FEED EFFICIENCY IN GROWING STEERS: RELATIONSHIPS BETWEEN EFFICIENCY AND CARCASS ULTRASOUND TRAITS

C. R. Branton¹, E. G. Brown¹, and G. E. Carstens²
Department of Agriculture
¹Stephen F. Austin State University, Nacogdoches, TX
²Texas A&M University, College Station, TX

Abstract
Phenotypic correlations between feed efficiency and carcass traits were examined in growing steers. Two feed efficiency trials were conducted using 233 Santa Gertrudis steers. Steers were individually fed a roughage-based diet for 77 days. Individual feed intake was recorded weekly and body weight was measured b-weekly. Ultrasound measurements of the 12th rib fat thickness (back fat), longissimus muscle area (REA) and percentage intramuscular fat were taken on day 0 and 77. Residual feed intake (RFI) is a measure of feed efficiency that attempts to measure variation in feed intake beyond that needed for growth and maintenance. Residual feed intake was calculated as the difference between actual feed intake and expected feed intake predicted by a linear regression model of dry matter intake (DMI) on mid-test BW² (MBW) and average daily gain (ADG) with trial x MBW, and trial x ADG as random effects. Steers were ranked by RFI in low, medium, and high groups. Results indicate that RFI was negatively correlated with DMI (r = -0.76), and FCR (r = -0.49), but not with MBW or ADG. To examine phenotypic correlations between feed efficiency and carcass ultrasound traits in growing steers.

Materials and Methods
Two trials were conducted with Santa Gertrudis steers (n = 233) during which steers were fed a roughage-based diet (2.1 Mcal ME/kg DM) during the growing phase.

- Steers were weighed at 14-16 intervals and DMI measured (Calan gate or GrowSafe) for 70 d during both the growing.
- Ultrasound measurements of the 12th rib fat thickness (BF), longissimus muscle area (REA), and percentage intramuscular fat (IMF) were taken on day 70.

Citations and Statistical Analysis:
- Partial correlation and least squares means were determined using PROC CORR and mixed models of SAS.

Results
- FCR was negatively correlated (P < 0.05) with ADG (r = -0.70).
- RFIp was positively correlated (P < 0.05) with DMI (r = 0.76) and FCR (r = 0.49).
- RFIc was positively correlated (P < 0.05) with DMI (r = 0.75) and FCR (r = 0.49).
- Gain in BF was positively correlated (P < 0.05) with RFIc (r = 0.14).
- Gain in REA was not correlated (P > 0.05) with FCR, RFIp, or RFIc. The Spearman rank correlation between RFIp and RFIc was high (r = 0.91). Results suggest that RFI is independent of growth rate and mature size, but related to DMI. Selecting for favorable RFIp phenotypes can potentially improve feed efficiency in cattle. Adjusting RFI for ultrasound carcass traits could also improve feed efficiency independent of growth, body size, and carcass composition.

Introduction
Past attempts to quantify feed efficiency in beef cattle has been accomplished through feed conversion ratio (FCR), a gross measure of feed efficiency not accounting for feed needed for maintenance and growth. An alternative measure of feed efficiency is residual feed intake (RFI), which attempts to measure variation in feed intake beyond that needed for growth and maintenance. Residual feed intake (RFI) has been shown to be moderately heritable (Herd et al., 2003) and genetically independent of BW and ADG (Arthur et al., 2001). It has been observed that more feed efficient animals have reduced daily feed activity as compared to less efficient animals (Golden et al., 2008). Selecting for RFI will improve feed efficiency without increasing growth rate and mature size of the animal (Baker et al., 2006; Johnson et al., 2002). Phenotypic correlations show that RFI has little or no influence on growth or longissimus muscle area, and only displays a slight decrease in subcutaneous fat depth. Thus, selecting animals based on RFI is unlikely to exhibit undesirable responses in performance traits of growing animals (Arthur et al., 1997).

Objectives
- To characterize feed efficiency traits in growing steers.
- To examine phenotypic correlations between feed efficiency and carcass ultrasound traits in growing steers.

Conclusion
Results in this study indicate that RFIp is independent of growth rate and mature size, but highly correlated with DMI. Selecting for favorable RFIp phenotypes has the potential to improve feed efficiency in cattle. Adjusting RFI for ultrasound carcass traits could also improve feed efficiency independent of growth, body size, and carcass composition.