



Ultrasound...Are We Riding the Right "Wave"? Patrick B. Wall

As the Director of Communications for Walter & Associates, LLC, my role at The National Centralized Ultrasound Processing CUP Lab® & Technology Center is to communicate with people involved in all facets of the ultrasound business. To this point, I have enjoyed working with field technicians and breed association personnel, but have struggled to reach the producer level. Through conversations with breeders, I've come to realize the issues facing today's cattle producers are much more complex than any final exam question I ever received during college. The problem lies in the answers, which to this point, have been explained over the phone. A sufficient answer for Breeder A in southern Utah doesn't always satisfy Breeder B in central Indiana or Breeder C in West Virginia. In search of the universal solution for all breeders' questions or concerns about ultrasound, I read more now than ever before. My goal is to let every cattlegrower, regardless of breed or size of operation, from farm to feedlot, know that ultrasound is a viable marketing tool that allows for accelerated genetic progress in carcass traits, nothing more, nothing less. Here is my attempt.

One thing is certain, agriculturists, not just cattle producers, are bombarded with more information than ever before. The problem is not with the information or even the amount of it, though some articles are much more useful than others. The major challenge is interpretation. Many occupations other than "cowboy/cowgirl," from cosmetology to insurance, utilize continuing education courses and re-certification programs to keep updated on the latest advancements in their field. Ultrasound is one of the latest hairstyles or newest policies offered to the beef industry, but cattle producers were never required to take a course on how to make it fit their operation. Your preferred analogy to ultrasound probably parallels your opinion of the technology. Fashion hairstyles rarely make it through two calf crops, but insurance policies will continue to be offered...as long as they work. I assure you, ultrasound is no fad.

One common question is on every breeder's mind. "How does ultrasound put more money in **MY** pocket?" As an employee of the ultrasound business, I should say it works for everybody and you should schedule your scan session today, but as a realist, I know that would do more harm than good. The true answer to the question is: ultrasound can and will put more money in your pocket, but only if your customers demand the information, and if the cattle fit what he/she is looking for. One common misconception is that ultrasound makes cattle worth more money. My family's 50-cow operation in central Illinois has never utilized ultrasound...but we plan to soon, just to be more competitive in another market. In an area where commercial cattle are virtually non-existent, mostly 4-H & FFA projects leave the farm, products of retired show heifers. Marketing "Miss Midnight's" Marbling or Retail Product EPD won't help her daughters win the county fair, but it could help sell her sons. Ultrasound is not for everyone, only those wishing to generate more demand for their cattle.

A major roadblock for the expansion of the use of ultrasound is accuracy. Calls to The CUP Lab® come from those who don't believe the science is precise enough, or from producers who are unhappy with the values they received from their breed association. Producers demand an explanation and often want to establish blame when raw values are less impressive than expected. Another misconception is that lower values than the previous year means genetic progress reversed. EPDs express the genetic ability of an animal to outperform its contemporaries in a single trait given the same environment and nutritional opportunities. Contrary to what some believe, EPD calculation makes it extremely difficult to "feed a Marbling EPD," but the system still relies on the honesty and integrity of breeders for contemporary grouping. Fortunately, a handshake and a promise still sells a lot of cattle in this country.

Breed associations do and should discourage producers from publishing raw scan figures or age adjusted data in sale catalogs. Here is just one example why: "Prize Cow/Bull A" produces a calf or set of progeny with 14.5 sq. in. ribeyes in 2002, outperforming his/her penmates with a REA (Ribeye Area) Ratio of 115. The mating worked so well "Breeder A" decided to try it again. In 2003, grass was scarce in August, followed by an extremely wet fall and harsh winter. Despite this, Prize Cow/Bull A has what looks to be an even better set of progeny than last year. When the scan data returns, adjusted REA for the "Prize" set of calves is 12.8, outperforming their penmates with a REA Ratio of 116. The mating worked well again, but the sale handout of ultrasound data reads as though a mistake in management was made. The power of EPDs is in contemporary grouping and ratios. Genetic progress can be made by either selecting superior animals, or more importantly, eliminating poor individuals from production. Raw or adjusted data makes advertising outliers very easy, but doesn't always tell the entire story, year after year.

If environment was the only factor influencing ultrasound data readings, this article would be finished. Unfortunately, weather and feed is only a portion of the variability. Other sources include: field technician bias, lab technician bias, season (fall-born vs. spring-born), scanning age/sex, and energy level or type of ration the cattle are being fed. Along with this, the collection of the images varies among groups. Some breeds are more difficult to scan than others, somewhat due to differences in hide thickness. As subcutaneous rib fat increases, images are harder to interpret. High marbling cattle can make ribeye boundaries difficult to see. All of these can affect the error of ultrasound data. Clipping hair off the scanning areas and allowing oil to soak into the hide helps to limit these factors. At The CUP Lab®, we get data from



some field technicians who consistently scan closer to the 12th rib, others closer to the 13th rib. Both cases are image quality problems. On the average, technicians who scan close to the 12th rib will get slightly smaller REA values and higher rib fat values than those field technicians consistently scanning close to the 13th rib. This does not mean you should hunt down the field technician who scans next to the 13th rib. In fact, a technician who correctly scans between the 12th-13th ribs will produce larger REA values than either of the previously mentioned methods. Consistency is most important; a good field technician with a good reputation will reduce these errors, but bias among technicians still exists.

Once an ultrasound image arrives at the lab, it is interpreted by extensively trained and UGC (Ultrasound Guidelines Council) certified personnel. The UGC Certification process tests a technician's ability to assess image quality problems, properly rank the animals in each trait, and acceptably correlate to carcass data and an experienced lab technician. As with field technicians, lab interpreters have bias as well. Breeders will rarely get the same lab technician year after year. Some breeds exclusively accept ultrasound data from only one lab to eliminate some of this error. One lab, one training program, and one protocol seemed better than many labs trying to compete for the most "friendly" data. The pioneers of ultrasound felt a centralized lab was necessary to maintain data integrity, hence the name Centralized Ultrasound Processing, or "CUP" as it is commonly referred to today.

Many opponents of ultrasound are cheerleaders for carcass data, the predecessor to ultrasound-derived EPDs. An increasing number of breeds are developing ultrasound EPDs or combining ultrasound and carcass data into one set of EPDs to simplify the data for breeders and customers and satisfy their demand for the information. Both those for and against the use of ultrasound can turn to research trials to back up their opinion. For ultrasound data to be accepted by a breed association, it must be collected by a UGC certified field technician and interpreted by a UGC certified lab technician at one of only four approved labs. In order for a research trial to get published in the Journal of Animal Science, none of this is necessary. One good example comes from a study by S.G. May et al. in 2000. May used highly trained personnel (i.e. cattle buyers, judges, etc.) to estimate USDA Yield Grade, carcass REA, and marbling score on live feedlot cattle. Ultrasound data was also collected on the steers. Both the live "judges" estimates and ultrasound data were then compared to carcass data.

The correlation of live estimate of REA vs. carcass REA was 0.71, better than ultrasound REA vs. carcass REA at 0.61 (a perfect correlation = 1.0). This poses a very important question. What training did the person who interpreted the ultrasound data receive prior to the study? In order to work at The CUP Lab[®], one must consistently correlate higher than 0.80, anything less will fail the UGC certification standards. Statistical thresholds are in place for each trait (Rump fat, Rib fat, REA, and %IMF), set by the UGC Board. In the same study, correlation of live estimates of marbling score vs. carcass marbling score was only 0.30. Many comparisons of %IMF (Percent Intramuscular Fat) to carcass marbling score are more than twice as accurate, with UGC standards for lab technicians set at >0.60. The argument still remains; ultrasound can be twice as accurate in certain traits as the best judge in the country, but 0.60 is still not close enough to 1.0 for some.

If we leave the study at this point, we have missed the most important source of variation in the trial...carcass data. The most common oversight in comparing ultrasound to carcass values is assuming that carcass data is perfect. Counting grid dots placed on the face of a ribeye muscle suspended six feet in the air swinging from a shackle on a moving chain is hardly accurate. There are sources of variation in ultrasound data, but there are at least as many chances for significant error in carcass data collection. Harvesting method between packing plants varies, from hide pullers to chain speed, and even day of the week. Chains can seem to move a little faster on Fridays! Along with this, variation exists among USDA Graders, cooler personnel may make ribbing mistakes, and plants vary in the amount of chill time (carcass cooling period) and bloom time (period from when the carcass is quartered or "ribbed" to when the grader evaluates it) given to each carcass. Both chill and bloom time can effect quality grade. Cattlepersons must remember that all carcass data measurements are subjective, meaning a matter of human opinion. Many meat packing plants, Excel in Dodge City, KS for instance, are implementing computer grading to reduce the amount of error and better qualify carcasses for branded programs. It is argued that ultrasound images are still a matter of human opinion, but computer models calculate %IMF, not the interpreter.

Having worked on a research trial in feedlot ultrasound application, I combed the literature from the 1970s to today in search of an M.S. degree with an authentic signature. After countless pots of coffee and thicker glasses, I have the signature and a good idea of how far ultrasound technology has come. Computers now have more capacity and speed, making image capturing and data collection easier. However, many of the original ultrasound studies still hold value today. Remember, the technology originated in the medical field; they hauled some of the first ultrasound machines from the hospital to the barn. Rib and rump fat thickness correlation to carcass measurements range from 0.57 (Hamlin et al., 1995) to the low 0.90s (Rouse et al., 1992). Ribeye area from ultrasound to carcass REA correlation ranges from 0.43 (Smith et al., 1992) to 0.83 (Robinson et al., 1992). Ultrasound %IMF vs. carcass marbling score correlation ranges from the 0.40s to 0.80, where 0.70 is fairly common (Rouse et al., 1992). Accuracy tends to vary among studies, with no significant trends from early trials to the most recent. Some of the range in these values could be attributed to poor interpretation of the ultrasound images, but that's merely speculation from experience.



If those numbers still don't "put more money in MY pocket," your section is next. A.R. Williams at Mississippi State University published an article comparing the cost of ultrasound to its counterpart, carcass data. Using progeny testing, or harvesting a bull's calves, it typically takes 3-5 years and approximately \$5,000 to "prove" a sire's genetics, sometimes only to find out the bull was a poor choice. Using ultrasound, average completion takes less than 2 years at a cost of \$450 per sire, without sacrificing any sons or daughters in the process. Many breed associations maintain carcass databases, but very few sires or dams are represented. For example, it took the American Angus Association 25 years to compile 75,000 carcass records on 5,600 sires. In 2003, nearly 100,000 head were evaluated using ultrasound. The amount of information available via ultrasound gives breeders many more options when selecting bulls and even heifers to use in their program. Breeders are finding accelerated genetic progress if they pay attention to the cow side of the equation as much as the bull. At the onset of CUP, nearly all animals interpreted were bulls; the percentage this year (2004) was 60/40, bulls/heifers. With an increasing number of commercial producers selecting replacement heifers based on ultrasound data, the trends could cross in the next few years.

The strongest and most vocal opponents of ultrasound claim there are antagonisms and detrimental effects to the cow herd when selecting for some carcass traits. In recent articles, it is commonly referred to as "chasing" or "single-trait selection." Most will agree that breeding to enhance only one trait can be dangerous. However, in an Iowa State University study on bulls, it was reported that selecting for increased REA or %IMF had no detrimental effect on scrotal circumference (Wilson et al., 2001). Ultrasound data is not meant to be a free pass to stop managing a cow herd, merely another tool to help breeders reach goals. Agriculturists, through natural selection, are some of the toughest and most competitive people on the planet, especially when it comes to defending their breed. Like political ads, some will revert to mudslinging to keep them in the race. It's hard to convince cowboys and cowgirls that we are all on the same team when we don't share the same pocketbook! Many are in search of the "all-purpose breed," in order to dominate the seedstock market. Frustration often sets in when progress is slow in selecting for retail traits in maternal breeds or marbling in breeds known for growth and muscle. Slow progress is better than no progress, but heterosis is still a powerful tool. Crossbreeding programs truly dominate the beef industry, with the potential to generate a better end product than the parent breeds could on their own.

Ultrasound-derived carcass traits are highly heritable, with genetic correlations ranging from 0.74 for marbling to 0.80 for fat thickness and 0.80 for REA (Crews, Jr. et al., 2003). Selecting for a trait a breed is not historically known for should not be discouraged, but overemphasis could be problematic. If a trait can be measured, it can also be managed; variation within a trait is the main requirement needed to make genetic progress. Forward-thinking breeders who put extensive selection pressure on carcass traits did not forget about reproductive traits if they wanted to be successful. Mother Nature has a funny way of eliminating those operations over time.

The demand for carcass genetics is at an all-time high in the beef industry. Producers in all phases of the industry are enjoying the friendly curve of the cattle cycle...for now. With the extreme selection pressure being placed on carcass EPDs, one wonders why % Choice and/or YG 1s at the packer level has not significantly changed. The generation interval of cattle, especially when compared to swine and poultry, has plagued the industry since the first imported cattle stepped foot on American soil. Progeny from superior carcass seedstock are just beginning to filter into commercial pastures. Also, real-time ultrasound is still a very young technology; The CUP Lab® opened its doors in 1998. Patience may be our most difficult challenge of all.

The past and current growth of the ultrasound business may be the greatest testimonial to practical science that's working for cattle producers, regardless of breed, nationwide. The CUP Lab® currently works with 23 breed associations, serving breeders in the United States, Canada, and South America. The 2004 UGC Field Technician Certification held in Athens, GA in September had 64 participants, many from states without field technicians. Walter & Associates, LLC is expanding its staff for 2005. Along with this, we plan to host 7-8 field technician training programs next year in the U.S. and Canada to accommodate our list of people interested in entering the ultrasound business. If you've struggled to find an available technician in your area, chances are, that won't be the case in the future.

Science-based agriculture has allowed producers from virtually all links on the production chain to capture more from less. Technological advancements, such as GMOs and cloning, have caused consumer unrest and food safety concerns. Ultrasound is not known to cause cancer or birth defects, but has been linked to increased sale averages and grid premiums. Its biggest opponent is also its sole potential beneficiary. The scanning season for spring-born calves is right around the corner. Is it time your operation took out a new insurance policy or changed its hairstyle? You decide.