Effects of Lot Type and Coat Color on Respiration Rate, Surface Temperature and Feeding Behavior of Feedlot Steers

S. C. Arp[1], F. N. Owens[2],
Steve Armbruster[3] and Y. Kojima[4]

Story in Brief

The influence of pen type (confinement or dirt pens) and coat color on respiration rate, body surface temperature and feeding behavior of 978 feedlot steers at Garden City, Kansas were measured. Respiration rates during the hottest part of the day on three different days were consistently higher (mean of 9.8 percent or 19 breaths per minute) for steers confined in "teardrop" floor pens than steers in more spacious dirt-floor feedlot pens. Surface temperatures of cattle were consistently higher (mean of 6.2 percent or 6.6 F) for steers with black than steers with red coat color. Feeding behavior of steers on concrete floors appeared to be slightly different from steers in drylot pens, with a higher percentage of steers eating overnight and fewer eating during the middle of the day (10 am to 3 pm) for more confined steers. Black steers, compared with red steers, were at the feed bunk more in the morning and less in the afternoon and evening.

Introduction

Heat stress can reduce performance and cause death loss of cattle in the Southern Great plains. Floor or pen type (density) and coat color may influence response to hot weather. The objective of this experiment was to determine the relationships of floor type (concrete "Teardrop" confinement with 21 to 26 square feet per steer versus drylot pens with over 70 square feet per steer) and coat color (red versus black) to respiration rate, surface temperature and feeding behavior.

Materials and Methods

Steers used and measurements taken are described in another report in this publication entitled "Relationships of Coat Color, Body Surface Temperature and Respiration Rate in Feedlot Steers."

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[1]Graduate Student, Animal Science [2]Professor, Animal Science [3]Feedlot Nutrition Consultant, Stillwater, OK [4]Visiting Professor from Kyoto University, Kyoto, Japan

Results and Discussion

On July 31, respiration rates were 28 percent greater ($P < .05$) for cattle in confinement than for cattle on drylot (Table 1). Confined cattle tended to have higher respiration rate throughout the day although body surface temperature appeared to be variable (Table 2), probably due to sprinkling of the cattle after 1 pm. Sprinklers were turned off on subsequent dates temperature and respiration measurements were taken.

Table 1. Comparison of respiration rates between lot types on 7/31/1982.

	Time				
Treatment	7:30 am	10:30 am	1:30 pm	4:30 pm	7:30 pm
	Respiration rate, breaths per minute				
Drylot	74.1	100.1[a]	120.5	132.6	109.4
Confinement	76.6	127.9[b]	131.9	141.4	106.9

[a,b]Means in a column with different superscripts differ ($P < .05$).

Table 2. Comparison of body surface temperature between lot types on 7/31/1982.

	Time				
Treatment	7:30 am	10:30 am	1:30 pm	4:30 pm	7:30 pm
	Surface temperature, F				
Drylot	83.9[a]	105.4[a]	115.6[a]	113.5[a]	86.7
Confinement	93.9[b]	109.9[b]	102.6[b]	95.6[b]	84.6

[a,b]Means in a column with different superscripts differ ($P < .05$).

On August 21, respiration rate was 10 percent greater for confined cattle at noon (Table 3), but no coat color effect on respiration rate was evident. Body surface temperature at 8 am was 11 percent greater ($P < .05$) for cattle in confinement with no effect of coat color (Table 4), but by noon, black cattle in drylot had higher body surface temperatures than either group of red cattle. Surface temperature of black cattle in confinement was 10 percent greater ($P < .05$) than that of confined red cattle, and overall, the surface temperature of drylot cattle was 5 percent greater than that of cattle in confinement.

On September 4, respiration rates were greater for cattle in confinement throughout the day except at 7:30 am and no effects of coat color were detected. Lot type had no significant effect on body surface temperature (Table 5) although cattle in confinement had slightly higher values except at 4:30 pm.

Based on respiration rate measurements, steers in confinement apparently are more heat stressed than cattle in drylots. This may be due in part to greater cattle density. Constant flushing in the teardrop system might increase the humidity locally, but no humidity or temperature difference was apparent between unoccupied concrete and dirt floors 4 feet above the surface. Constant flushing of recycled water held the concrete surface temperature below 105 F compared with a maximum soil surface temperature of 130 to 140 F. Recycled water used to flush the floor was generally 2 to 3 F higher in temperature after it had flushed through the system than at the source. Flushing

Table 3. Comparison of respiration rates between low types and coat color on 8/21/1982.

Treatment	Coat color	Time		
		8:00 am	12 Noon	4:00 pm
		---- Respiration rate, breaths per minute ----		
Drylot	Black	60.4	132.2[a]	128.3
Confinement	Black	57.9	144.6[b]	126.1
Drylot	Red	57.6	131.3[a]	129.3
Confinement	Red	82.6	146.2[b]	138.7
Drylot	Overall	59.0	131.7[a]	128.8
Confinement	Overall	70.3	145.4[b]	132.4

[a,b]Means in a column and set with different superscripts differ (P<.05).

Table 4. Comparison of body surface temperatures between lot types and coat color on 8/21/1982.

Treatment	Coat color	Time		
		8:00 am	12 Noon	4:00 pm
		---------- Surface temperature, F ----------		
Drylot	Black	84.2[a]	117.7[a]	109.9
Confinement	Black	92.0[b]	112.2[ab]	108.1
Drylot	Red	80.6[a]	107.6[bc]	107.6
Confinement	Red	90.9[b]	102.2[c]	108.3
Drylot	Overall	82.4[a]	112.6	108.8
Confinement	Overall	91.4[b]	107.2	108.2

[a,b,c]Means in a column and set with different superscripts differ (P<.05).

may hold the night temperature of the floor higher than that of soil since temperature of the water was generally above night air temperature. Black bulb temperature reached 111°F suggesting that coat color could influence uptake of heat by radiation.

Feeding behavior subdivided by floor type measured at half-hour intervals from midnight to midnight is illustrated in Figure 1. Peaks were higher for steers in drylot pens than steers on the teardrop floor. This suggests that bunk space availability may limit access to feed for cattle in confined pens. Decreasing animal density will increase both space at the bunk and space in the pen. Decreased density may prove desirable to increase performance in this facility, although this may not be economically feasible. Bunk space, watering space and floor area all need consideration in newly designed facilities. Time of eating appeared changed as well, with a lower percent of the steers in confinement than in drylot pens eating during the middle of the day (10 am to 3 pm). Possibly to compensate, a higher percent of steers in confinement than in drylot pens were eating before sunrise.

The feeding pattern of steers classified by red and black coat color is presented in Figure 2. More black steers tended to eat from 7 am until noon, while from noon to 7:30 pm, more red steers were at the feed bunk. Higher surface temperatures and respiration rates for black than red cattle may have reduced their desire to eat during the hotter hours of the day.

Table 5. Comparison of respiration rates between lot types on 9/04/1982.

Treatment	Coat color	Time				
		7:30 am	10:30 am	1:30 pm	4:30 pm	7:30 pm
		Respiration rate, breaths per minute				
Drylot	Black	49.8	70.5[a]	116.9[a]	95.9[a]	63.6[a]
Confinement	Black	43.7	100.4[b]	138.7[b]	116.0[b]	90.2[b]
Drylot	Red	43.4	71.6[a]	109.3[a]	99.7[a]	58.5[a]
Confinement	Red	49.7	105.8[b]	149.8[b]	131.4[b]	104.0[b]
Drylot	Overall	46.6	71.0[a]	113.1[a]	97.8[a]	61.0[a]
Confinement	Overall	46.7	103.1[b]	144.3[b]	123.7[b]	97.1[b]

[a,b]Means in a column with different superscripts differ ($P<.05$).

Table 6. Comparison of surface temperatures between lot types on 9/04/1982.

Treatment	Coat color	Time				
		7:30 am	10:30 am	1:30 pm	4:30 pm	7:30 pm
		Surface temperature, F				
Drylot	Black	83.2	105.6[a]	109.4	110.9	86.1
Confinement	Black	88.2	106.1[a]	111.9	104.9	86.2
Drylot	Red	82.2	100.4[b]	106.2	105.9	85.9
Confinement	Red	86.5	100.0[b]	108.9	103.9	86.6
Drylot	Overall	82.7	103.0	107.8	108.4	86.0
Confinement	Overall	87.4	103.1	110.4	104.4	86.4

[a,b]Means in a column with different superscripts differ ($P<.05$).

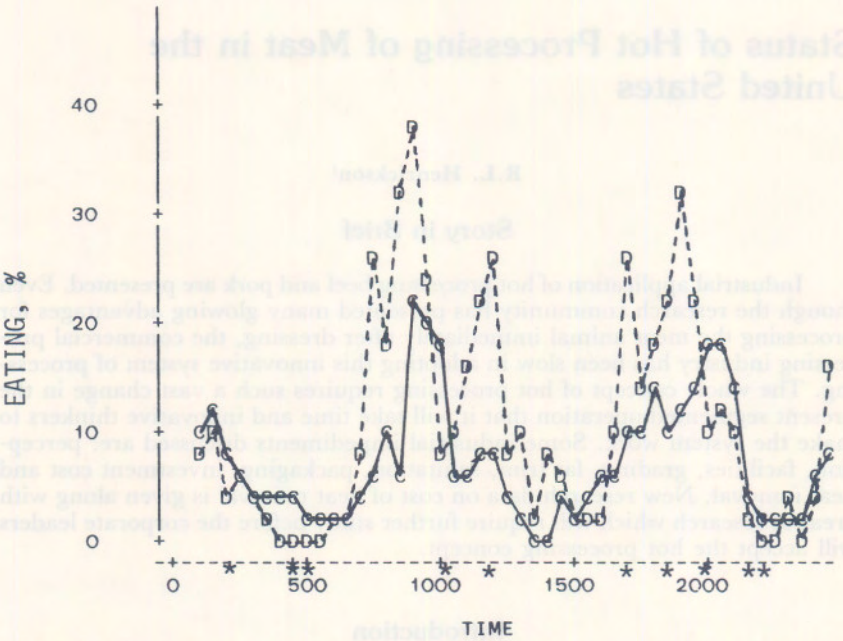

Figure 1. Percentage of steers on teardrop floor (C, solid line) or in dirt floors pens (D, dotted line) eating at different times of a day.

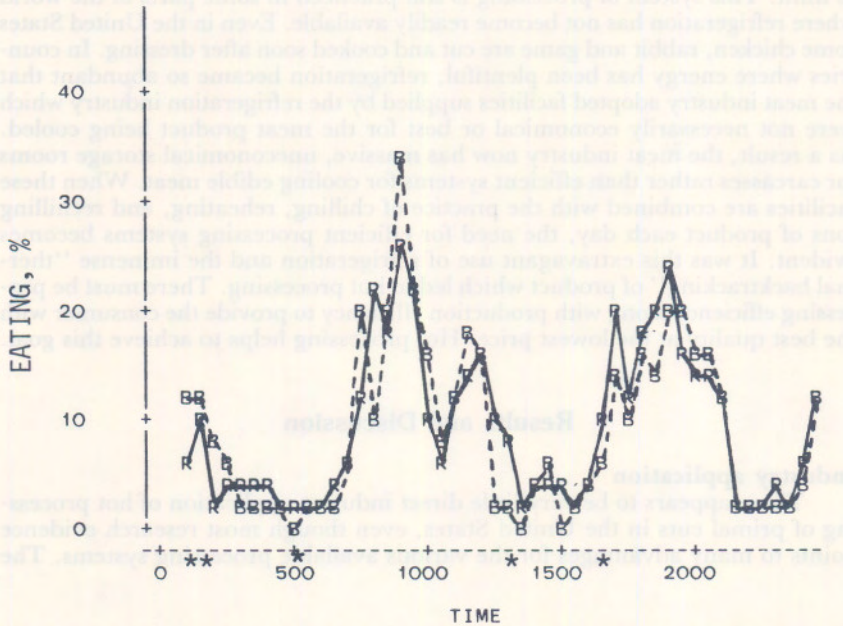

Figure 2. Percentage of black (B, dotted) and red (R, solid line) steers eating at different times of a day.