USE OF TELEMETRY TO EVALUATE THE IMPACT OF SUMMER HEAT STRESS ON CORE BODY TEMPERATURE OF CATTLE

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Exposure to summer heat stress in the absence of shade can have significant impact on thermal status of feedlot cattle, especially in Midwest, USA. Few studies have considered the direct impact of solar radiation on thermal status. Recent advances in telemetry technology provide continuous monitoring of core body temperature in a field environment, allowing for assessment of relationships with ambient endpoints. A 14-day study was conducted during peak summer heat to record core body temperature via radiotelemetry and simultaneously monitor ambient conditions. Twelve Angus × Simmental steers (533 kg average body weight; *Bos taurus*) were maintained in a feedlot environment without access to shade, and provided a typical finishing diet and water *ad libitum*. Core body temperature (Tcore) was continuously recorded for each animal using a telemetric temperature transmitter (CowTemp Model BV-010; Innotek, Inc.) in the peritoneal cavity. Data loggers (Hobo H8 Pro; Onset Computer Corp.) were used to record air temperature (Ta) and percent relative humidity, together with black globe temperature (BG) for assessment of radiant heat load. Both temperature-humidity (THI) and black globe temperature-humidity (BGTHI) indices were calculated using these recorded ambient values. Initial comparison of animal and environment values showed greater correlation between day values alone than day-night values combined. Therefore, all comparisons use averaged group values for day only. Daily high Ta and BG values ranged from 26-37 and 36-48°C, respectively, with lows for both values ranging from 14-27°C. High THI values reached danger - emergency zones from day 9 to 16. Likewise, Tcore exhibited a progressive increase from days 9 to 14. Breaking points for linear increases in Tcore for the entire study period were 23.5 and 31.8°C for Ta and BG values, respectively. Best-fit relationships between Tcore and all environmental variables, using all day values, were second-order polynomial regressions. Correlation (R) between Ta and Tcore was 0.85, and increased only to 0.86 with a 1 hour Tcore delay behind Ta. In contrast, R for BG and Tcore increased from 0.75 to 0.86 with a similar shift. Relationships between THI and BGTHI with Tcore improved when Tcore was shifted 2 hours behind the indices. Product values of Ta × BG and THI × BGTHI with Tcore yielded the highest R values (i.e., 0.89 - 0.90) when Tcore was shifted behind the environmental stressor index by 1 hour. These results indicate telemetric transmitters can be used to reliably predict changes in thermal status within the natural environment, and identifies that the best prediction is achieved with a 1-2 hour delay in core temperature behind changes in ambient thermal conditions.

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