EVALUATION OF REAL-TIME ULTRASOUND FOR PREDICTING CARCASS TRAITS OF FEEDLOT LAMBS

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Story in Brief

One hundred fifty-five lambs were ultrasonically measured for backfat thickness and ribeye area 1 day prior to slaughter. Live animal ultrasound measures were then compared to actual carcass measurements after slaughter. Ultrasound measures of fat thickness had 31% of lambs estimated within 0.04 inch of actual backfat. Scans for ribeye area predicted 50% of the lambs within 0.25 inch^2 of actual ribeye area. However, it was just as accurate to estimate ribeye area based upon slaughter weight, with 51% predicted within 0.25 inch^2. Additionally, the ultrasound measure of fat thickness was more highly correlated to actual fat thickness on trimmer lambs (<0.03 inch actual fat thickness) than on fatter lambs. Ultrasound ribeye measures were inconsistent for small to large ribeye areas. These results suggest that ultrasonic measurements of fat thickness and ribeye area in lambs are inconsistent, especially within narrow ranges, with actual carcass measures.

(Key words: Ultrasound, Lambs, Fat Thickness, Ribeye Area.)

Introduction

The sheep industry has been experiencing dramatic changes in product acceptance over the last several years. The traditional "fat" lamb has decreased in acceptance.

Consumers are demanding, and receiving, more closely trimmed meat cuts at the retail level. The lamb industry must increase leanness and trimness of its product to compete. With these changes occurring, the industry must find a way to more accurately identify lean lambs prior to slaughter. The use of ultrasound to estimate fat thickness as well as ribeye

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area may provide a vehicle for the industry to identify animals more desirable for these traits. This trial was designed to determine the effectiveness of ultrasound for measuring backfat thickness and ribeye area of live lambs and to compare those estimates to actual carcass measures 24 h after slaughter.

Materials & Methods

One hundred fifty-five Texas Rambouillet lambs were utilized in conjuction with another trial. Lambs were slaughtered at various weights and condition, allowing ultrasound to be evaluated at different levels of carcass fatness and muscularity. Twenty-four h prior to slaughter, lambs were weighed and ultrasound measurements were obtained using a real-time, diagnostic ultrasound unit (Aloka 210DX) equipped with a linear array, 3 megahertz transducer. Scanning site was between the 12th and 13th ribs on the left side of the animal. The measurements were recorded on video tape and later evaluated on a large display monitor. Ultrasound fat thickness (FSCAN) was measured directly from the screen, while ultrasound ribeye area (RSCAN) was measured by tracing the longissimus dorsi (LD) from the screen and using a ribeye dot grid on the tracing. Following a 24 h chill, lambs were ribbed and carcass measurements were taken for ribeye area and for fat thickness over the LD. The actual fat thickness (ACFT) and ribeye area (REA) were then correlated to FSCAN and RSCAN, respectively. In addition, ribeye area was predicted (PREA) based on slaughter weight (SLWT) by use of the equation PREA = 0.3150811806 + (0.016602775 * SLWT). The Statistical Analysis Systems (SAS, 1985) was used to determine partial correlation coefficients.

Results and Discussion

Simple correlations between FSCAN and ACFT are presented in Table 1. Also presented are simple correlations between REA, RSCAN, and PREA. In contrast to slaughter cattle, where ultrasound has been highly correlated (r=.82) with actual fat thickness (Smith et al., 1990), this study found a moderate correlation (r=.43). Ultrasound estimates had a correlation coefficient of .70 with actual ribeye area, but predicted ribeye areas based upon slaughter weight were even more highly correlated (r=.81).

Table 2 presents cumulative frequency distribution of carcass ribeye measurement errors. The ultrasound was able to estimate 50% of the lambs within 0.25 in^2, and this increased to 80% of lambs within 0.50 in^2. This compares quite favorably to the number of lambs estimated within 0.25 in^2 of ribeye area by the prediction equation using slaughter weight. The accuracy

Table 1. Simple correlations between actual fat and ribeye measures and ultrasound or predicted measures.

	FSCAN[a]	SCAN[a]	PREA[a]
ACFT[a]	0.43[b]		
REA[a]		0.70[b]	0.81[b]

[a] FSCAN = Ultrasound fat thickness; RSCAN = Ultrasound ribeye area; PREA = Predicted ribeye area based on slaughter weight; ACFT = Actual fat thickness; REA = Actual ribeye area.
[b] All correlations were P<.05.

Table 2. Cumulative frequency for absolute deviations from actual ribeye area for ultrasound and predicted estimates.

Absolute deviation(in^2)	RSCAN[a] Cumulative %	PREA[a] Cumulative %
0.00	1.9	0.0
0.25	50.3	51.0
0.50	80.0	78.7
0.75	94.8	94.8
1.00	98.1	98.7
1.25	99.4	99.4
1.50	100.0	100.0

[a] RSCAN = Ultrasound ribeye area; PREA = Predicted ribeye area based on slaughter weight.

of ultrasound for predicting fat thickness is presented in Table 3 as absolute deviations of 0.04 inch increments from the actual fat thickness. Approximately 31% of lambs were estimated within 0.04 inch of their actual fatness. At 0.08 inch this increased to 62.6% and at 0.12 inch, it was 85.0%. Ribeye area scans were slightly more highly correlated in an intermediate range of actual ribeye areas (1.51-2.0 in^2) to actual ribeye area; the correlation was highly negative for three lambs with ribeye areas greater than 2.76 in^2 (Table 4). In contrast, ultrasound measures were more accurate on trimmer lambs, as correlation coefficients decreased dramatically as lambs increased in fatness from 0.04 in. (Table 5).

ACFT ranged from 0.00 inch to 0.30 inch and REA had a range of 1.00 in^2 to 3.00 in^2 in this trial. This compares to much larger ranges for fat

Table 3. Cumulative frequency distributions for absolute deviations from actual fat thickness for ultrasound measures.

Absolute deviation(in)	FSCAN[a] Cumulative %
0.00	6.5
0.04	31.0
0.08	62.6
0.12	85.8
0.16	96.8
0.20	100.0

[a] FSCAN = Ultrasound fat thickness.

Table 4. Correlation coefficients between actual ribeye area and ultrasound estimates.

REA(in^2)[a]	N	RSCAN[a] correlation
<1.50	17	-0.06[b]
1.51-1.75	29	0.29
1.76-2.00	44	0.05
2.01-2.25	36	-0.05
2.26-2.50	24	0.23
2.51-2.75	9	-0.24
>2.76	3	-0.94

[a] REA = Actual ribeye area; RSCAN = Ultrasound ribeye area.
[b] All correlations were P>.05.

thickness and ribeye area in previous work done conducted with cattle by Smith et al. (1990). Results herein would indicate that the decreased magnitude of measures may effect the accuracy of measurement. Previous work by Henderson-Perry et al. (1989) has shown accuracy to be highly technician dependent, and coupling those results with ones reported here, technician training and equipment quality would play a large role in success of ultrasound for prediction of lamb carcass parameters.

Table 5. Correlation coefficients between actual fat thickness and ultrasound estimates.

ACFT(in)[a]	N	FSCAN[a] correlation
<0.040	32	0.45[b]
0.041-0.08	46	0.11
0.081-0.12	42	0.13
0.121-0.16	14	0.00
0.161-0.20	13	-0.29
>0.201	12	0.11

[a] ACFT = Actual fat thickness; FSCAN = Ultrasound fat thickness.
[b] $P<.05$.

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