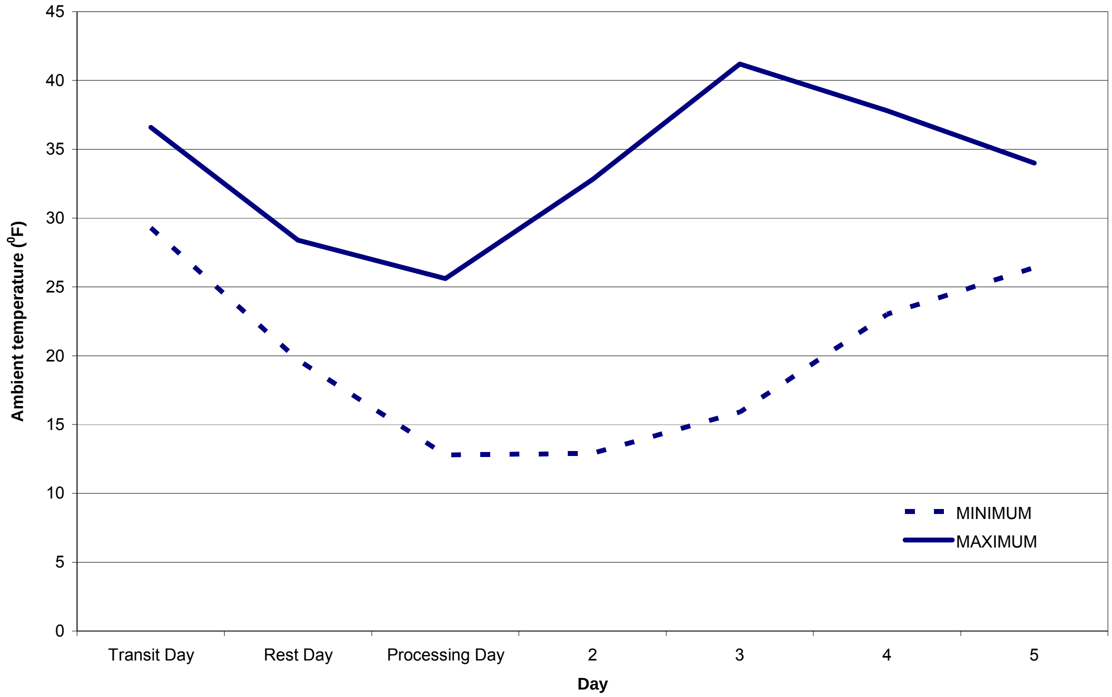

Figure 2. Mean tympanic temperatures for initial 20h by management group[a]

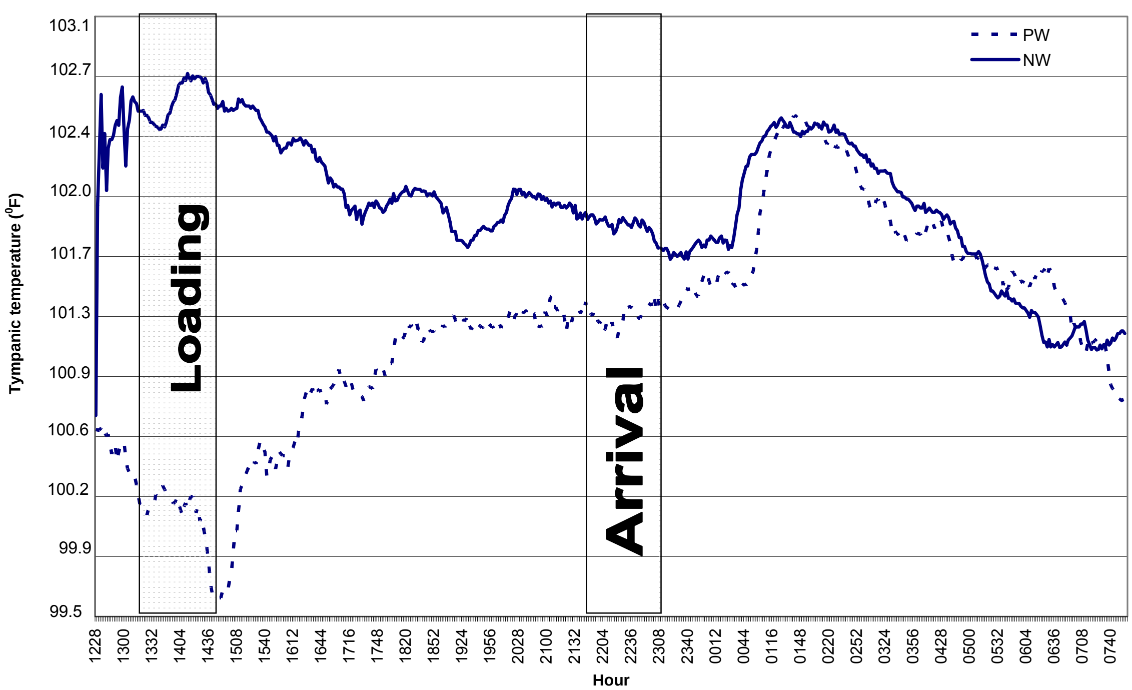

Figure 3. Tympanic temperature on day 4 by management group[a]