The Professional Animal Scientist 30 (2014):597–601; http://dx.doi.org/10.15232/pas.2013-01285


# Comparison of real-time ultrasound measurements for body composition traits to carcass and camera data in feedlot steers

**F. R. B. Ribeiro,[1] PAS, A. J. Thompson, S. N. Aragon, A. D. Hosford, J. E. Hergenreder, M. A. Jennings, and B. J. Johnson**

Department of Animal and Food Sciences, Texas Tech University, Lubbock 79409

## ABSTRACT

*The objective of this experiment was to compare measurements of real-time ultrasound (RTU), carcass and camera data used to determine body composition in feedlot steers (n = 69). Measurements of RTU were taken 24 h before slaughter. The RTU-measured traits consisted of twelfth and thirteenth rib back fat thickness, twelfth and thirteenth LM area, and marbling score (uMARB). Intramuscular fat was converted to uMARB by the equation* $uMARB = \{[769.7 + (56.69 \times uIMF)]/100\} - 5$*. Overall means for 48-h chill carcass data were twelfth and thirteenth rib back fat thickness, twelfth and thirteenth LM area, and marbling score (cMARB). Marbling scores were converted to a numeric cMARB (*$Slight^{00} = 4$*,* $Small^{00} = 5$*, and* $Modest^{00} = 6$*). Carcass camera data consisted of twelfth and thirteenth rib back fat thickness, twelfth and thirteenth LM area, and marbling score. Data were analyzed using the PROC REG, MEANS, and CORR procedures of SAS. Results show that all 3 methods were highly correlated to each other. Correlations ranged from 0.79 to 0.82, 0.68 to 0.95, and 0.57 to 0.87 for back fat, LM area, and marbling score, respectively. Carcass back fat and twelfth and thirteenth rib back fat thickness were over-predicted by RTU (0.06 and 0.07 cm, respectively); however, LM area was under-predicted by RTU when compared with carcass and camera twelfth and thirteenth LM area (−0.78 and −1.13 cm*$^2$*, respectively). Camera marbling score was over-predicted by uMARB (0.17) and cMARB was under-predicted (−0.32). These results indicate that RTU can be used to predict carcass traits before slaughter. Also, linear measurements of carcass traits can be more accurately predicted when compared with a nonlinear measurement.*

**Key words:** camera, carcass, steers, ultrasound

## INTRODUCTION

The use of real-time ultrasound (**RTU**) to assess body composition in livestock animals dates back to the 1950s (Temple et al., 1956). Since then several researchers have reported of the accuracy and benefits of the use of RTU (Wilson, 1992; Greiner et al., 2003; Ribeiro and Tedeschi, 2012). The benefits of using RTU in beef cattle are that it is a noninvasive technique, it is fairly inexpensive, and it is fast; likewise, it is a more objective way of assessing body composition than live evaluation. Currently RTU can measure back fat thickness (Greiner et al., 2003; Ribeiro et al., 2008; Hughes 2012), LM area (Greiner et al., 2003; Ribeiro et al., 2008; Hughes 2012), and percentage of intramuscular fat (Herring et al., 1998; Hassen et al., 2001); RTU has also been used to try and predict body composition early in the finishing phase (Wall et al., 2004; Rhoades et al., 2009). Most recently Ribeiro et al. (2008) and Ribeiro and Tedeschi (2012) developed a new technique to assess total internal fat in beef cattle. There is no available literature comparing RTU and camera, and limited information on carcass measurements to predict camera measurements of beef carcass (Cannell et al., 1999;

[1] Corresponding author: flribeiro@pvamu.edu

Steiner et al., 2003; Moore et al., 2010). As camera data should become more widely used in the beef industry, we need to make sure that RTU of carcasses are able to predict them. Also, RTU is a great tool to help feedlots sort cattle into more uniform lots to avoid discounts of excessively fat carcass and maximize premiums through higher QG and lower YG. Therefore, the objective of the current experiment was to evaluate the accuracy of RTU predictions of carcass and camera data and the accuracy of carcass data to predict camera data in beef cattle.

# MATERIALS AND METHODS

All procedures involving live animals were approved (#12047–06) by the Texas Tech University Animal Care and Use Committee.

## *Animal and Diet Description*

Data for this experiment was obtained from British × Continental crossbred steers (n = 69) that were fed at the Texas Tech University Beef Center in New Deal, Texas. Steers were fed a 90% concentrate finishing diet for 55 d. These steers were used in an experiment that was looking at the influence of yeast cell wall supplementation during the finishing phase (Aragon, 2013).

Cattle were fed once daily in the morning (0900 to 1000 h) and feed delivery was adjusted to provide ad libitum access to feed while reducing waste. Feed was mixed and delivered daily in a pull-type Rotomix feed wagon (Dodge City, KS). Cattle were fed a 90% concentrate diet throughout the experiment. Treatments were top-dressed in feed bunks daily at a rate of 5.0 g of yeast cell wall per steer.

Zilpaterol hydrochloride (Zilmax, Merck Animal Health, Summit, NJ) supplementation began on d 30 of the experiment and continued for the following 20 d. The mixing ratio ensured that when the type B premix was included at a rate of 0.5% of dietary DM, it would provide 8.3 mg of zilpaterol hydrochloride/kg of dietary DM. Zilpaterol hydrochloride was excluded from the diet starting on d 50 and all bunks were cleaned of refusals that morning to ensure the proper withdrawal (minimum 3 d) period was allowed.

On d 55, BW was measured individually using a Silencer squeeze chute (Moly Manufacturing Inc., Lorraine, KS; accuracy ± 0.5 kg), ultrasound measurements collected, and steers were returned to their home pens. The following morning, steers were loaded onto 2 trucks and sent to harvest at Tyson Fresh Meats Inc. (Amarillo, TX).

## *Ultrasound Measurements*

The RTU measurements were taken 24 h before harvest. Real-time ultrasound measurements consisted of twelfth and thirteenth rib back fat thickness (**uBF**), twelfth and thirteenth rib LM area (**uLMA**), and percentage of intramuscular fat (**uIMF**). Images were collected by an Ultrasound Guidelines Council field-certified technician using an Aloka 500V instrument with a 17-cm, 3.5-MHz transducer (Aloka Co. Ltd., Wallingford, CT). Images were stored using the CUP Lab UICS Software (CUP Lab Walter Associates LLC, Ames, Iowa) and interpreted by the National CUP Lab in Ames, Iowa. Ultrasound measurements of IMF were converted into marbling score units (**uMARB**) using the linear equation uMARB = {[769.7 + (56.69 × uIMF)]/100} – 5, reported by Wilson et al. (1998).

## *Carcass and Camera Measurements*

After harvest, the carcasses were chilled for 48 h before carcass data were collected by trained Texas Tech University personnel; data consisted of HCW, twelfth and thirteenth rib back fat thickness (**cBF**), twelfth and thirteenth rib LM area (**cLMA**), and degree of marbling. Camera data were also collected by plant personnel and consisted of twelfth and thirteenth rib back fat thickness (**camBF**), twelfth and thirteenth rib LM area (**camLMA**), and degree of marbling. Carcass and camera degree of marbling were converted to a numeric carcass and camera marbling score (**cMARB** and **camMARB**, respectively) with 300 = 4, 400 = 5, 500 = 6, and 600 = 7 (Wilson et al., 1998). There were 2 carcasses that did not have camera data, therefore only 67 camera data points.

## *Statistical Analysis*

All statistical analyses were performed using the PROC GLM and PROC REG of SAS (SAS Inst. Inc., Cary, NC). Prediction equations were developed regressing carcass and camera data with RTU data and camera data with carcass data.

# RESULTS AND DISCUSSION

Table 1 shows the summary statistics of RTU, carcass, and camera measurements. There were some variation in back fat thickness, with values ranging from 0.10 to 2.74 cm. Measurements of back fat thickness were over-predicted by uBF (0.06 and 0.07 cm for cBF and camBF, respectively), which could be explained by the use of hide pullers in commercial plants that have a tendency to remove some of the fat with the hide. Herring et al. (1994) reported that the accuracy of back fat thickness is affected by hide pullers. Measurements of muscle area and marbling were also different between the 3 methods of assessing carcass traits.

Most research comparing RTU with carcass or carcass and camera are reported using correlation coefficients. Correlation coefficients have some limitations in regard to accuracy; for instance, population variation influences correlation coefficients and does not account for bias (Houghton and Turlington, 1992). To compare our results with available data, we used correlations (Table 2); however, we also reported bias and standard error of the prediction (Tables 3 and 4).