

Evaluation of real-time ultrasound to predict pre-harvest market endpoints in serial slaughtered British x Continental steers administered an E2+TBA implant treatment vs non-implanted controls



B. B. Grimes*, T. L. Perkins[‡], F. R. B. Riberio[§], T.J. Kirkpatrick*, K. R. Wesley*, S. L. Pillmore*, K. B. Cooper*, F. L. Francis*, M. D. Garrison[±], T. C. Tennant*, W. T. Nichols[†], J. P. Hutcheson[†], and T. E. Lawrence*

*Beef Carcass Research Center, [‡]West Texas A&M University, Canyon, TX 79016; [§]Prairie View A&M University, Prairie View, TX 77446; [±]Performance Cattle Company, LLC, Amarillo, TX 79124; [†]Merck Animal Health, Madison, NJ 07940

Introduction

Ultrasound benefits:

- ✓ **Non-Invasive**
- ✓ **Determine carcass value pre-harvest**

- Ultrasound has been shown to represent the actual carcass outcomes as measured in the live animal (Williams, 2002).
- We hypothesized that measuring the terminal variables on live steers utilizing B Mode ultrasound would correlate to carcass outcomes including:

- **Marbling (MARB)**
- **12th rib fat thickness (FTC)**
- **Longissimus muscle area (LMAC)**

Methods

Animals

- Charolais x Angus steers (n=80)
- 378 d feeding period

Experimental Design

- Balanced incomplete block design
- Animal as experimental unit

Slaughter & Grading

- Steer pairs (REV or CON) were randomly assigned to 1 of 10 harvest dates: d 0, 42, 84, 126, 168, 210, 252, 294, 336, and 378 DOF.
- 8 steers (4 pairs) were harvested every 28 days.

Ultrasound

- Aloka 500 device
- Certified Ultrasound Guidelines Council (UGC) technician

Outcomes

- **12th rib fat thickness (FTU)**
- **Longissimus muscle area (LMAU)**
- **Percentage intramuscular fat (%IMFU)**
- **Marbling score → 40 = Small⁰⁰**

Statistical Analysis

- Analyzed via MIXED models
- Pearson correlation coefficients

Treatments

- **CON** – Received no growth-promoting implant
- **REV** – Received Revalor-XS on d 0 & d 190

Results

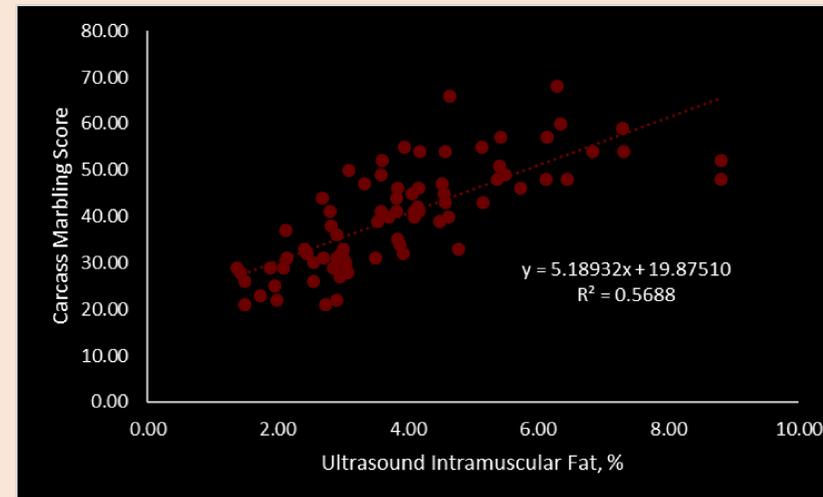


Figure 1. Relationship of ultrasound intramuscular fat percentage to visual marbling.

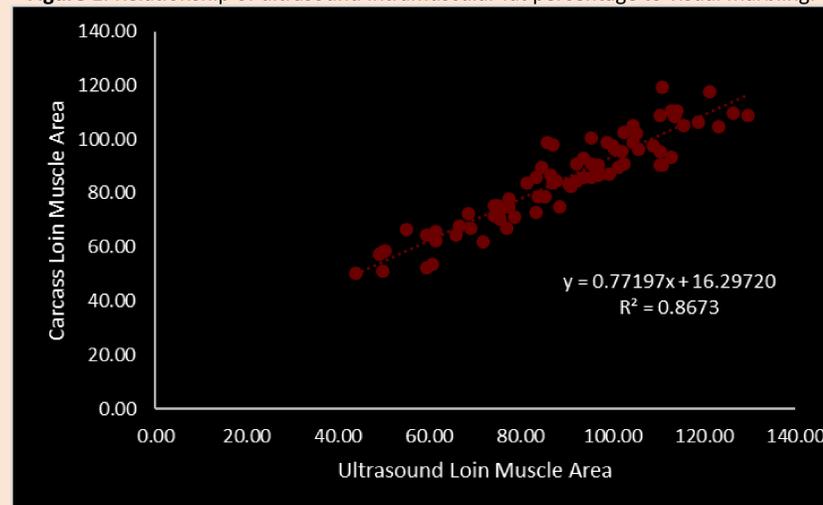


Figure 2. Relationship of ultrasound loin muscle area to carcass loin muscle area.

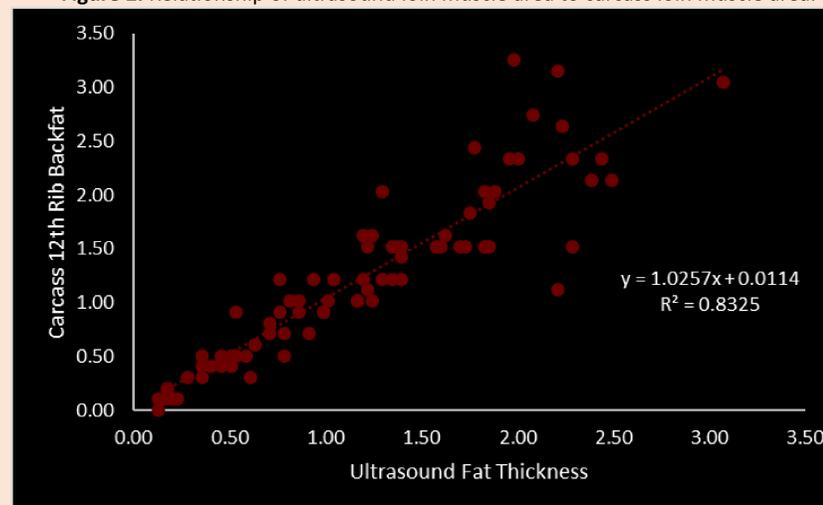


Figure 3. Relationship of ultrasound fat thickness to carcass 12th rib backfat thickness.

Table 1. Predictive regression equations for the relationship of carcass outcomes and ultrasound outcomes in implanted or non-implanted Charolais × Angus steers as estimated by a 378-d serial harvest study.

Item	Linear	Adjusted R ²	RMSE
FTC ¹	$y = 0.0114 + (1.0257x)$	0.83	0.32
LMAC ²	$y = 16.29720 + (0.77197x)$	0.87	6.21
MARB ³	$y = 19.87510 + (5.19832x)$	0.57	7.35

¹ 12th rib fat thickness of the carcass.

² Loin muscle area of the carcass.

³ Marbling score of the carcass

- Positive correlations ($P < 0.01$) between ultrasound measures and carcass measurements indicated strong relationships between FTU and FTC ($r = 0.91$), LMAU and LMAC ($r = 0.93$), and moderate relationships between %FATU and MARB ($r = 0.76$).
- Linear regression equations were calculated to estimate carcass outcomes from ultrasound measurements.

Discussion & Conclusion

- Previous research has reported similar results for the correlation of ultrasound fat thickness to carcass 12th rib fat thickness (Perkins et al., 1992).
- Past literature has reported similar results for the correlation of ultrasound REA and carcass REA (Greiner et al., 2003).
- As supported by previous literature and results from this study, ultrasound technology can be used to estimate both carcass loin muscle area and backfat thickness due to their strong relationship.
- These data suggests that improvements in marbling prediction are warranted. Future research should develop improved algorithms for marbling prediction.
- These results suggest real-time ultrasound data provides an effective tool to estimate carcass outcomes pre-harvest.