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Finishing Steers in a Deep-Bedded Hoop Barn and a Conventional Feedlot: Effects on Behavior and Temperament in Iowa

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Abstract
As the Iowa beef industry invests in environmental management, there has been increasing interest in systems that minimize runoff. One example of such a facility is the deep-bedded hoop barn. To date there is limited information comparing animals raised for beef production in regards to their behavior between the deep-bedded hoop barns and other housing systems for beef cattle. Identifying potential alterations in cattle behavior and overall temperament between different housing systems can help producers when redesigning facilities and in the creation of educational management tools, to maximize beneficial impacts for animal well-being and economical return. The objective of this study was to compare steer behavior and temperament between two housing treatments; hoop building (HP) vs. conventional feedlot (FD).

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Introduction

As the Iowa beef industry invests in environmental management, there has been increasing interest in systems that minimize runoff. One example of such a facility is the deep-bedded hoop barn. To date there is limited information comparing animals raised for beef production in regards to their behavior between the deep-bedded hoop barns and other housing systems for beef cattle. Identifying potential alterations in cattle behavior and overall temperament between different housing systems can help producers when redesigning facilities and in the creation of educational management tools, to maximize beneficial impacts for animal well-being and economical return. The objective of this study was to compare steer behavior and temperament between two housing treatments; hoop building (HP) vs. conventional feedlot (FD).

Materials and Methods

Animals and timeline. Two hundred and forty crossbred steers were used. Steers were ear tagged, implanted, and weighed on arrival and allotted to balance weight and breed. All steers were fed a diet of 74.2% dry whole shelled corn, 15% ground hay, 3.3% protein pelleted supplement, 300 mg/hd/d monensin, and 7.5% added water. Steers had libitum water access from one waterer/pen. Corn stalks were provided to HP steers for bedding. The trial was conducted from January through April 2007 (winter) and August through November 2006 (summer).

Treatments. Two housing treatments were compared. Treatment one was the ***hoop barn*** (HP; n = 3). Pen dimensions were 12.2 m wide by 15.2 m long. The hoop barn was oriented lengthwise in a north / south direction. The roof material was composed of a polyvinyl tarp stretched over arched supports in a Quonset® design. The roof was set on 3.05 m tall wood posts, which provided a total height of 7.92 m. The north and south ends were left open and the west wall was covered in planking for wind and sun protection. The east wall was left open with a 0.5 m by 12.2 m by 0.91 m concrete feedbunk along its length. A concrete pad extended 4.3 m from the bunk. A driveway along the east exterior provided access for a feed wagon. Waterers were located next to the bunk along the pen dividers. Space of 4.65 m^2/steer was provided.

Treatment two, the ***conventional feedlot*** (FD; n = 3) was an open feedlot. Pen dimensions were of 12.2 m wide by 48.2 m long. A 0.5 m high by 11.9 m long by 0.91 m wide feedbunk was located at the north end of the pens, with a concrete pad extending 10 m from the bunk. Waterers were located in the pen 7 m from the feedbunk. A metal open-front building covered 7.6 m of the north end of all the pens, with a drive-through alley for feed wagon access. The north wall of the building was equipped with adjustable polyvinyl curtains, and the south wall was open. Space of 14.7 m^2/steer was provided.

Animal handling facility. The tub, chute, and squeeze chute were located in the west end of the conventional feedlot. The squeeze chute was a Silencer® (Moly Mfg, Lorraine, KS) Rancher model (Interior dimensions: 0.66 m wide by 2.3 m long). Sand was placed at the exit of the squeeze chute for a distance of 3 m at a depth of 6 cm for traction. Exiting steers then proceeded to a holding pen until all steers from a pen were weighed, and then were returned to their original pen. Steers from the feedlot walked 79.2 m on average to the chute, and from hoop barn walked 223 m on average to the chute.

Behaviors and postures. Behavioral data were collected using a 10 min live scan sampling technique by two experienced observers from 0700 h to 1600 h on 3 days of the trial. Two behaviors (***head in bunk*** defined as the steer within 1 m of bunk, with head in or immediately over the bunk and ***head in waterer*** defined as head in water bowl, actively drinking) were noted. Three postures (***lying***, defined as the steer's main body in contact with the ground, lying laterally or sternally, ***walking*** defined as the steer on all 4 legs while changing position in the pen, and ***standing*** defined as not moving, with all four legs in contact with ground and no main body contact) were recorded.

Temperament scoring. One day post-behavioral collection steers were moved through a squeeze chute for subjective temperament scoring. Scores ranged from 1 (exits chute calmly) to 6 (very aggressive; charges handlers). The scoring system was adapted from the Beef Improvement Federation (2006; Table 1).

Results and Discussion

Behaviors and postures. In winter, HP steers spent more time at the feedbunk ($P = 0.04$) than FD steers, however there was no difference ($P = 0.66$) for time spent at the waterer. Lying behavioral incidence was higher ($P = 0.008$) for HP steers compared with their FD counterparts. HP steers exhibited a lower ($P = 0.003$) incidence of walking and standing ($P = 0.008$) compared with their FD counterparts (Table 2).

In summer, there were no ($P = 0.22$) differences for head in bunk behavioral incidence between housing treatments, however there was a difference ($P = 0.02$) for drinking behavior incidence, with HP steers spending more time at the waterer than FD steers. Lying behavioral incidence was greater ($P = 0.004$) for HP steers vs. FD steers. Fewer ($P < 0.05$) steers exhibited walking or standing behavior in the HP compared with FD steers (Table 3).

Temperament scores. In winter, temperament scores were lower ($P = 0.03$) for HP steers compared to FD steers (Table 2). Day was a source of variation ($P < 0.001$) with HP steers exhibiting lower scores that FD steers, and overall increasing on the first two observation days and decreasing on the third (Table 5). Day by treatment interactions were not different ($P = 0.47$; Table 4).

In summer, temperament scores were not ($P = 0.13$) different between housing treatments (Table 3), but day ($P < 0.0001$; Table 5) and day by treatment ($P < 0.001$; Table 4) were sources of variation for temperament measures.

In conclusion, housing steers in a hoop barn does not result in adverse behavior or temperament alterations.

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Table 1. Temperament scoring for steers exiting the squeeze chute (BIF 2006).

Score	Definition
1	Exits chute calmly (walk).
2	Restless, exits promptly (trot).
3	Nervous, constant movement, exits at fast trot.
4	Jumps, shakes chute, exits briskly (canter).
5	Aggressive, jump, bellow in chute. Exits at gallop.
6	Very aggressive. Charges handlers.

Table 2. Effects on behavior and postures of housing facility (hoop versus feedlot) for beef steers from January to April 2007 (winter).

	Treatment		
	Hoop	Feedlot	P-values
Behavior, %			
Head in bunk	20.8 ± 0.008	17.7 ± 0.008	0.04
Head in waterer	0.70 ± 0.001	0.009 ± 0.001	0.66
Postures, %			
Lying	46.9 ± 0.02	37.1 ± 0.02	0.008
Walking	1.70 ± 0.002	4.0 ± 0.002	0.003
Standing	30.0 ± 0.01	40.3 ± 0.01	0.008
Temperament score	1.96 ± 0.06	2.12 ± 0.06	0.03

Table 3. Effects of behavior and postures by housing facility (hoop versus feedlot) for beef steers from August to November 2006 (summer).

	Treatment		
	Hoop	Feedlot	P-values
Behaviors, %			
Head in bunk	22.6 ± 0.01	24.9 ± 0.01	0.22
Head in waterer	1.95 ± 0.001	1.4 ± 0.001	0.02
Postures, %			
Lying	33.9 ± 0.02	20.6 ± 0.02	0.004
Walking	2.10 ± 0.003	3.90 ± 0.003	0.008
Standing	39.6 ± 0.02	48.4 ± 0.02	0.02
Temperament score	1.84 ± 0.04	1.94 ± 0.04	0.13

LSMeans ± standard error.

Table 4. Temperament scores of steers by housing type and season when exiting squeeze chute.

	Winter[1]					Summer[2]				
Observation Date[3]	40	76	119	SD	P	35	57	92	SD	P
Hoop (HP)	2.08	2.12	1.67	.07	0.47	1.64[c]	1.81[a]	2.07[d, e]	.06	<0.001
Feedlot (FD)	2.15	2.34	1.88	.07	0.47	1.90[a, b]	1.95[a, d]	1.99[b]	.06	<0.001

[1]January to April 2007.
[2]August to November 2006.
[3]Days after start of trial.
[4]Means in the same season with the same letter do not differ (P < .01).

Table 5. Temperament scores for beef steers over three observational days when exiting squeeze chute.

	Winter[1]					Summer[2]				
Observation Date[3]	40	76	119	SD	P	35	57	92	SD	P
Temperament score	2.11	2.23	1.77	.05	.001	1.77	1.88	2.03	.42	.001

[1]January to April 2007.
[2]August to November 2006.
[3]Days after start of trial.