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Body Temperature Changes Associated with Moving Feedlot Cattle

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Moving cattle through working facilities requires an expenditure of energy, causing an elevation of average body temperature between 0.5 and 1.4°F.

Summary

In two winter and two summer studies, tympanic temperatures (TT), an indicator of body temperature, were obtained in unrestrained feedlot cattle moved through working facilities. Moving yearling cattle elevated TT between 0.5 and 1.4°F. Effects of cattle movement and handling on body temperature needs to be taken into account when evaluating animal health studies. Furthermore, minimal handling of cattle during hot days is recommended for promoting animal well-being and comfort.

Introduction

In general, cattle are processed (vaccinated, treated for parasites, receive a growth implant, and provided an eartag for identification) within a few days of arriving at the feedlot. In addition, a significant number of cattle are returned to the processing facilities to receive health care or to be re-implanted with a growth promotant. The effect of activity on body temperature is particularly important when it is used as an indicator of health status or when environmental conditions exist which could contribute to heat stress. The objective of these studies was to evaluate effects of cattle movement in the feedyard and quantitate body temperature of animals moved various distances and at different times during the year.

Procedure

Two winter and two summer studies were conducted using yearling feedlot cattle fed a high-energy finishing diet. Studies were conducted in the following order January, February, August and June. In January, five animals from one pen were moved from the pen through the working facilities and back into the pen. Cattle were moved around 0800 and 1500 hour. Total distance moved each time was about 500 feet (250 feet each way). Animals were moved two days and allowed a day of rest (baseline days) before and between the days moved. In February, six animals from one pen were moved from the pen through the working facilities and back into the pen. Cattle were moved only once at approximately 0945 hour. Total distance moved was about 1,000 feet (500 feet each way). Animals were moved two days in a row and allowed a rest (baseline days) the day before and after the days that they were moved. They were moved to the facilities briefly delayed in the working facilities, and returned to the pens. Total moving time was approximately 15 minutes, but varied between 5 and 25 minutes.

In August, eight animals were placed in two pens (four head/pen). On days one and two, one pen of cattle was moved through the working facilities a short distance of about 500 feet and the other pen was moved a longer distance, about 2,000 feet, through the working facilities and back to their pens. Cattle were allowed two days of rest and moved again over the next two days. Moving distance (short vs long) assignments were reversed for each pen of cattle on the second set of moving days. All moves began at approximately 0900 hour.

In June, 18 animals were placed in three pens (six head/pen). On days one and two, cattle from respective pens

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were moved through the working facilities a total distance of about 1,000, 2,000 and 3,000 feet, respectively. Cattle were moved only once/day at approximately 0900 hour. Cattle were allowed a day of rest after the second day of moving. In all handling studies, tympanic temperatures were obtained throughout the study period using procedures described below. In all four studies, average animal weight was about 1,050 pounds. In all studies, cattle were not pushed and were allowed to move at a pace they chose. Cattle tended to move at a faster pace (run or trot) versus a slower pace (walk).

In all studies, individual animals were randomly selected from each pen to assess the effect of the imposed treatment on tympanic temperature (TT). In the two winter handling studies, TT were obtained from three animals in the pen. In the summer handling studies, two and four animals/pen were selected in the first and second study, respectively. Tympanic temperature loggers (Stowaway XTI®, Onset Computer Corporation, Pocasset, MA) were placed in the left ear of the selected animal. Placement of the logger into the ear consisted of attachment of a thermistor to the data logger and inserting the thermistor approximately four to five inches down the ear canal until the tip was located near the tympanic membrane of the animal. The datalogger was wrapped in gauze and secured to the ear using self-adhesive bandages (Vet-Wrap and athletic tape). Tympanic temperature was obtained once every 15 minutes in the January and February studies, and every two and 1.5 minutes in the August and June summer studies, respectively. After loggers were secured to the ear, all steers were returned to their respective pens. The handling studies were initiated the day following placement of the data loggers. Data loggers were removed the day following the last time cattle were moved or rested, depending on study design.

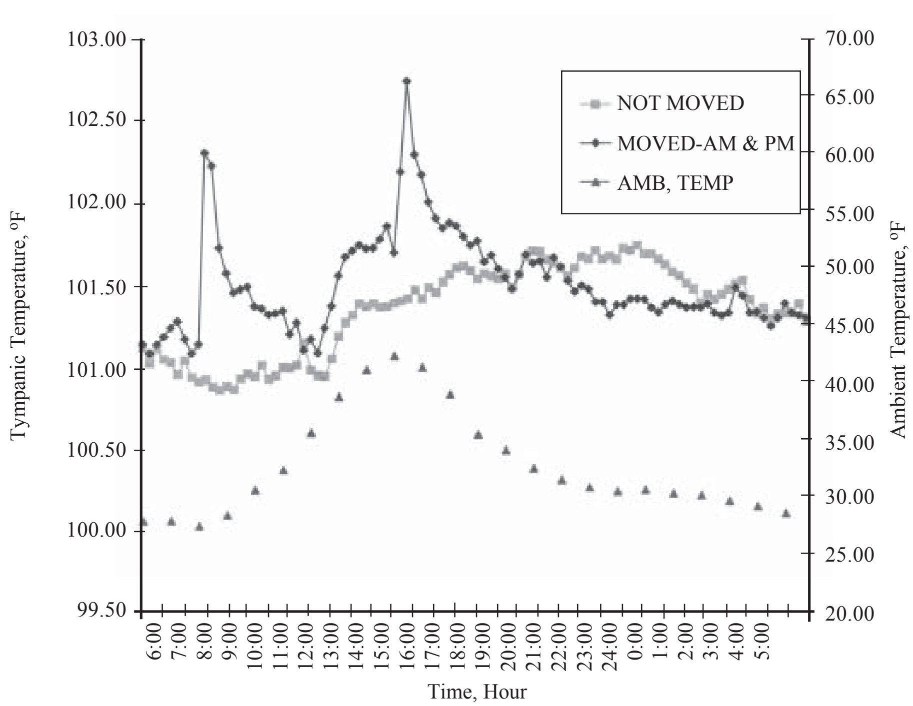
Ambient temperature for each study was obtained from the High Plains Climate Center automated weather station about 1 mile northwest of the feedlot facilities.

Tympanic temperature data were analyzed using analysis of variance proce-

Table 1. Effects of moving cattle through working facilities on tympanic temperature.

	Tympanic temperature (TT), °F			
	Baseline	Initial peak	Post-peak low[a]	Post-low high[b]
January study				
Morning move				
Distance, feet				
0[c]	100.9	100.9	101.2	101.4
500	101.1	102.3	101.1	101.9
SE	0.1	0.1*	0.1	0.1*
Time, hour[c]	0800	0815	1145	1445
Afternoon move				
Distance, feet				
0[c]	101.4	101.4	101.6	101.7
500	101.7	102.7	101.6	101.7
SE	0.1	0.1*	0.1	0.1
Time, hour[c]	1500	1530	1900	1945
February study				
Distance, feet				
0[c]	102.0	102.0	102.4	102.9
1,000	102.0	102.5	102.4	102.7
SE	0.3	0.3	0.2	0.2
Time, hour[c]	0945	1015	1400	1715
August study				
Distance, feet				
0 (for 500 foot move)[c]	101.4	101.4	101.5	102.5
0 (for 2,000 foot move)[c]	101.4	101.4	101.8	102.5
500	101.4	102.0	101.5	102.6
2,000	101.4	102.7	101.8	102.5
Pooled SE	0.1	0.1*	0.2	0.3
Time, hour (for 500 foot move)[d]	0906	0922	1002	1814
Time, hour (for 2,000 foot move)[d]	0906	0928	1136	1812

*Means between moved and non-moved cattle, within a column for respective trial or moving time, differ ($P < .05$).
[a]Low point and/or point at which moved cattle TT becomes to that of cattle not moved (see figures).
[b]Time and TT corresponding to highest TT obtained by moved cattle following post-peak low TT.
[c]Corresponds to time moved cattle TT were recorded.
[e]Time TT was recorded for characteristic associated with moved cattle.



Fgure 1. Tympanic temperatures of cattle moved through working facility in January. Cattle were moved about 500 feet around 0800 hour and 1500 hour.

Table 2. Effects of moving cattle through working facilities (June study)

	Distance moved, feet				Chi-square
	0	1,000	2,000	3,000	*P*-value
Tympanic temperature,°F					
Baseline, 0900 hour	101.4	101.3	101.5	101.5	—
Initial peak[ab]	—	102.6 (.2)	102.8 (.2)	102.9 (.1)	—
Time initial peak occurred, hour	—	0942	0931	0934	—
Post-peak low[b]	—	101.7 (.1)	101.8 (.1)	101.8 (.1)	—
Time post-peak low recorded, hour	—	1052	1112	1137	—
Time cattle returned to pens	—	0934	0937	0945	—
Behavior, % of observations					
Time					
1000					
Standing	19.4	83.3	75.0	83.3	0.01
Lying	36.1	5.6	0.0	0.0	0.02
Head in or over waterer	2.8	5.6	8.3	2.8	0.87
Head in bunk	41.7	5.6	16.7	13.9	0.20
1100					
Standing	55.6	38.9	44.4	55.6	0.91
Lying	2.8	47.2	41.7	38.9	0.13
Head in or over waterer	16.7	11.1	5.6	0.0	0.06
Head in bunk	25.0	2.8	8.3	5.6	0.10
1200					
Standing	80.5	61.1	41.7	58.3	0.13
Lying	2.8	16.7	30.6	22.2	0.20
Head in or over waterer	13.9	13.9	13.9	0.0	0.15
Head in bunk	2.8	8.3	13.9	19.4	0.23
1300					
Standing	77.8	38.9	66.7	72.2	0.85
Lying	11.1	47.2	22.2	22.2	0.89
Head in or over waterer	11.1	13.9	11.1	5.6	0.89
Head in bunk	0.0	0.0	0.0	0.0	—
1400					
Standing	0.0	38.9	44.4	52.8	0.01
Lying	100.0	33.3	44.4	36.1	0.02
Head in or over waterer	0.0	2.8	8.3	8.3	0.11
Head in bunk	0.0	25.0	2.8	2.8	0.72

[a]Means differ from control (0 feet moved) at respective times TT were recorded (P< 0.05).
[b]Parenthetical numbers represent standard error of the mean.

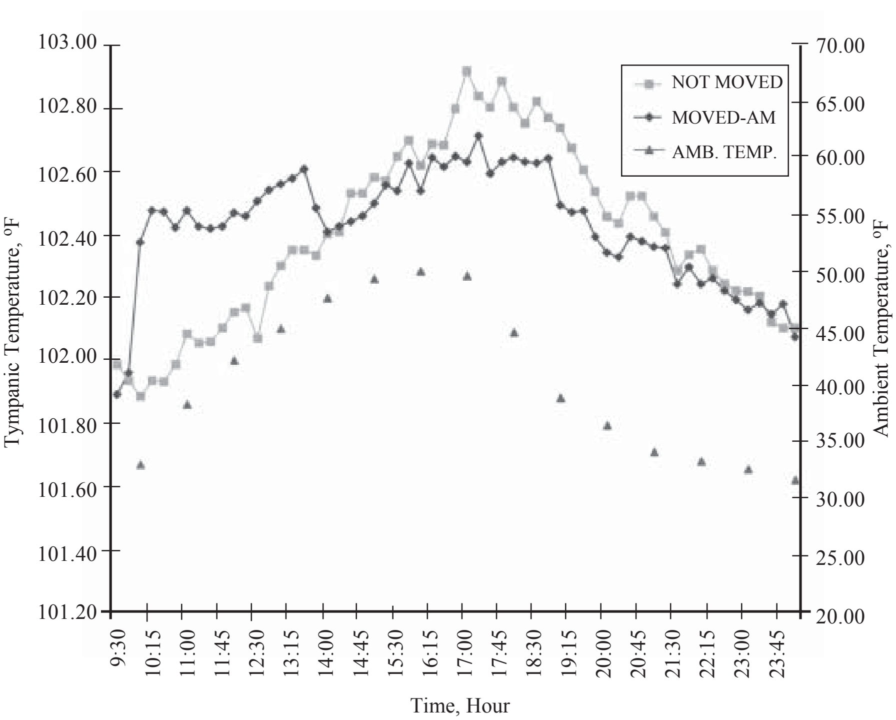


Figure 2. Tympanic temperatures of cattle moved through working facility February. Cattle were moved about 1,000 feet at 0945 hour.

dures for repeated measures (SAS; SAS Inst. Inc., Cary, N.C.). The model included treatment, animal, day and time. Data from the days cattle were rested were used for determining moving treatment TT changes, which occur over time relative to cattle that are not moved. Prestudy TT were used as a covariant in studies is which initial TT were found to be different. Differences among treatments were determined using Fisher's Protected LSD and the PDIFF option. Behavior data were analyzed using Chi-square. Significance was determined based on the Mantel-Haenszel Chi-square test.

Results

In general, mild climatic conditions existed for the time of year these studies were conducted. Tympanic temperatures were increased by moving cattle in the winter both in the morning and afternoon (Figure 1, Figure 2 and Table 1). The process of moving cattle obviously elevates TT and body temperature immediately, most likely through muscle activity. The rate of decline in TT can be very rapid as found in the January study, but may remain constant as shown in the February study. In the first study, non-moved cattle TT remained very low, while in the second study, non-moved cattle TT was rising during the day-time hours. Feeding pattern, cattle disposition, and in-pen activity, as well as ambient climatic conditions, would most likely influence the rate of TT decline.

In the summer studies, the rise in TT was similar to that found in the winter for cattle moved a short distance (Figure 3 and Table 1). In the August study, the rise in TT was nearly doubled for cattle moved longer distances when compared with cattle moved shorter distances. In the June study, TT rises were similar regardless of distance moved. The rise was significant in all cases (Figure 4 and Table 2). In every study, TT of cattle that were moved returns (declines) to points near (below or equal) that of the TT of non-moved cattle before the moved cattle TT begins to rise again. Cattle apparently need to reach a TT level comparable to what would be normal under

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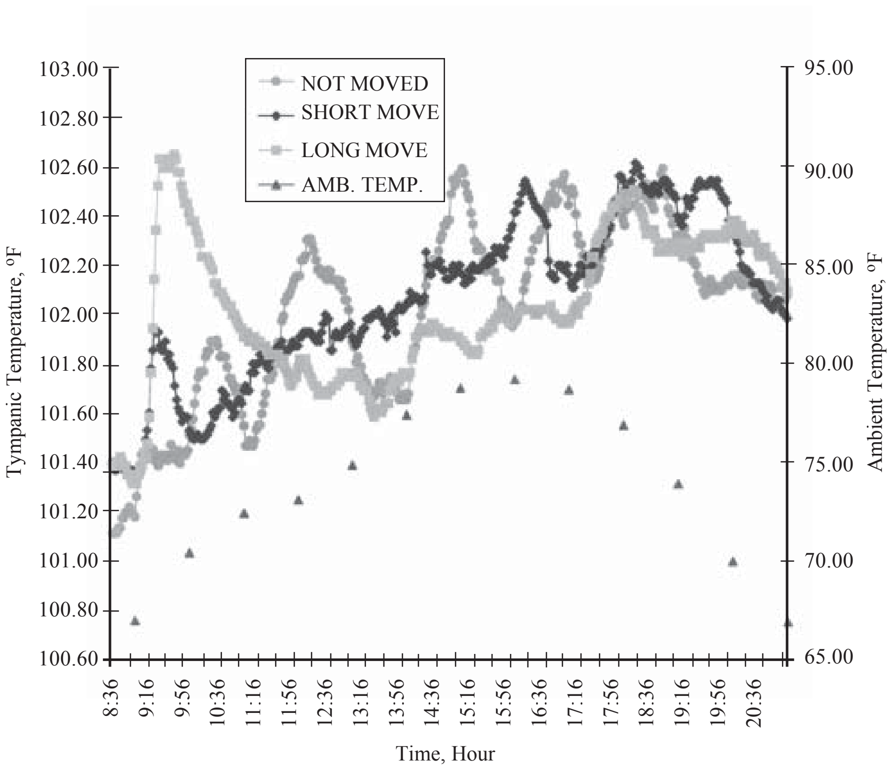

Figure 3. Tympanic temperatures of cattle moved through working facility in August. Cattle were moved about 500 feet (short) or 2,000 feet (long) around 0900 hour.

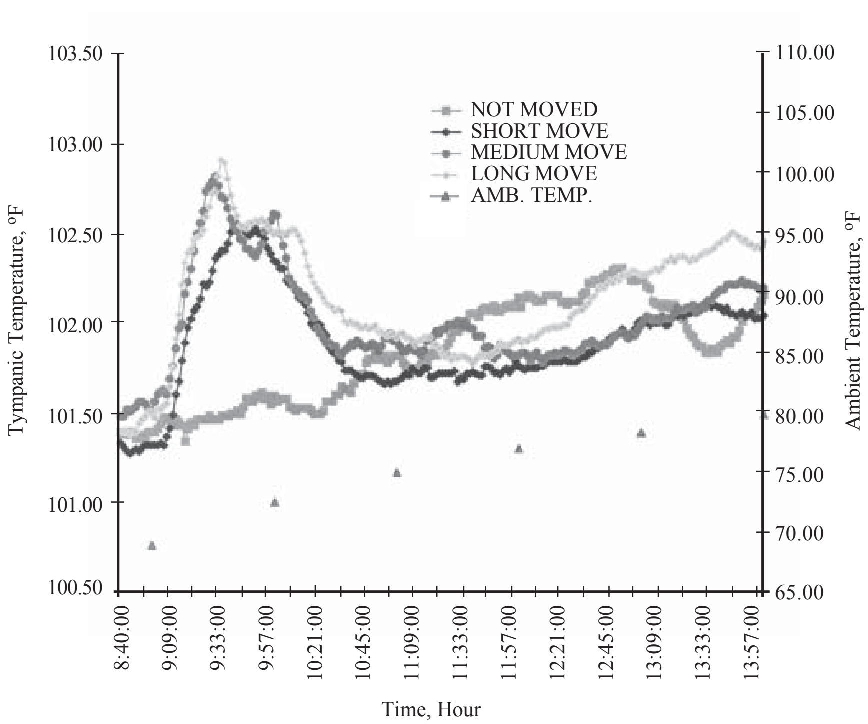

Figure 4. Tympanic temperatures of cattle moved through working facility in June. Cattle were moved approximate distances of 1,000 feet (short), 2,000 feet (medium) or 3,000 feet (long) around 0900 hour.

prevailing conditions before they resume normal eating and other behavior patterns. Also, during short moves, peak TT may occur after cattle are returned to the pen. During longer moves peak TT occurs while the cattle are being moved or possibly in the working facilities (Table 2). In addition, moving affects other post-move activities, which is dependent on distance cattle were previously moved. Particularly the percentage of cattle lying, standing, or at water varied with time of day and previous distance moved. Eating activity (head in bunk) tended to be reduced at 1000 and 1100 hour but increased by noon for cattle moved the farthest distance (Table 2). Interestingly, non-moved cattle were all resting (lying) by 1400 hour while only 33 to 36% of the moved cattle were resting.

Strategies are needed to reduce the detrimental effects of heat stress while maintaining animal productivity. In order to derive maximum benefit, livestock producers must be proactive in their decision-making and must be able to accurately assess the level of stress to which their animals are subjected. Minimal handling of cattle during hot days is a justifiable means to promote animal well-being and comfort. Adjustments for potential rise in body temperature, due to handling, may be needed when assessing animal health status.

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