Effects of temperature of consumed water on rumen temperature of beef cows

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STORY IN BRIEF

Pregnant, non-lactating, Angus cows (n = 9) were administered temperature recording boluses to determine the effect of temperature of consumed water on rumen temperature (RuT). After restriction of water intake for 21 h, cows were allowed access to 20 kg of water at 32°C (WARM), 16°C (COOL), or no water (CONTROL). The maximal decrease in Rut of COOL cows occurred at 0.5 h after consumption of water and RuT of WARM cows was not altered during the first hour of water consumption. After consumption of cool water, the nadir in RuT was 37°C. Rumen temperature of COOL cows was similar to the RuT of WARM cows at 2.75 h after consumption. Cows that did not consume water had greater RuT than COOL cows and WARM cows after treatment. Decreases in RuT after consumption of cool water can be identified by a 1.0°C decrease in RuT, which persists for at least an hour. Exclusion of RuT associated with water consumption from data sets should provide a more accurate assessment of RuT.

Key Words: beef cows, rumen temperature, water consumption, water temperature

INTRODUCTION

Core body temperature is useful to predict important physiological events in beef cattle. Rumen temperature is an effective measure of body temperature (Hicks et al., 2001) and may be used to predict disease, estrus, parturition and heat stress. Temperature can be obtained by placement of a temperature bolus in the rumen and recording of measurements by radio telemetry. The use of long lasting RuT boluses may be more efficient to monitor temperature compared with external devices. Several factors may impact the use of RuT for identification of physiological events. Consumption of cool water decreases RuT of dairy cows (Bewley et al., 2008). The objective of this study was to determine the influence of consumption of warm or cool water on RuT of beef cows.

MATERIALS AND METHODS

Angus (n=9) cows with a body condition score (BCS) of 5.0 ± 0.4, in mid gestation, were utilized to determine the effects of drinking warm or cool water temperature on RuT. The experiment was conducted from October 31 to November 5. Cows were administered a temperature bolus (Smart Stock, LLC) with a balling gun before the experiment. Boluses were programmed to record and transmit RuT, ID and time to a computer every 5 min. Animals were managed in a drylot at the Range Cow Research Center with ad libitum grass hay and water.

Cows were assigned to three, 3x3 Latin-squares. Each cow was exposed to each treatment with a minimum of 42 h between treatments. Prior to treatment water, feed and water intake were restricted for 21 h. Cows had access to 20 kg of 32°C (WARM) or 16°C (COOL) water for 20 min and the amount of water consumed in 20 min was recorded. CONTROL cows did not have

access to water during the experimental period and feed and water intake were restricted for all cows. Data for three cows (1 COOL and 2 WARM) that did not consume water during the experiment was excluded from analysis. The other 15 cows consumed all the water within 20 min. Ambient temperature ranged from 23 to 25 C during treatment (www.agweather.mesonet.org) from 2 d before to 2 d after completion of the treatments. Three 5 min temperature values were averaged for analysis. Data were analyzed using a mixed model (PROC MIXED, SAS Institute Inc., Cary, NC); the model included treatment, day, time and the interactions.

RESULTS AND DISCUSSION

Consumption of cool water decreased RuT ($p < 0.05$) within 0.5 h of consumption compared with WARM or CONTROL cows (Figure 1). WARM cows had decreased RuT ($P < 0.05$) compared with CONTROL cows at 2.0 to 3.75 h after consumption of water. The effect of WARM water on RuT may be caused by alteration of rumen function. Rumen temperature of COOL cows was at least 0.5°C less compared with WARM cows for 1.75 h after consumption of water. The maximum RuT decrease for COOL cows occurred at 0.5 h after consumption and ranged from 0.5 to 3.6°C. Bewley et al. (2008) also found that consumption of 5.1°C water decreased RuT of dairy cows, and RuT of cows that consumed 38.9°C water was not altered. Decreases in RuT in the beef cows that consumed COOL water in this experiment were of a smaller magnitude than those in beef steers (Dye, 2005) and dairy cows (Bewley et al., 2008). The differences in results between experiments could be related to size of animals, diet and the duration during which cows consumed water. In this experiment, water was consumed within 20 min and consumption durations for individual animals were not recorded. Our results demonstrate that the temperature of consumed water influences RuT of beef cows. Consumption of cool water results in a rapid decrease in RuT that persists for at least 2 h compared with consumption of warm water. Consumption of warm water had minimal impact on RuT. The effect of water consumption on RuT should be evaluated in development of models that use RuT to predict physiological events.

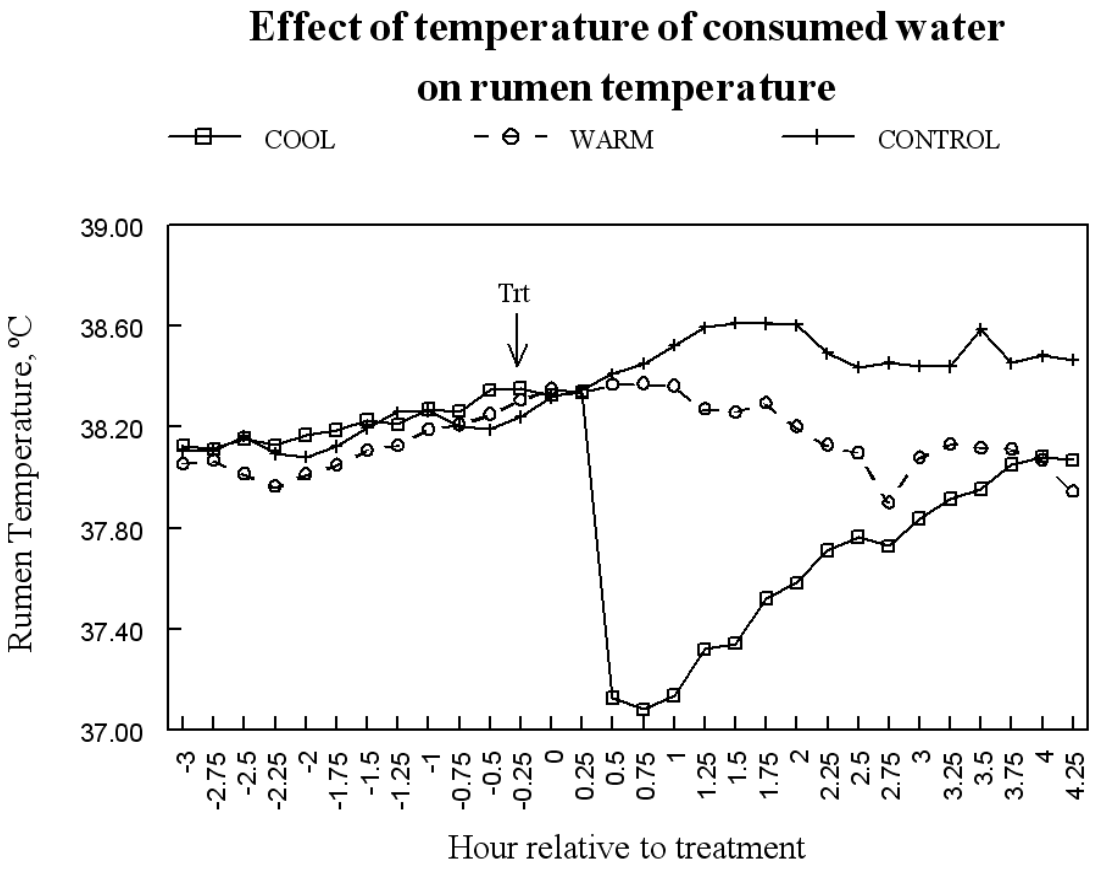

Figure 1. Mean rumen temperature (RuT) of cows that consumed warm, cool or no water.

Frequent monitoring of RuT may be a useful tool in beef cattle management. Prado-Cooper et al., (2008) and Bailey et al., (2009) found that RuT of beef cows decreased the day before parturition and increased at the onset of estrus. Utilization of RuT to predict health, estrus and parturition may be influenced by the consumption of cool water. This study provides information for the development of models to use RuT to accurately predict physiological events. Current studies will evaluate effects of feed intake on RuT in beef cows.

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