Scanning *into the* Future

Story provided by
IOWA STATE UNIVERSITY

Have you ever wondered how your cattle would fit into a grid-marketing system? Real-time ultrasound uses high-frequency sound waves to "see inside" while the animal is still alive. A sound-emitting probe held snugly on the animal's back bounces sound waves off the boundaries between fat and muscle layers. A cross-sectional image created by the reflected sound appears instantly on the video screen.

What does that mean for you as a cattle producer? Real-time ultrasound enables you to get a fast and objective prediction of the carcass composition of your beef cattle. This tool can help you meet specific market demands and production systems.

In addition, carcass composition information could assist you in the genetic selection and breeding of your cow herd.

What is the accuracy of real-time ultrasound? Certified technicians can measure:

- Ribeye area to within 0.6-0.7 square inches of the actual ribeye area using real-time ultrasound.
- 12th-13th-rib fat and rump fat thickness to within 0.04-0.05 inches of the actual fat thickness using real-time ultrasound.
- Percent intramuscular fat to within 0.8%-0.9% of the actual amount of percent intramuscular fat (see table on page 18).

The benefits of using real-time ultrasound are many:

- Objective prediction of carcass lean and fat in live beef animals.
- A trained evaluator can subjectively determine differences in fat cover and muscling on live cattle. However, it is impossible for a person to evaluate percent intramuscular fat (marbling) of the live animal. Ultrasound gives us the ability to objectively measure marbling in the live animal.
- Evaluation of percent intramuscular fat from the ribeye to determine USDA quality grade.
- Information on body composition eliminates the expense and the time required by progeny testing for carcass merit.
- The full potential of real-time ultrasound will be realized when the data collected can be used to calculate expected progeny differences (EPDs) on a national scale for every breed, working toward improved carcass merit.
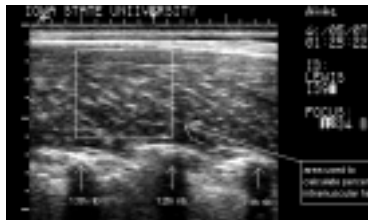

The technician is collecting the image shown above for calculation of percent intramuscular fat (marbling). The real-time ultrasound image is collected across the 11th, 12th and 13th ribs.
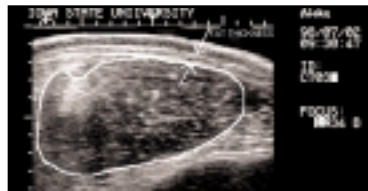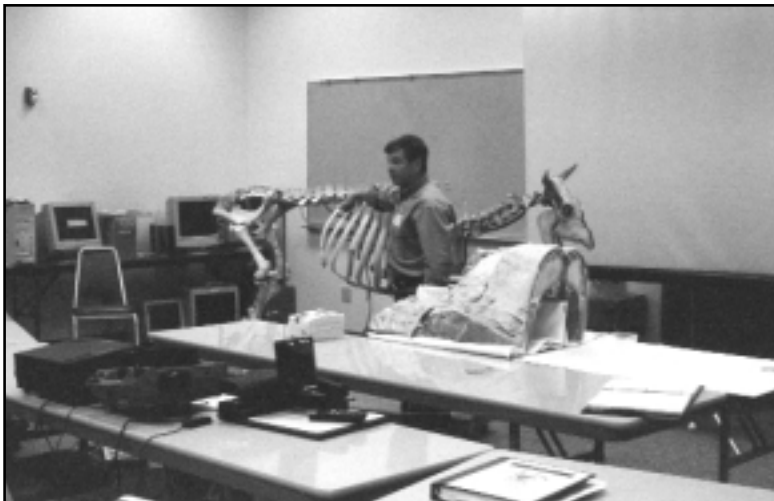

The technician is collecting the image shown above for measurement of ribeye area and 12th-13th-rib fat thickness.
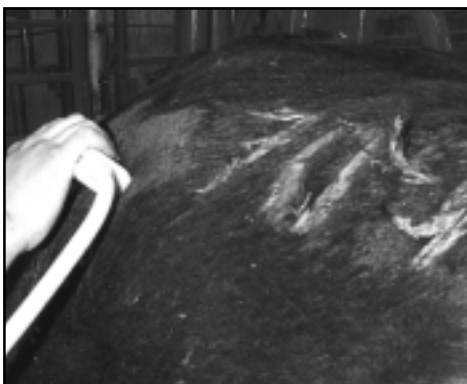
The technician is collecting the image shown above for calculation of rump fat thickness.

1 ── Marbling

3 ── Rump

2
Ribeye
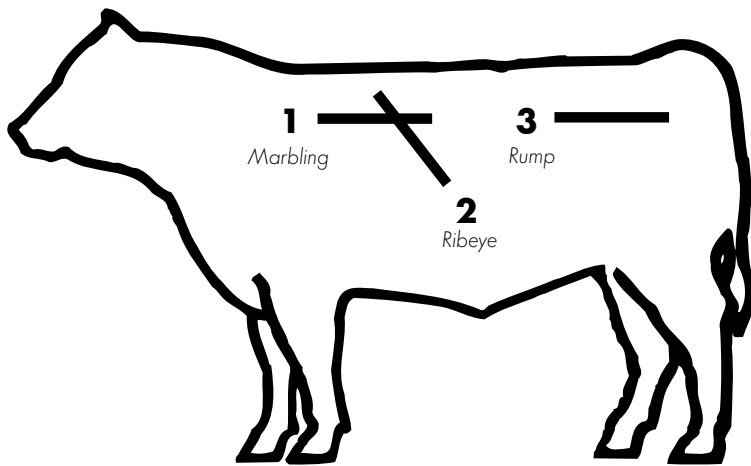
The reference points (1, 2 and 3) on this drawing represent the areas where ultrasound images are collected and later interpreted, as shown in the photos and scans below left.

AAACUP technicians receive classroom and hands-on training as proper technique for real-time ultrasound is explained at a recent training seminar held at the Armstrong Research Center, Atlantic, Iowa. For the most current list of technicians approved to submit scans for AAACUP, call John Crouch, American Angus Association director of performance programs, at (816) 383-5100. (PHOTOS BY JOHN CROUCH)

"In the hands of properly trained technicians, ultrasound offers the beef seedstock industry one of the most powerful tools for genetic improvement of carcass merit ever devised. Its time is now."
— *Doyle Wilson*

INSIGHT:

Real-time ultrasound glossary

Real-time ultrasound: *this technology uses high-frequency sound waves. A sound-emitting probe held snugly on the animal's back bounces sound waves off tissues of different densities, such as fat and muscle. A cross-sectional image is created by the reflected sound and appears instantly on the video screen.*

Ultrasound machine: *there are two major types of ultrasound machines being used for carcass evaluation of beef cattle: the Aloka 500 and the Classic Scanner 200. These machines have been designed to collect ultrasound images specifically for livestock.*

Transducer: *the instrument attached to the ultrasound machine in order to collect ultrasound images. The transducer both transmits and receives ultrasound waves.*

Standoff guide: *made of a pliable "super flab" material, it serves as a guide for the transducer. The transducer is placed in the standoff, which fits the natural curvature of the animal. This assists in the collection of the ribeye image.*

Marbling: *measured as percent intramuscular fat (PIMF). Beef carcasses are traded on the amount of intramuscular fat they contain at the 12th to 13th rib. Real-time ultrasound has the capability to predict the actual percent fat in the ribeye muscle, which is what the USDA grader is primarily trying to visually evaluate. Heritability for marbling is in the moderate range, approximately 35%.*

Percent intramuscular fat: *an objective measurement of marbling in live cattle. Percent intramuscular fat is highly correlated with a USDA grader's visual evaluation of marbling in a carcass.*

USDA Quality Grade: *determined mainly by two factors – marbling and maturity (age) of the carcass.*

Ribeye area: *a measure of muscle in the carcass, which is measured in square inches (sq. in.). Ribeye area is highly correlated with percent retail product. This trait is moderately heritable at 35%, meaning that the trait should be passed on to its progeny.*

12th to 13th rib fat thickness: *a measure of external fat on the carcass, which is measured in inches. This measurement is taken at a point three-fourths of the length of the ribeye from the backbone end. Fat thickness is a good indicator of percent retail product. The higher the fat thickness, the lower the percent retail product. Fat thickness is slightly lower in heritability than ribeye area and marbling (20%-25%).*

USDA Yield Grade: *the predicted yield of saleable meat from a beef carcass. It is calculated as follows: Yield Grade = 2.5 + (2.5 × fat thickness, in.) + (0.2 × percent kidney, pelvic and heart fat) + (0.0038 × hot carcass weight, lb.) – (0.32 × ribeye area, sq. in.). The lower the Yield Grade, the higher the percent of retail product.*

Rump fat thickness: *a measure of external fat on the carcass, this is measured in inches. This measurement is taken across the rump of the animal. Rump fat is negatively related to percent retail product and is thought to be an additional indicator of carcass fat. Rump fat measures may be most useful for predicting percent retail product in leaner cattle, which have less 12th-rib fat.*

Figure: Conversion from Percent Intramuscular Fat to Marbling Score
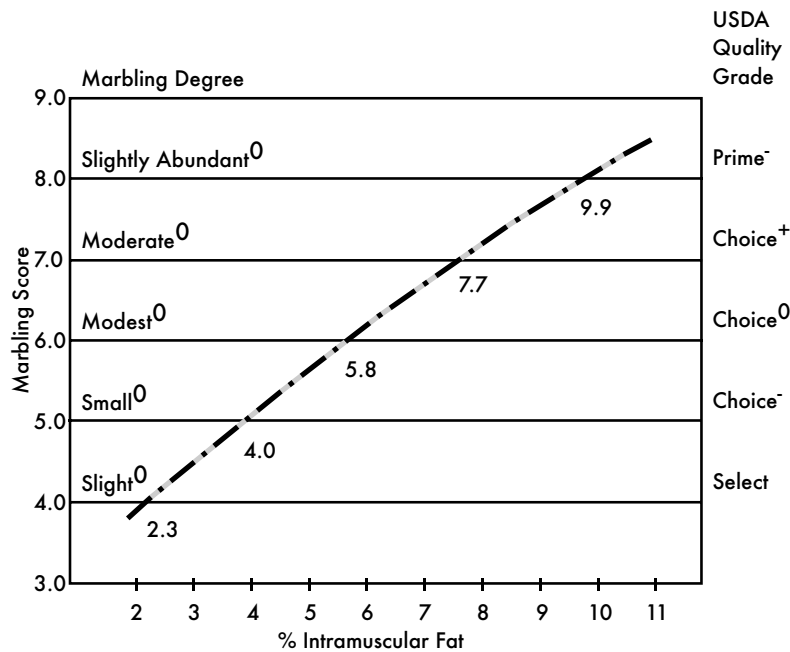
Marbling is measured as percent fat. Beef carcasses are traded on the amount of intramuscular fat (marbling) they contain between the 12th and 13th ribs. However, marbling is a subjective score. Real-time ultrasound has the capability to objectively predict the actual percent intramuscular fat in the ribeye, which is what the grader is trying to visually evaluate.

This graph relates percent intramuscular fat to amounts of marbling in the USDA Quality Grading system.

Table: Conversion from Percent Intramuscular Fat to Marbling Score

% Intramuscular Fat	Quality Grade	Marbling Degree	Marbling Score
2.3-3.0	Select[-]	Slight[0-40]	4.0-4.4
3.1-3.9	Select[+]	Slight[50-90]	4.5-4.9
4.0-5.7	Choice[-]	Small[0-90]	5.0-5.9
5.8-7.6	Choice[0]	Modest[0-90]	6.0-6.9
7.7-9.7	Choice[+]	Moderate[0-90]	7.0-7.9
9.9-12.1	Prime[-]	Slightly Ab[0-90]	8.0-8.9
≥ 12.3	Prime[0]	≥ Moderately Ab[0]	≥ 9.0

Editor's Note: *The information presented in this article was prepared by Doyle Wilson, Gene Rouse, Craig Hays, J.R. Tait and Jodi Kruser, Iowa State University Department of Animal Science, Ames.*