Meat and Muscle Biology™

Evaluation of Beef Cattle Temperament Attributes Using Infrared Thermography Technology

W. P. Ogdahl[1]*, J. Young[1], J. Frandrup[1], L. L. Hulsman Hanna[1], and X. Sun[2]

[1]Animal Sciences, North Dakota State University, Fargo, ND, USA
[2]Agricultural and Biosystems Engineering, North Dakota State University, Fargo, ND, USA
*Corresponding author. Email: william.ogdahl@ndsu.edu (W. P. Ogdahl)

Objectives

The objective of this study was to evaluate beef cattle temperament scores using infrared thermography technology.

Materials and Methods

Angus and Angus × Hereford calves (total $n = 650$) were brought through a handling chute system over two weaning sessions (October 2016 and 2017). Beef cattle temperament was subjectively quantified by (1) temperament score (TS), the disposition of the animal observed by an individual evaluator on a scale of 1 (calm) to 5 (excitable); (2) docility score (DS), the level of observed calmness of the animal displayed (1 = calm to 6 = excitable); and (3) qualitative behavior assessment (QBA), scored on twelve different attributes, (i.e., active, relaxed, etc.). There were two traits measured on a four-platform standing scale: (1) the standard deviation of total weight over time (SSD); and (2) the SSD's coefficient of variation (CVSSD). Thermal images of the animal's head were acquired by industrial fixed focus infrared camera (TiS40, Fluke Corporation, Everett, WA). The maximum, minimum, average, and standard deviation of temperature of the eye region were extracted from the thermal images. Stepwise and linear regression analyses to estimate subjective temperament traits from thermal imaging data and scale data were conducted using the reg procedure in SAS (v. 9.4, SAS Institute, Inc., Cary, NC). Correlations were estimated using the corr procedure in SAS.

Results

The results showed low correlations between thermal imaging and subjective temperament traits. The correlations that were significant were around an absolute value of 0.1. However, all four thermal imaging traits were significantly correlated when the animal exhibited distress observed by QBA. When fitting only thermal imaging data into the regression analyses, R2 values were all under 0.03. When including SSD and CVSSD, there were a few traits with an $R^2 > 0.1$ and none having an $R^2 > 0.15$. The QBA traits that had an R^2 between 0.1 and 0.15 were active, fearful, calm, apathetic, happy, and distressed for both linear and stepwise regressions.

Conclusion

Additional validation research on this thermal imaging technology needs to be conducted with temperamental cattle as this current data was collected using observed calmer cattle, to give a more realistic application to beef cattle production. Overall this result shows potential to achieve beef cattle temperament evaluation with thermal imaging.
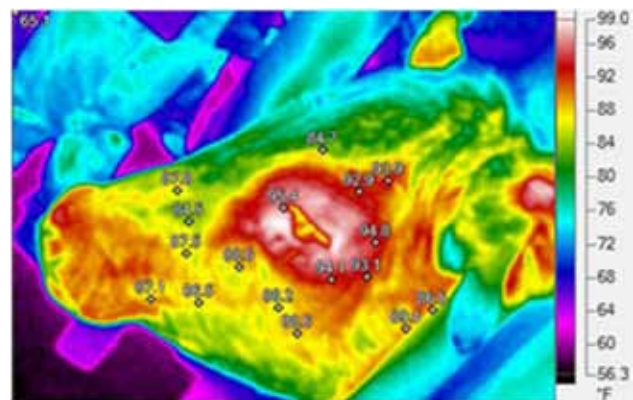

Figure 1.