



Fat, marbling and carcass characteristics of this group of uniform-looking, mostly Angus heifers are as different as night and day under the penetrating gaze of ultrasound.

Carcass ultrasound

Using ultrasound to evaluate carcass merits can enable you to give clients better information for marketing their cattle.

By Geni Wren

Editor's note: Last in an ultrasound series.

They look the same. Black, mostly Angus heifers. They weigh almost the same, too. So how did Lynn Locatelli, DVM, Twin Forks Clinic, Benkelman, Neb., know that one heifer should be sent to the packer as soon as possible, one should be fed for 36 more days and another should stay around the feedlot for two more months, thereby maximizing the feeder's investment? Simple. She just got under their skin. With ultrasound.

"If you tell a manager to go and sort a load of cattle with his eyeball, sometimes they may all look uniform, but if you look under the hide you see they

are as different as different can be," Locatelli says. "And when you're doing value-based marketing, it's really important because the wrong decisions can take money out of the feeder's pocket." In this case of 125 heifers, every animal was black, but there were a variety of carcass characteristics between animals. "The clients learn a lot about their cattle by seeing what's going on under the hide."

Locatelli scans about 30,000 head of cattle per year with the ultrasound machine and has been using the technology this way for eight years. Using the CPEC program developed and continuously updated by John Brethour of Kansas State University, Locatelli says

Sorting a group of heifers

On this particular day, Lynn Locatelli, DVM, is sorting a group of heifers at a Colorado feedlot. It takes her about five minutes to set up her equipment by the chute, and she's ready to go. Locatelli pregnancy checked this group of yearling heifers at the ranch, and those that were not eligible for the replacement herd were sent to the feedlot.

While she scans an animal, a member of the feedlot crew is spraying oil on the backs of cattle waiting in line to smooth down the haircoat. This allows coupling of the transducer to the hide. Locatelli covers the transducer with a zip-type freezer bag to protect its finish against cattle that have a lot of sand in their haircoats. In the bag with the transducer she has mineral oil, irrigation drip oil or vegetable oil to give it a surface to slide over. While she scans, another employee is re-implanting. "It's low stress on the cattle to ultrasound them while they are getting re-implanted," she says.

Locatelli is sorting these heifers in four groups based on what their weight and the ultrasound can tell her. Sort one receives no ear tag notches, sort two gets a side notch, sort three gets a low notch and sort four, which are the really fat cattle, get notches all the way around the tag. For now, all four groups will go back to the same pen.

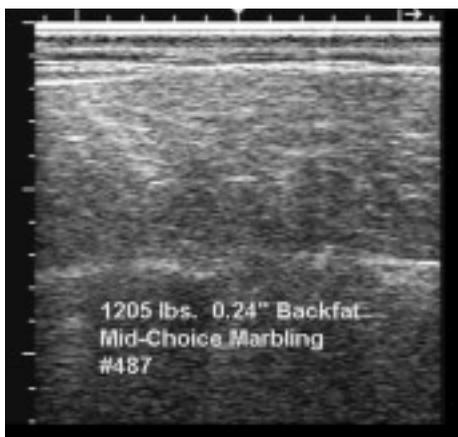
Trevor Preston of Oakland, Neb., says many of his clients also use this method of keeping the group together for the time being, no matter which sort designation they are given. "We identify the different outcome groups with different colored ear tags. So while the marketing of the cattle may have changed, the cattle remain in the same pen so management practices haven't changed as much. Some clients do adjust their implant strategies based on which group an animal is being sorted into."

After cattle are designated a sort group, Locatelli explains that the computer will indicate what the carcass attributes are for cattle in sort one, for example, generate a profitability curve and indicate when the group should be sold. "For this group, it says sell them in about 38 days. If we do that, most will be yield grade 3 and about 70% choice. The next sort will go in about 52 days, and at about 1269 pounds, which is a bit leaner than sort one."

The third sort will be fed another 76 days. "This group is even leaner with a bit more marbling. In a typical pen these are the cattle with the most Continental influence or largest frames, so typically the choice grades are projected lower in the third sort. However, in this group it's a little higher, and we're getting leaner and better as we go."

Locatelli says she'll tell the feedlot manager that that is her upper end recommendation. "He may not want to get the heifers this heavy, but from here on out he can watch the market and if it looks better to market them earlier, he can."

Sort group four will go as soon as they can. "We'd like to get rid of these heavy cattle soon, so when the bus comes and there's room, they can get on. This way we can avoid getting any yield grade 4's by keeping them too long."



LYNN LOCATELLI, DVM

Heifer #487 has desirable carcass characteristics. She's heavier, leaner, has a larger ribeye and more marbling. This heifer is more profitable than #488 below.



LYNN LOCATELLI, DVM

Black heifer #488 has poor carcass characteristics compared to #487.

it's important that the system be flexible. "There are different feeding programs, limit feeding programs, push-them-hard-and-fast programs, various breed targets, different resource bases and different marketing preferences, etc. We can adjust our programs to fit each scenario."

Trevor Preston, Midwest Veterinary Services, Inc., Oakland, Neb., has also been using ultrasound in feedlots to sort cattle into different outcome

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GENI WHEEN

Before cattle enter the chute they are sprayed with oil for better transducer contact and curried if the haircoat is muddy.

groups in order to better match and thus increase the profitability of a particular group of cattle. He also received training from Brethour and Kansas State and has been using ultrasound for about five years. "The producers that seem to be most interested in using ultrasound are feedlots that are marketing their cattle on value-based pricing grids," he says. "Ultrasound helps them to take better advantage of the premiums offered and avoid the significant discounts."

How does it work?

What Locatelli likes to do is prioritize pens of cattle with the feedlot manager. If there's a lot of Continental influence in the pen, she may wait a little bit longer to scan versus if they are strictly English. "Our target is to scan them about 70 days from slaughter," she says. "We

When a producer can sort cattle into two or more outcome groups to hit the optimum marketing date, the profitability can be significantly increased.

just keep a work list going and schedule ourselves out for those times."

Using a computer connected to the ultrasound machine, in the program Locatelli builds a new file for every pen of cattle, gives them a lot number and a general description. "The set-up program really individualizes what we do. Every pen, every feedlot, every feeding scenario, every set of resources that we have."

Before she even begins scanning the cattle, she tells the computer where the premiums and discounts are coming from, in terms of carcass weight, quality grade and yield grade. "We talk a little bit to the computer about the economic

environment, cost of gain, premiums, etc. A lot of that information comes from the feedlot manager, and I enter it into the set-up program." The last thing she puts in is a little bit about performance projections, what type of cattle they are, genetics (Continental vs. English), management and more.

The screen queries Locatelli for specific information, such as quality grade premiums and discounts. She may enter a discount of \$20 per hundredweight for a standard carcass. Premiums are also entered, such as if there is one for Certified Angus Beef or other programs. She also inputs yield grade premium and discounts, weight penalties, cost of

gain, current weight of cattle and projected average daily gain.

With the transducer suspended from the chute above to avoid damage, it's placed in the area of the 12-13th rib and takes the scan where the processor ribs the carcass and grades it in the packing plant. The computer measures backfat and marbling score in the ribeye. After entering the weight from a digital scale, the computer builds a profitability curve. "Not a growth curve, not a finish curve, but a profitability curve," says Locatelli.

"The curves are based on the carcass attributes of this animal relative to the set-up program we put in," she adds. "Where the profitability curve peaks is the optimal time to sell the animal." The graph on the screen indicates that, for example, an animal should be fed for another 36 days. "If we slaughter



Mike Thompson, DVM, says his more progressive seedstock producers have taken advantage of carcass scanning and the information it provides.

her at the recommended 36 days, the computer shows us the projected backfat, thereby approximating yield grade, and projects carcass weight and her fi-

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Lynn Locatelli, DVM, likes to scan cattle about 70 days prior to slaughter.

nal marbling score. In this case, the heifer is projected to finish as a yield grade 2 choice animal.”

Locatelli says ultrasound can act as a crutch but doesn't make all the decisions. “I don't just do what the computer says,” she notes. “We're going to create a plan here, then adjust it to fit the cattle.”

Mike Thompson, DVM, Willow Bend Animal Clinic, Holly Springs, Miss., has been using ultrasound in his practice since 1995. He uses ultrasound in a variety of ways including small animal and



A zip-type heavy plastic bag protects the expensive transducer against sand and other debris in the hair coat. Locatelli suspends it from the chute so it doesn't get dropped.

equine work, as well as bovine reproductive and carcass evaluation. He says with the information gained from ultrasound imaging, his clients are able to explore treatment options, utilize more progressive breeding techniques and make decisions about which seedstock animals to buy or sell based on the genetic differences demonstrated by bovine carcass scanning.

Benefits

One of the benefits of ultrasound is having an image that can be saved in a computer, printed or e-mailed as a per-

Liver ultrasound

For many years veterinarians and researchers have been using ultrasound to non-invasively delve into liver problems of cattle. Kelly Lechtenberg, DVM, PhD, Midwest Veterinary Services, Inc., Oakland, Neb., says, “In some domestic animals the liver is not a very accessible target, but in cattle where it's displaced to the right and held pretty firmly up against the right side of the animal, it's fairly easy to visualize with ultrasound.”

Lechtenberg has been using ultrasound for years for liver pathology determination. He has also used ultrasound to place surgical catheters into the portal vein, for liver abscess induction. Catheters can also be placed in hepatic veins and arteries for nutrient absorption research. “Liver abscesses appear as a hyper-echoic center and, depending on the age of the abscess and how acute the infection is, it will be surrounded by a hypo-echoic area. If it's encapsulated, there will be a hyper-echoic capsule around that, so you'll get kind of a starburst or spherical lesion that shows up within the parenchyma of the liver.” Abscesses can be measured and quantitative scoring can be done.

Though used primarily in research to track abscess formation through the feeding period, Lechtenberg says his data indicates that abscesses found at slaughter are primarily representative of abscesses formed in the last 60 days on feed. Many of the abscesses that occur earlier in the feeding period resolve into scar tissue by the time the animal is processed.

Lechtenberg, K.F., Avery, T.B., Nagaraja, T.G., & Hartke, G.H. (1989). Ultrasound-guided percutaneous catheterization of the portal vein in cattle. *Agri-Practice*, 10:2, 41-44.

Lechtenberg, K.F., Nagaraja, T.G., Leipold, H.W., & Chengappa, M.M. (1988). Bacteriologic and histologic studies of hepatic abscesses in cattle. *American Journal of Veterinary Research*, 49:1, 58-62.

manent record. “I can save images and digitize them,” says Locatelli. “When I save the image and take a picture of the animal, then show that to a producer, it can really make an impact on someone who is wondering if ultrasound should be incorporated into his or her operation.”

Two examples she notes are animals that the ultrasound shows are inefficient, with no fat, muscling or marbling. “You don't want to spend money on feeding these inefficient cattle.” The other is the animal that has a little bit of muscle and a whole lot of fat. “We'll sell this one earlier to avoid a yield grade 4. In a variable load of cattle, it's important to get them sold when they need to be sold.”

As far as the time it takes, scanning can go pretty fast. In the summer with a good crew, Locatelli can scan 100 head or more in an hour. “In the winter when

there is a lot of hair on the cattle, I might do 70 an hour.”

Locatelli charges clients \$3 per head to scan. “If you look over huge numbers of cattle and are marketing cattle on a grid or value-based system, you want the packer to pay you based on everything you can. Just by sorting cattle in the entire cattle population — including southeastern, Mexican, sick or northern origin cattle — you can get back a little over \$11 a head by having them in appropriate groups. You can buy essentially market-priced cattle and sell them for above market price. If you're going to own a lot of cattle, you can multiply that through your lots, and that is a lot of money.”

Preston agrees and says the information received from feedlot ultrasound is quite valuable. “When a producer can sort cattle into two or more outcome groups in order to hit the optimum mar-

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keting date, the profitability can be significantly increased through feed savings and minimized discounts.”

Back to the ranch

The herds Thompson works with in Mississippi are commercial and purebred, and range from 15 head to over 2,000 head. He says his fees vary with the number of animals scanned, the amount of time per animal, as well as the level of facilities and the distance traveled. Aside from early pregnancy diagnosis, diagnosis of reproductive problems and stage of estrous in cattle and horses, his carcass evaluations include ribeye cross-sectional area, intramuscular fat, depth of back fat and depth of rump fat.

Thompson supplemented his ultra-

The Charolais ranch could identify sire line potential and make improvements by looking underneath the hide to accelerate their progress.

sound training in those areas through Iowa State University's Centralized Ultrasound Processing (CUP) program, which gathers compositional and quality evaluations with ultrasound to allow producers a faster and less expensive way to improve carcass merit. The program collects images for rump fat, 12-13th rib fat thickness, ribeye area and percent intramuscular fat. CUP-certified ultrasound technicians can measure ribeye area to within .6-.7 square inches of the actual ribeye area using real-time ultrasound, fat thickness to within .04-.05 inches of the actual fat thickness at

the 12-13th rib and rump and percent intramuscular fat to within .8-.9% of the actual amount of percent intramuscular fat.

“In my area the more progressive seedstock producers have taken advantage of the carcass scanning and the information this provides,” says Thompson. “Public awareness and our willingness to invest in equipment and continuing education will determine how much growth we have in this area.”

Preston also uses ultrasound as a tool for evaluation and selection of breeding stock for seedstock producers and says with the many value-based marketing grids available, the use of carcass ultrasound will continue to rise.

Bovine ultrasound is not without its challenges, however. Owner facilities and working around weather problems can be difficult at times, says Thompson, as well as scheduling long scanning sessions. Also, staying current with the technology can be expensive if the amount of ultrasound work you are doing is not paying you back.

But once you've made a commitment to ultrasound, it can open a lot of doors other than the few tasks you may have originally envisioned. Scanning cattle in the feedlot has also brought Locatelli back to the ranch level. One ranch of Charolais cattle was so impressed with the scanning at the feedlot level that it had Locatelli scan all yearling bulls and heifers on the ranch. “They could identify sire line potential and make improvements by looking underneath the hide to accelerate their progress. We could knock out the bottom 20% of the herd and identify the outstanding individuals. You do not want the losers in the herd, and you need to cut them before they do any economic damage. We'd also like to identify the outstanding individuals early and amplify those lines.”

Clients with retained ownership of

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Liver lipid assessment with ultrasound

A study by Iowa State University assessed the use of ultrasound for fatty liver determination in dairy cattle. Fatty liver, or hepatic lipodosis, can impair function of the liver, precede ketosis and left displaced abomasum, decrease immune response and increase susceptibility for infectious diseases and increase susceptibility for retained placentas and parturient paresis.

Currently, diagnosis of fatty liver and determination of triacylglycerol content of liver can be done only by puncture biopsy of the liver followed by chemical or histological analyses, which is not convenient for normal farm situations. This study sought to develop a non-invasive, easily-applied, on-farm diagnostic test in early lactation cows to diagnose fatty liver and determine its lipid content.

The study evaluated 49 liver scans from 29 cows. After scanning, 4-6g of liver tissue was obtained by puncture biopsy and analyzed for total lipid and triacylglycerol. Livers were classified according to their total lipid content, measured as total lipids of liver wet weight by biochemical analyses into three groups: normal (0-8%), moderate fat accumulation (8-12%) and severe fat accumulation (>12%).

A parameter was calculated from the ultrasound parameters by multivariate, linear regression. A linear parameter from the ultrasound parameters was calculated by regressing the ultrasound parameters to the total lipid content as measured by biochemical analysis. The ultrasound detection of fatty liver had a sensitivity of 95%, a specificity of 96% and an accuracy of 98%.

The study concluded that ultrasound imaging can be a reliable, non-invasive technique to diagnose fatty liver and determine the lipid content of the liver.

Bobe, G., Amin, V.R., Hippen, A.R., Wilson, D.E., Lindberg, G.L., & Young, J.W., Department of Animal Sciences, Iowa State University, (1999). Noninvasive determination of liver lipid content in dairy cows by digital analyses of ultrasonic images. *Journal of Dairy Science* 82 (Suppl. 1), 100-101

higher end, more uniform cattle can often capture \$28-\$30 per head above market, says Locatelli. "Plus, they can take all of that information back and incorporate it into better management and genetic decisions."

Profitability is definitely the driver of using this technology in the feedlot, says Locatelli. "It's a good value-added service for some of the clients because when times are tough, the yards are empty. If you can do more to help the

client be profitable, you're more likely to have a yard full of cattle."

Aside from the rancher and veterinarian, sorting cattle this way also gives the packer what he wants. "If you look over our data set, less than 2% of the cattle we've been sending are out cattle, such as yield grade 4's, standards, heavy, light or dark cutters," says Locatelli. "If you can essentially make that zero, it's good for the packer, and makes your system more cost-effective."

Using this tool can help you help clients with their marketing programs. "Some yards want to know if their cattle are good enough to sell on a grid, and

Clients with retained ownership of higher end, more uniform cattle can often capture \$28-\$30 per head above market.

they buy great cattle, but they don't have the confidence to go to that market," says Locatelli. "I work with a lot of those people and teach them how they can use a value-based marketing system and help give them the confidence to do that."

"The information gained from ultrasound is very interesting and exciting," notes Thompson. "I have found ultrasound work to be very rewarding in all areas and on all levels. Whether you helped a seedstock producer find the top carcass bull in an upcoming sale or you just showed a family the 18-day old conceptus in their mare, the benefits are great." ■

For more information about Iowa State's CUP program, visit the website at: <http://www.extension.iastate.edu/Pages/ansci/ultrasound/>.