Body Temperature in Free-Roaming Beef Cattle

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Introduction Body temperature (BT) measurements are traditionally used in diagnosing sick animals, but may also be used as an indicator of stress or activity. Based on results of metabolism studies, Mader *et al.* (1999) reported that BT can vary as much as 0.9°C and can depend on metabolisable energy (ME) of the diet consumed. Acceptable measures of BT can be obtained from the rectum, vagina, or ear canal. Technologies are also being developed for continuously monitoring BT via radio-telemetry. The objectives of this study were to determine the effect of high concentrate (low fibre) versus high fibre diets on BT, assess the capabilities of obtaining BT in free-roaming cattle, and compare temperatures taken in the rumen with vaginal and tympanic temperatures.

Materials and methods Tympanic, vaginal, and ruminal temperatures were obtained from four, 400 kg crossbred heifers over two, four-day periods while being provided either a 10 MJ/kg high fibre (forage based) or a 13 MJ/kg, low fibre (non-forage based) diet. Heifers had a 400 m^2 roaming area and were allowed a ten-day acclimation period between periods before temperatures were monitored. Tympanic temperatures were recorded at 15-minute intervals using a Stowaway XTI® data logger (Onset Corporation, Pocasset, MA) and thermistor. The thermistor was inserted into the ear canal until the tip was near the tympanic membrane. Loggers, with thermistors attached, were secured to the inside of the ear. Vaginal and ruminal temperatures were recorded at hourly intervals using an ETD Bolus™ (CowTek, Inc., Santa Clarita, CA). Boluses were inserted into the rumen using a balling gun. Boluses were hand-placed inside the vagina, immediately behind the cervix. Boluses were activated via wireless signal.

Results To negate heat stress effects, the study was conducted during the winter in which temperatures averaged near 0°C. Over the two study periods, ruminal temperatures averaged 0.7°C greater ($P < 0.05$) than tympanic and vaginal temperatures (Table 1). Cattle consuming the high fibre diet had mean temperatures of 0.4°C (38.87 vs 39.27°C) lower ($P < 0.05$) than cattle consuming the low fibre diet. No diet by temperature measuring location interactions were found. However, diet by time of measure interactions were evident ($P < 0.10$) with mean temperature of cattle consuming the high fibre diet being 0.4°C lower (38.7 vs 39.1ºC; $P < 0.05$) in late morning (09.00 h) versus late evening (21.00 h) while cattle consuming the low fibre diet had only a 0.1º lower (39.2 vs 39.3ºC) BT in the morning. Although feed intakes are not known in the current study, the BT data agree with data previously reported by Mader *et al*. (1999) which were obtained from cattle fed in metabolism stalls. In these studies, cattle fed low fibre diets had 0.4ºC greater BT during the 4-day hot period than cattle fed diets containing intermediate fibre levels, even though ME intakes for both groups, prior to the hot period, were equivalent at 82 MJ/head per day.

Table 1 Location of measurement and fibre level effects on mean daily body temperature*

Diet:	Low Fibre			High Fibre		
Location:	Tympanic	Vaginal	Ruminal	Tympanic	Vaginal	Ruminal
Temperature, ºC	39.0	39.0	39.8	38.6	38.7	39.3

*Fibre levels differ ($P < 0.05$); tympanic and vaginal measures differ from ruminal measures ($P < 0.05$)

Conclusion Tympanic, vaginal, and ruminal temperatures were all found to be acceptable measures of BT in free-roaming cattle, however ruminal temperatures would overestimate core BT. The greater ruminal temperatures can most likely be attributed to fermentation effects. Cattle BT can be influenced by diet ME content. Cattle consuming diets with higher ME are likely to have greater core BT, which will probably influence their susceptibility to health and climatic heat stress challenges.

References

Mader, T.L., J.B. Gaughan & B.A. Young (1999). Feedlot diet roughage level for Hereford cattle exposed to excessive heat load. *The Professional Animal Scientist*, 15 (1), 53-62.