IMPACT OF SOAKING COWS HOUSED IN A TUNNEL-VENTILATED, EVAPORATIVE-COOLED BARN IN THAILAND

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Summary

Ten multiparous lactating Holstein cows were arranged in a replicated 5 × 5 Latin Square design to evaluate the effect of soaking frequency and volume of water per soaking on lactating cows housed in a tunnel-ventilated and evaporative-cooled freestall barn. Rectal temperature, respiration rate, and body surface temperatures were measured every 5 minutes. Treatments were: control (C); soaking every 5 minutes with 0.26 gallons (5L); soaking every 5 minutes with 0.53 gallons (5H); soaking every 10 minutes with 0.26 gallons (10L); or soaking every 10 minutes with 0.53 gallons (10H). Average ambient temperature and humidity were 86.5ºF and 68% outside the barn, and 80.4ºF at 86% inside the barn, respectively. Water having a temperature of 80.6ºF was applied manually from the shoulder to the tail. Treatments were applied after three initial measurements were assessed. Seventeen measurements were made during treatment application and five measurements after the treatments were stopped. Air velocity over the shoulder of the cows was 4 mph. Respiration rate and body surface temperature for all treatments were less than those of the control, except for rear udder surface temperature in the 10L treatment. Rectal temperature for 5L, 5H, and 10H were less than those of the control. Respiration rate for 5L and 5H were less than that of 10L. These data indicate that soaking can be used in combination with tunnel ventilation and evaporative pads to reduce heat stress.

(Key Words: Heat Stress, Cooling Systems, Facilities.)

Introduction

Heat stress has a major impact on milk production, reproduction, and health of dairy cows. During periods of heat stress, feed intake may decrease 6 to 16%, compared with that of cows in thermo-neutral conditions. In addition to reduced feed intake, a 30 to 50% reduction occurs in the efficiency of energy use for milk production. Two strategies have been implemented to reduce heat stress, including providing a cooler environment (cooling the air) or soaking the cow and evaporating water off her skin surface (cooling the cow). A trial was completed in Thailand to evaluate the possibility of using a combination of providing a cooler environment and cooling the cow directly by evaporating water off her skin surface.

Experimental Procedures

Lactating dairy cows used in this trial were housed in a tunnel-ventilated freestall barn

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equipped with evaporative pads. The structure, located in Thailand, was 371 ft long, 52 ft wide, and had a ceiling height of 8.5 ft. The tunnel ventilation was powered by eleven 51-inch fans, and the air was pulled through 850 ft^2 of 6-inch pads. Approximately 322 gallons of water was circulated through the evaporative pads per hour. Air velocity over the shoulder of the cows was approximately 4 mph. Average ambient temperature and humidity were 86.5ºF and 68% outside the barn and 80.4ºF and 86% inside the barn, respectively.

Ten multiparous lactating Holstein cows producing an average of 90 lb of milk were arranged in a replicated 5 × 5 Latin Square design to evaluate the effect of soaking frequency and volume of water per soaking. The experiment was carried out in 5 periods between September 6 and 11, 2003, between 1:30 and 3:30 p.m. Rectal temperature, respiration rate, and body surface temperature (shoulder, thurl, and rear udder) were measured every 5 minutes. Treatments were: control (C); soaking every 5 minutes with 0.26 gallons (5L); soaking every 5 minutes with 0.53 gallons (5H); soaking every 10 minutes with 0.26 gallons (10L); or soaking every 10 minutes with 0.53 gallons (10H). Cows were restrained in headlocks and 80.6ºF water was applied manually from the shoulder to the tail. Treatments were applied after three initial measurements were made. Seventeen measurements were made during treatment application and five measurements were made after the treatments were stopped. Data were analyzed as a completely randomized block design by using the Mixed Model of SAS (SAS Inst. Inc., Cary, NC). The difference between control and treatment was separated by using the least-significant-difference procedure.

Results and Discussion

Results are presented in Table 1. Respiration rates and body surface temperatures for all treatments were less than those of the control, except for rear-udder surface temperature of 10L. Rectal temperature for 5L, 5H, and 10H were less than that of the control. Respiration rate for 5L and 5H were less than that of 10L. The changes in respiration rate, rectal temperature, and thurl surface temperature are presented graphically in Figures 1, 2,and 3.

The results at this trial indicate that there is potential to reduce heat stress in lactating dairy cows housed in evaporative-cooled freestall barns by adding automated feedline soakers. In this trial, cows did not have a choice whether they were soaked or not soaked. In a commercial setting, dairy cows can choose when they come to the feedline to be soaked. Additional research is needed to determine how to manage feedline soakers in evaporative-cooled barns on commercial dairies.

Table 1. Impact of Soaking Cows Housed in a Tunnel-ventilated, Evaporative-cooled Barn on Respiration Rate, Rectal Temperature, and Body Surface Temperature

	Treatment[1]					
	C	5L	5H	10L	10H	SE
Respiration rate, breaths/min	72.8[a]	51.0[c]	51.6[c]	59.3[b]	55.6[bc]	2.03
Rectal temp., ºF	101.3[a]	100.7[b]	100.7[b]	100.9[ab]	100.7[b]	0.12
Body surface temp., ºF						
Thurl	93.9[a]	89.6[c]	89.2[c]	90.7[b]	91.14[bc]	0.38
Rear udder	95.5[a]	94.3[b]	94.5[b]	95.0[ab]	94.6[b]	0.25
Shoulder	93.7[a]	89.8[bc]	89.4[c]	91.2[b]	90.9[b]	0.50

[abc]Means having different superscript letters within in row differ ($P \leq 0.05$).
[1]Treatments were: control (C); soaking every 5 minutes with 0.26 gallons (5L); soaking every 5 minutes with 0.53 gallons (5H); soaking every 10 minutes with 0.26 gallons (10L); or soaking every 10 minutes with 0.53 gallons (10H).

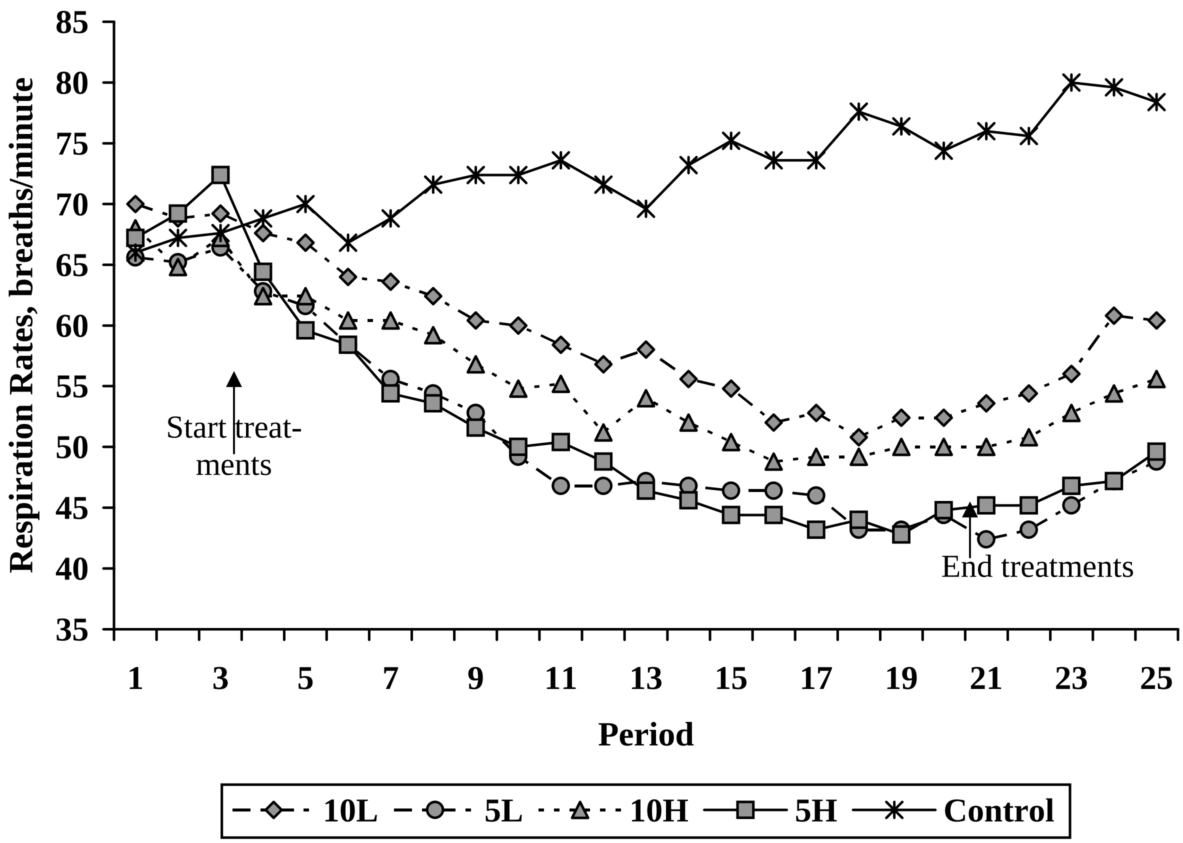

Figure 1. Impact of Soaking Frequency on the Respiration Rates of Cows Housed in Tunnel-ventilated Barns with Evaporative Pads (Thailand).

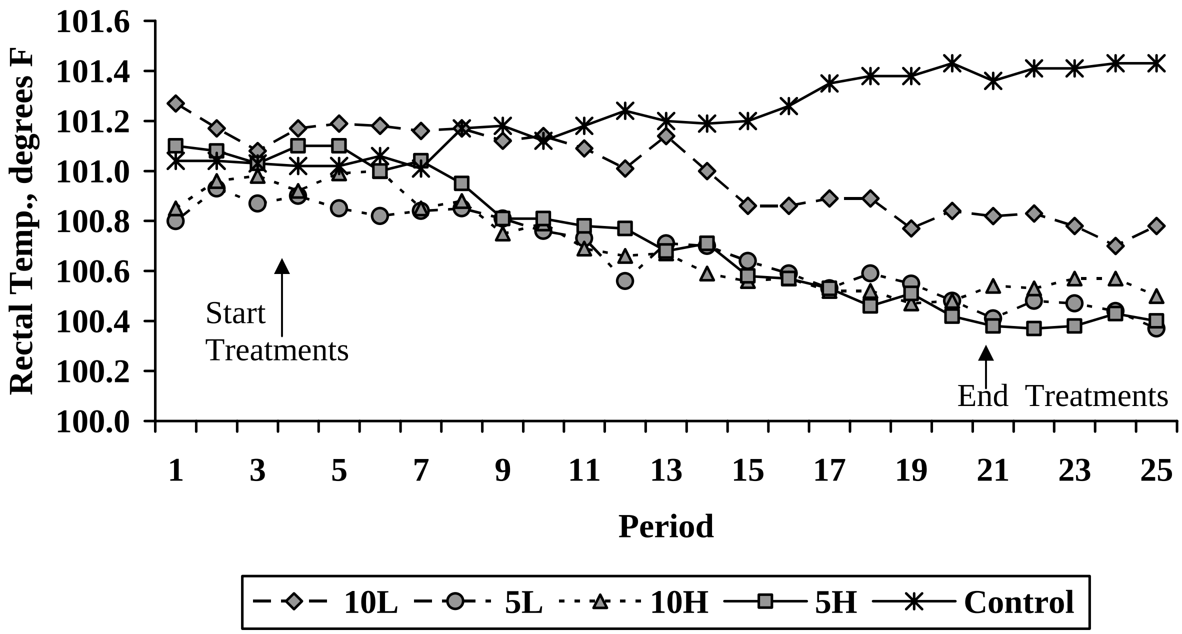

Figure 2. Impact of Soaking Frequency on the Rectal Temperatures of Cows Housed in Tunnel-ventilated Barns with Evaporative Pads (Thailand).

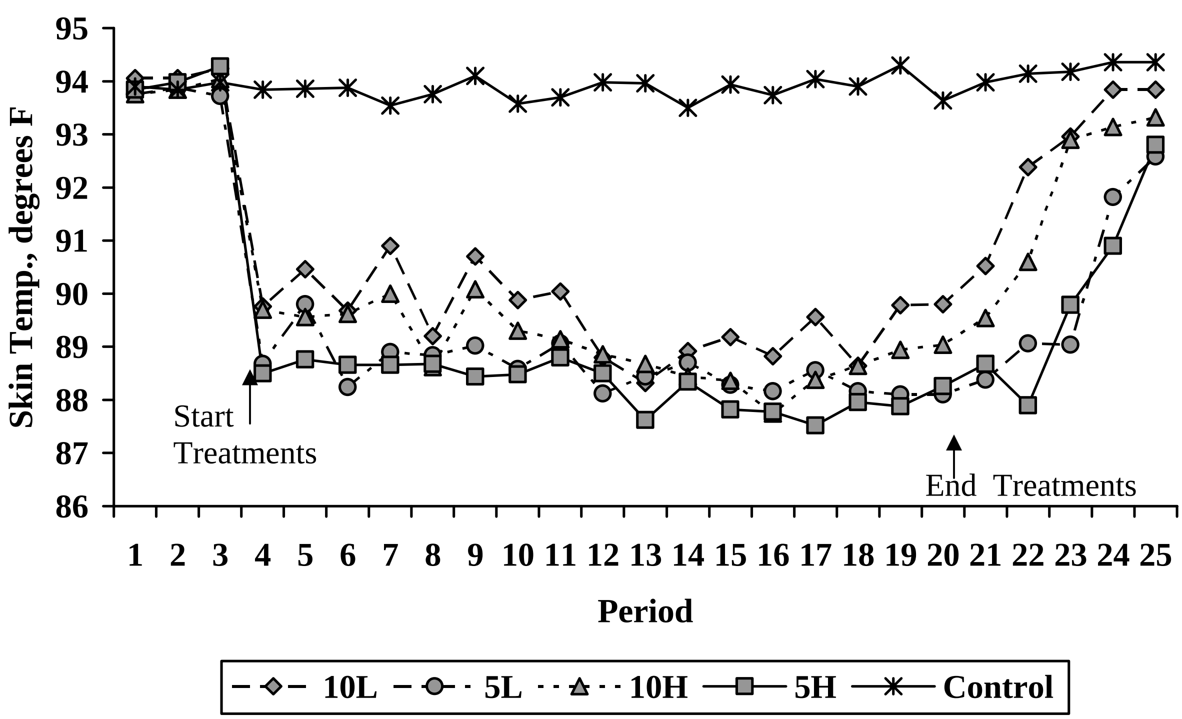

Figure 3. Impact of Soaking Frequency on Thurl Skin Temperature of Cows Housed in Tunnel-ventilated Barns with Evaporative Pads (Thailand).