Evaluation of Rumen Temperatures in Commercial Feedlot Cattle

T.K. Dye and C.J. Richards

Story in Brief

The continued advancements in technology have resulted in potential methods of tracking an animal electronically and determining its health status. Temperature boluses that remotely transmit an animal's core body temperature are not only being tested for research purposes, but may be applicable to a feedlot production operation. The traditional method of determining an animal's core body temperature by moving it to a chute and recording its rectal temperature is the most accepted method of confirming an animal's health status in the feedlot. However, the potential exists to continually monitor an animal's temperature while it is in the pen. Determining whether remote monitored rumen temperature boluses are feasible in a commercial feedlot operation will be beneficial in determining the new technology's efficacy in the beef industry. The objective of this study was to determine the read rate, normal temperature range and rumen temperature in relation to ambient temperature of rumen temperature boluses in steers in a commercial feedlot. This research concluded remote monitoring rumen temperature boluses can be integrated into a commercial feedlot operation and there is a positive correlation between rumen temperature and ambient temperature from March to July.

Key Words: Feedlot Cattle, Rumen Boluses, Temperature Monitoring

Introduction

Disease occurrences and outbreaks cost the feedlot industry millions of dollars a year due to cost of treatment, labor and reductions in cattle performance and reduced carcass merit. Developing a method of detecting an animal's core body temperature, remotely, could be advantageous to the feedlot industry in treating the illness and preventing further outbreak. Electronically monitoring an animal's core body temperature has been used for research purposes, but little to no testing of remote temperature monitoring devices has been performed in commercial feedlot situations. When considering new technologies in the livestock industry, prototype testing with a few animals is not always applicable to commercial livestock operations.

Most illnesses in cattle are currently detected by visual symptoms and then verified by determining an animal's core body temperature with a rectal thermometer. However, this requires the animal to be sorted from a pen, moved to a handling facility and restrained in a chute. Remote monitored rumen temperature boluses could decrease the need for rectal temperature measurements, thereby, decreasing stress and labor associated with movement of the animal for health evaluation. This study evaluates the applicability and provides base line data for utilizing a remote temperature monitoring bolus in the feedlot industry.

Materials and Methods

Animals and Data Collection. This study was conducted at Harry Knobbe Feedyard in West Point, Nebraska. Ninety-six total steers were utilized in two adjacent pens measuring 43' X 34' and 41' X 34'. Cattle were housed in completely covered pens, open on all four sides, with

slotted floors. Temperature boluses (Figure 1; Smartstock, LLC, Pawnee, OK) were orally administered prior to March 16, 2006 using a custom made balling gun (Figure 2). The boluses remained in the animals and transmitted reads until June 21, 2006 or July 5, 2006, depending on when cattle were harvested. Only 46 animals were included in the dataset past June 22, 2006. Temperature transmitted from the bolus every 20 min to a remote data station via one receiver located between the two pens. Data was continuously recorded in real time and displayed on an on-site computer where the temperature, animal identification, date and time could be viewed and saved. Average, minimum, maximum and range of rumen temperatures were determined for each animal for each day (SAS, SAS Institute, 2003). Frequency of reads received for each animal for each day was also determined (SAS, SAS Institute, 2003). Maximum daily ambient temperatures for West Point, Nebraska were obtained from the local weather station. Maximum daily ambient temperatures were compared to average maximum daily animal temperatures using a best fit regression line. For this study, no comparisons were made to health data because few animals were pulled and treated.

Figure 1. Rumen temperature bolus measures approximately 3.25 inches long and 1.25 inches in diameter.

Figure 2. Balling gun used to administer rumen temperature boluses.

Results and Discussion

Temperature data was used for 89 of the 96 animals administered boluses. The reasons for not using the data from the remaining boluses included: temperature reads were never received from the bolus, the bolus stopped reading shortly after being administered or the temperature readings from the bolus were abnormally high or low indicating the bolus had malfunctioned. For the 89 animals from March 16th, 2006 to June 5th, 2006, 130,763 temperature readings were recorded. The minimum number of reads per animal per day was one with the maximum number of reads per animal per day of 54. The average number of reads for each animal was 20 per day. The minimum and maximum rumen temperature was 86.9°F and 108.0°F, respectively. The low minimum rumen temperature may be contributed to water events. It was apparent the colder water during the winter months had a greater effect on decreasing the rumen temperature than did the water during the summer months. The average rumen temperature was 102.5°F ± 1.9.

With the changing of Nebraska temperature from March to July, it is beneficial to evaluate the effects of ambient temperature on rumen temperature in a commercial feedlot. The correlation of ambient maximum temperature and rumen maximum temperature average can be seen in Figure 3. The relatively moderate R^2 could be attributed to the animal's housing conditions as they were not subject to direct sunlight or the effects of a drop in temperature caused by inclement winter weather and snow.

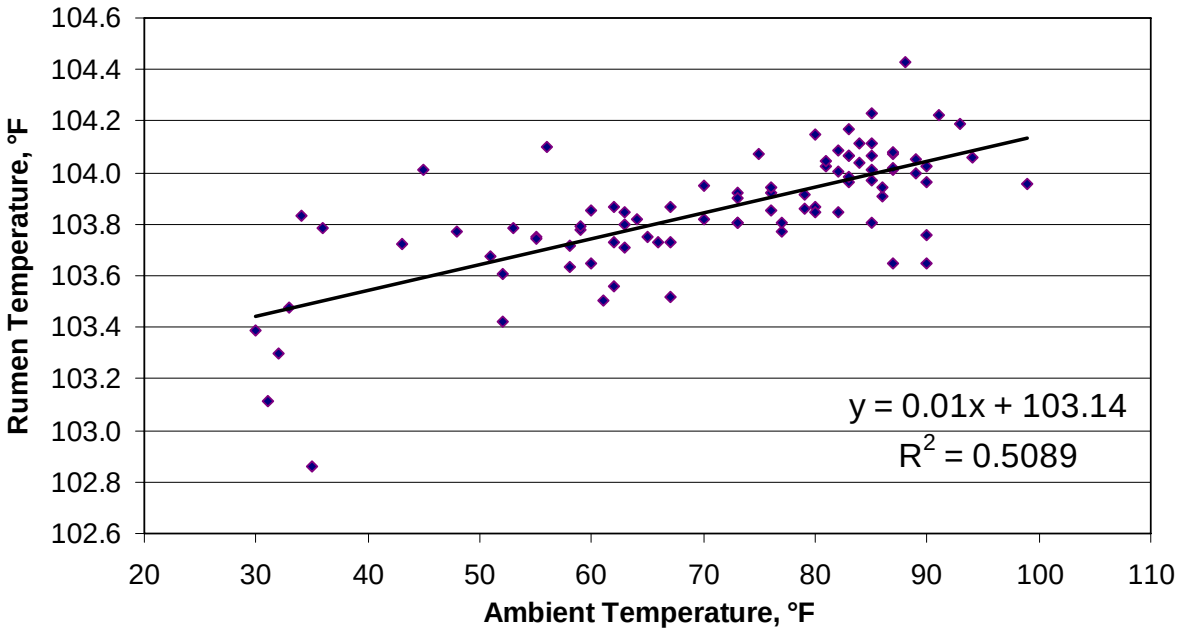

Figure 3. Comparison of daily rumen maximum temperature average of commercial feedlot cattle vs ambient maximum temperature from March 16, 2006 to July 5, 2006.

The purpose of this study was to evaluate the ability to integrate the use of remote monitoring rumen temperature boluses and its equipment in a commercial feedlot without disrupting normal activity. In a study performed by Dye et al. (2007), it was determined that remote monitoring rumen temperature boluses were successful in detecting an increase in core body temperature when animals were subject to an immune challenge. If boluses can be integrated into a feedlot system they could aid in determining health status and disease occurrences. The rumen bolus average read rate of 20 reads per animal per day would be a considerable amount of data in a production setting and could allow a producer to determine if an animal's temperature had risen resulting from a disease or stress event. Average rumen temperature of 102.5°F in this study agrees with literature (Dye et al., 2007) of 102.3°F average temperature in control and disease challenged animals in a more controlled environment. A rise in ambient temperature causes a rise in core body temperature during the day because heat-gain from solar radiation and metabolism exceeds heat-loss from radiation, convection and evaporation (Finch, 1986). However, Finch (1986) also stated core body temperature has the ability to decrease at night as the stored heat dissipates back into the environment. Heat retention and loss and an animal's range of core body temperature can ultimately affect its performance (Finch, 1986). This study agrees with Finch (1986), as there was a positive correlation between ambient temperature and rumen temperature from March to July. As ambient temperature increases in the summer

months with less time to dissipate heat during the presumably cooler nights, rumen temperature maximum increases.

Conclusion

This study suggests a remote monitoring rumen temperature bolus system could be integrated into a feedlot setting without added labor and has the possibility of being advantageous for relating a rise in core body temperature to adverse health events. More research needs to be completed to determine the effect fermentation and water intake have on rumen temperature, the economic feasibility of this technology in the feedlot industry and its ability to detect an increase in core body temperature prior to the onset of clinical signs of a disease.

Literature Cited

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Authors

Dye, T.K. – Graduate Student

Richards, C.J. – Assistant Professor, Animal Science