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Carcass Ultrasound 101

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Measures of Muscle

Undoubtedly, one of the more enjoyable eating experiences from the beef carcass is the ribeye steak. Often referred to as the *longissimus dorsi* in research journals, this muscle gets the vast majority of the attention in genetic selection as well as at the restaurant. Ribeye Area (REA) is the sole measure of muscle in a purebred animal's Expected Progeny Difference (EPD) profile, unless you include collaborative measures like % Retail Product, Yield Grade, or some Indexes (all of which use REA in the formula). The absence of other muscle selectors is not for lack of trying. Researchers have simply been unsuccessful in finding an indicator of muscle that is either more accurate or more practical than REA. This creates a challenge for beef cattle breeders to use somewhat limited resources to make progress in red meat yield, not just REA.

Put simply, there are two main methods to measure muscle in beef cattle, dead or alive. Measuring REA in harvested cattle is certainly not new technology, but the introduction of online grading systems in packing plants offers a possible new tool to retrieve carcass information. The "old school" method of measuring REA is often referred to as the "actual" value simply because it was the first method utilized. Estimates of REA from live animal judging, ultrasound, and camera grading are often gauged against carcass REA measured in the cooler. However, a deeper explanation of how REA is collected in real-world harvest facilities makes the term "actual" quite broad and also helps one appreciate new technology for selecting genetics for muscle.

In the current USDA Grading System, each carcass is "ribbed" with a knife at the 12th-13th rib. Given the variation in cattle and the speed at which plants operate, some carcasses are mistakenly ribbed at the wrong location, causing potential error in REA estimation. The most popular tool used in measuring REA in the cooler is the "plastic grid." The clear plastic grid is placed over the ribeye face and squares equal to 0.1in^2 are counted. Unless you are 6'5" tall, measuring REA with a plastic grid in a packing plant can be quite difficult. The ribeye facing of an average carcass is often above eye level, causing one to walk on their tip-toes as they follow the carcass moving on the rail, counting squares along the way. If you can picture this being done, you can also understand the possible errors with this method. In some cases, cattle can be "railed off" so that measurements can be taken on a still carcass using a step ladder. Most harvest facilities will not slow or stop production just to increase the accuracy of REA. Fortunately, USDA Graders and online grading camera operators are elevated from the cooler floor to give a better view of the ribeye.

Numerous research trials have also used acetate paper to obtain REA. The paper is rubbed over the face of the ribeye and then peeled off. The muscle tissue leaves a discolored or wet residue on the paper, which can be traced around with a pen. The plastic grid can then be used to interpret REA. This method is more time consuming and has its pitfalls, but it does allow for collection of REA in a warm office rather than amongst swinging sides of beef.

More recently, on-line grading systems have found their way into commercial packing plants. This new technology offers a potential opportunity for cattle producers to receive accurate carcass data on an individual basis. This system basically uses a flash bulb camera to take a picture of the ribeye face and a complex software program to identify REA, as well as additional USDA quality and yield grade information. Extensive research has proven this method relatively accurate, but numerous challenges exist in collecting REA from this system, including animal identification, traceability, cost, and computer error. Though the buzz around on-line grading is exciting and new, collecting carcass data via computer in a harvest facility can best be described as a "work in progress."

Obviously, the advantage of live animal evaluation for carcass traits is the preservation of life for the animal being evaluated. The most popular tool for live animal estimation of REA in the last decade has been ultrasound. This technology can evaluate sires and dams, as well as their progeny, without sacrificing the animals themselves. As a result, genetic progress in REA can be accelerated at a lower cost.

The downfalls of ultrasound measurement of REA are similar to that of carcass estimation. To eliminate some of the error, a structured certification process was adopted by the Ultrasound Guidelines Council (under direction from the US Beef Breeds Council) for both technicians who collect the images at the ranch and those who interpret them. Ultrasound REA estimation attempts to mirror carcass data by collecting an image in the same location the carcass is ribbed. The interpreter then uses landmarks in the image to draw the outline of the ribeye muscle with a mouse. The computer then calculates the area within the outline.

The accuracy of carcass vs. ultrasound REA has been debated. Both are viable tools for selection regardless of which measure you prefer. Structured sire evaluations via carcass testing can improve a bull's carcass EPD accuracy, but the study takes time and money to perform. Ultrasound technology allows cattle breeders to collect REA on the individual as well as relatives, but requires that contemporary groups be held intact for the information to have power. Each measure of muscle has its pros and cons in terms of accuracy, but the tools are available to make progress for those who utilize them. However, intensive selection pressure for REA is not advised. One complaint from restaurant chefs is inconsistent plate portion size of the ribeye steak. This is not a problem for pork chop or chicken breast entrées. While happy bull buyers are important, breeders must make sure meat-eating consumers are repeat customers as well.