UF-Gainesville Beef Cattle News Corner

Comparison of tympanic and tail temperatures in Angus and Brahman steers

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Background. Our group is interested in understanding the genetic control of thermotolerance in beef cattle. For the past 4-5 summers, we have been recording a large number of traits to describe thermotolerance on a large number of Bos Indicus influenced cattle. The most important measure to describe thermotolerance, or at least a good indicator of heat stress level, is core body temperature. Accurately recording core body temperature can be difficult and labor intensive. Besides being labor intensive, animals need to be restrained during the process. This presents additional challenges and expenses especially for beef cattle which are reared on pasture. Furthermore, restraining can cause stress and an increase in body temperature which results in inaccurate data. Recently, iButton data loggers have been used for monitoring internal temperature continuously. For heifers or cows, these data loggers can be used vaginally to record the body temperature continuously for several days by attaching the data loggers to a blank controlled internal drug release (CIDR). However, this type of data collection is restricted to female animals. In addition to vaginal temperature, body temperature can be measured internally or externally on different locations of an animal, such as rectum, ear, reticulorumen and on the forehead or udder surface. Temperature recorded in the ear canal is a very reliable indicator of internal core body temperature because the blood flowing through the vessels of the tympanic membrane comes from the branch of the carotid artery that also supplies the hypothalamus. One drawback of the tympanic temperature is the possibility of ear infections if recording is attempted over multiple days. Another option for continuous measurement of core body temperature over several days without disturbing the animal is using data loggers under the tail, however, there is very little information to date on the comparison of tympanic and tail body temperatures of beef cattle. Last year we set up an experiment to investigate the possibility to record body temperature in different ways. The main goal was to compare the recorded tympanic and tail body temperature measurements in beef cattle.

Methods. The study was conducted at the University of Florida Beef Teaching Unit (Gainesville, Florida). Angus (n=13) and Brahman (n=11) steers were used to determine the change in body temperature during one day while grazing on pasture. Body temperature was measured in the ear as tympanic temperature and under the tail as tail temperature using iButton dataloggers (**Figure 1C**). To measure the tympanic temperature, the iButtons were placed in the right ear and the ear canal was filled with cotton, then the ear was taped with self-adhesive bandages (**Figure**

1A). A string was attached to each iButton to facilitate recovery. For the tail temperature measurement, the iButtons were placed under the tail, covered with cotton and taped with self-adhesive bandages (Figure 1B). Tympanic and tail temperatures of the steers were measured every 15 min from 0600 hour May 21, 2019, to 1830 hour May 21, 2019.

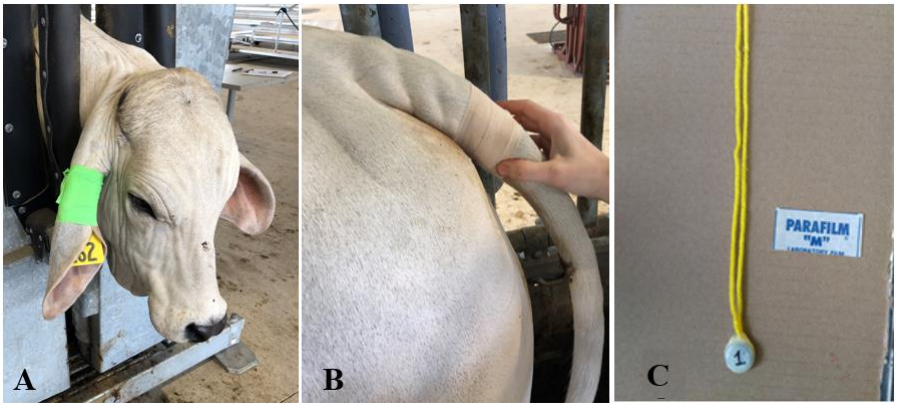

Figure 1. Tympanic (A) and tail (B) temperature data collection using iButton datalogger (C) covered with parafilm in Brahman steer.

Results. There was a significant breed effect (P=0.01), hour (P<0.0001) and breed by hour interaction (P<0.0001) for the tympanic temperature. Brahman steers, which are known to have superior thermotolerance, maintained a lower body temperature than the Angus steers during the afternoon under grazing conditions. In the Brahman steers there was only a minimal increase in the body temperature throughout the day, an evidence of the thermotolerance ability of the breed. In the Angus steers, which experienced an increase in their body temperature from hour to hour with a peak around 1600 hour; there was a significant difference between the tympanic and tail temperature during the times when the body temperature as measured by the tympanic recordings was the highest (1300 to 1700 hour).

Conclusions. Our results confirm the sensitivity of Angus cattle to environmental THI while the Brahman cattle showed a relatively constant body temperature throughout the study. Our study showed that tympanic temperature is higher than tail temperature in steers reared under grazing conditions when THI is high (Figure 2). While the tail temperature is easy to perform and can be used to monitor the body temperature of steers continuously, it is not an accurate measure of body temperature as it fails to accurately capture the increase in core body temperature. Tympanic temperature is a relatively easy measurement to perform and allows for a continuous measurement of body temperature in natural environment for up to several days and without disturbing the animal.

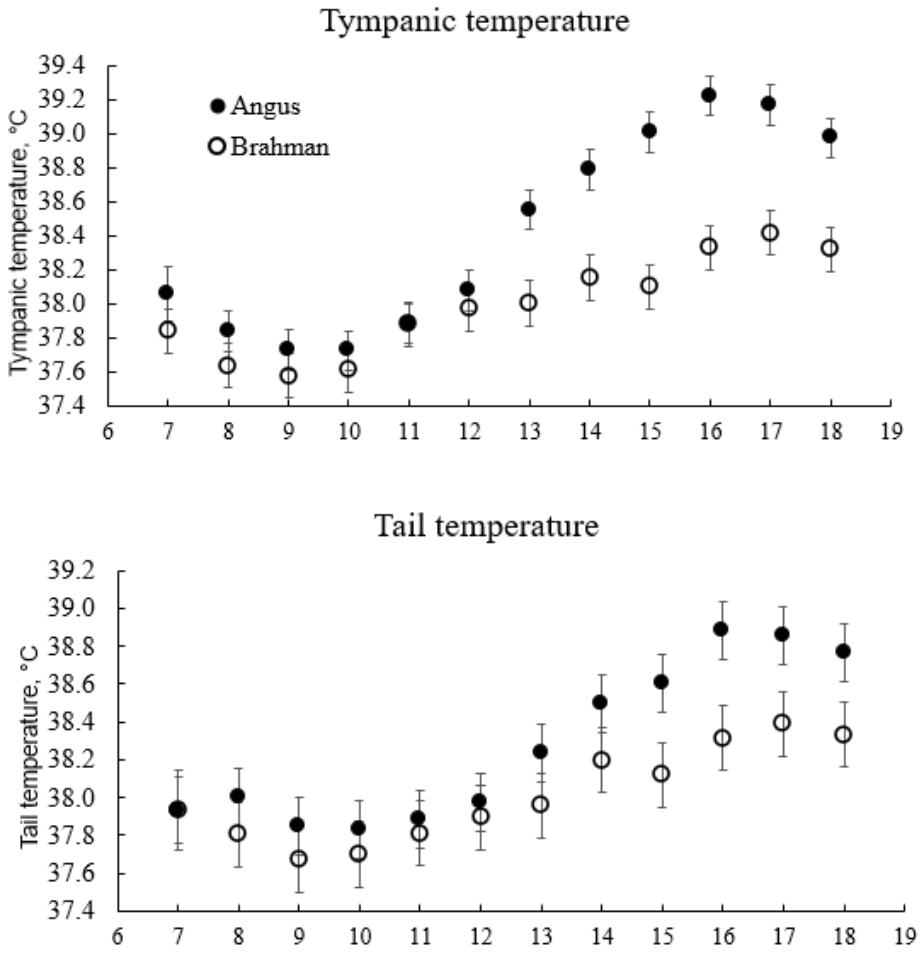

Figure 2. Means and standard errors for hourly average tympanic (top graph) and tail temperature (bottom graph) of Angus (closed circle) and Brahman (open circles) steers.