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Carcass Ultrasound 101

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Ultrasound vs. DNA Testing: Carcass Tools, Not Choices

At first glance, it might seem impossible for a person entrenched in ultrasound to publish any article about DNA testing without sounding biased towards ultrasound. Breeders often consider the two technologies as bitter rivals fighting for the same prize. However, a more in-depth look at each carcass tool reveals that ultrasound and DNA rarely compete directly with one another. Each technology can be aimed at the same genetic “question,” but give entirely different “answers.” Breeders and bull buyers alike need to be aware of what the results mean, not just what they say. In some cases, breeders may be spending money on technology for information their customers don’t want, and buyers may be placing unneeded emphasis on a trait that is not adding to their bottom line. Contrary to what some may believe, carcass ultrasound and current DNA technology can be harnessed together to assess the true genetic value of beef cattle.

On the surface, DNA testing offers a promise that someday all the answers to beef cattle genetics will be contained in a few tailhairs or a notch of the ear. While scientists have been successful in mapping the genome of livestock species, they have not yet deciphered nor understand what each part of the gene sequence does. Basically, DNA tests currently on the market offer only a small piece of the genetic puzzle. The progress of DNA technology over the last five years is impressive and will continue to expand. DNA offers the unique ability to make selection progress in economically relevant traits that are extremely difficult to measure by any other means, particularly herd health and efficiency. With rising feed costs, cattle will be expected to do more with less, and DNA technology will be a useful tool in helping producers find more profitable genetics.

Marbling is actually the only trait currently measured by both DNA and ultrasound, in which the DNA test has been validated by the National Beef Cattle Evaluation Consortium (NBCEC). Since the trait name is the same, breeders have begun asking when they can quit ultrasound scanning and just pull a DNA sample. Agreeably, the process is much simpler and can be done at Day 1 instead of waiting until the animal is a yearling. Unfortunately, DNA testing will never be able to give you the same information as ultrasound technology. Equally, carcass ultrasound will never be able to detect the presence or absence of a gene sequence.

The limitations of each science are quite simple. DNA tests do not include the environmental component or test the expression of a trait, only the presence or absence of genes thought to be relevant to the trait. Current DNA technology only explains a fraction of a trait in a given population, though the portion is growing as new markers are discovered and validated. Ultrasound basically tests the expression of all the genes responsible for marbling in a given environment. It is well known that some animals known to contain all the markers for marbling in a DNA test do not express high Ultrasound Intramuscular Fat (%IMF) readings. As well, individuals that scan well into the USDA Prime grade may actually have zero gene markers for marbling. These facts have caused a bit of unrest among breeders who may question the



accuracy of either technology. However, there are a number of scientific explanations that breeders can actually utilize to get ahead of the competition.

Zero gene markers for marbling in a high marbling individual can actually be good. The animal may simply excel in marbling genetics not currently tested in the DNA profile. This may also mean that a minor genetic mutation or recombination of genes has occurred in the animal's development resulting in a new genotype far better than either of the individual's parents. A number of famous carcass sires may have resulted from beneficial mutations. Of course, genetic mutations can go the other way and be detrimental or even lethal to the offspring. As stated earlier, DNA tests only detect the presence or absence of genes. As a result, ultrasound is only tool that would "find" this elite animal. A DNA test alone may overlook the hidden value of this individual for marbling. The same case can be made in favor of DNA testing versus ultrasound alone. An adverse environment, limited feed, or illness could cause a genetically superior bull or heifer to get lost in a contemporary group by scanning poorly for %IMF.

Seedstock producers and buyers need to ask themselves a series of questions when deciding to utilize ultrasound and DNA technology, or its results. First of all, do my customers want the information, or is it necessary? Wasteful spending is a hot political topic in an election year, but a topic that may be overlooked by a seedstock producer who is in search of an advertising piece for the sale flyer. Secondly, breeders should search for unbiased research trials that test ultrasound and DNA on their specific breed(s) of cattle and concentrate on the areas that need work. For example, some breeds may have an extremely high incidence of all the gene markers in a given test. As a result, testing for those genes is pointless; you may get the same answer 98% of the time. On the other hand, if tough steaks are a problem in your breed, then genetic selection for tenderness via DNA should be encouraged. Carcass ultrasound has a more difficult time ranking grass-fed or limit-fed cattle. The scanner must find variation in the contemporary group to be an effective selection tool. It's hard for a buyer to pick the "best" marbling bull for his/her program if all the animals scanned between 2.0-3.0%IMF and Carcass Expected Progeny Differences (EPD) are unavailable.

Publishing and promoting ultrasound data and DNA test results should also be done with thought. Selective reporting allows buyers to draw their own conclusions. For instance, if Lot 1 is promoted as "Super Tender" in the sale catalog and Lot 2 is not, buyers may assume Lot 2 must not have any markers for tenderness. DNA test results are absolute, making it easier for buyers to compare animal to animal. Breed associations that require ultrasound data to go through a centralized lab give buyers a sense of confidence in the data, since selective reporting is not allowed and ultrasound traits are listed in the Carcass EPD profile.

Here's an example of a well-educated breeder using ultrasound and DNA technology hand-in-hand: Breeder A retains a set of heifers that scanned extremely well for %IMF, but DNA testing showed very few markers for marbling in his replacement pen. In search of the perfect bull to hit a quality grid with the offspring, Breeder A finds a high-growth bull that is "star-crazy" for marbling, but barely above breed average for Marbling/%IMF EPD. This mating insures the bull will improve the known genes for marbling "missing" in the females as well as capture the heifers' expression for marbling from the ultrasound scan results. With any luck, Breeder A will get the best of both parents.



The tools of beef cattle production have quickly evolved from a 5-gallon bucket and fencing pliers to personal computers and satellite auctions. DNA technology is easily the most recent tool to hit the market, but it cannot be viewed as the “magic bullet” that will replace all the others tomorrow. To quote one breeder, “I can’t wait for the day when all I have to do is pull a few tailhairs instead of collect all this other stuff.” I can’t imagine how boring raising seedstock would be if that day ever comes.