BQA BEGINS EARLY

Well before the finishing phase, management decisions on the ranch influence beef quality.

BY JOHN MADAY

Grain finishing, traditionally, has served as a primary management measure toward beef quality and consumer satisfaction. Feedyards can take cattle of virtually any background, feed them a grain-based diet for 120 days or more, and in most cases build enough fat and marbling to produce beef of acceptable quality. ¶ Results, however, vary widely, and the lack of uniformity and predictability persists as a key beef-quality challenge. It has become clear that grain finishing alone cannot assure quality, especially as rising input prices reduce the economic viability of long finishing periods. ¶ Instead, the industry is evolving toward a more integrated approach for improving product consistency and assuring quality. Emerging science and technology will allow more advanced genetic selection, coupled with lifelong nutrition and management, to set cattle on the road toward top-quality beef long before they arrive in the feedyard, perhaps for a shorter, more efficient finishing period.

IT'S IN THE GENES

Conventional genetic selection, and development of expected progeny differences for carcass traits have played a role in improving beef quality. Today, emergence of DNA testing and marker-assisted selection offer potential for more rapid progress. Kevin DeHaan, PhD, technical services director for Igenity, says marker-assisted genetic selection helps producers better match sires to their cow herds, potentially overcoming weaknesses, or capitalizing on strengths in the herd in terms of beef tenderness, marbling or other traits.

In conventional breeding systems, beef-quality traits are difficult to predict, and extraneous variables such as environmental differences, nutrition and management make it difficult to measure genetic influences on beef quality. DNA profiling eliminates some of the guesswork. Producers can know, early in a calf's life, its potential for producing well-marbled, tender beef. With that knowledge, managers can shift those calves with the greatest potential into production systems that capitalize on that potential and target premium markets. Calves with less genetic potential can move to lower-cost production systems that target a leaner endpoint.

Marker-assisted selection can accelerate the pace of genetic improvement, particularly for low- to moderately heritable traits such as fertility, marbling and tenderness, while also, of course, maintaining selection for other important production traits.

DeHaan says that as Merial continues adding marker panels to its Igenity Profile and studies field applications of the technology in different production systems, producers are becoming better able to identify and predict those animals that can reach a high-quality endpoint with shorter times on feed, allowing lower production costs while assuring consumer satisfaction.

Marker-assisted selection for beef quality can

include traits besides tenderness and marbling, such as ribeye area, fat thickness, hot carcass weight and yield grade. However, the definition of beef quality may be expanding beyond tenderness and carcass uniformity. Researchers at Iowa State University, for example, in studies funded by Pfizer Animal Genetics and the National Beef Cattle Evaluation Consortium, are working to improve the nutritional value of beef through genetic selection.

"Our ultimate goal is to help improve human health through the beef people eat," says ISU animal scientist James Reecy, PhD. "For instance, we could identify genetic markers associated with increased levels of beneficial nutrients such as fatty acids like conjugated linoleic acid and minerals like zinc, iron and copper."

Reecy adds that the researchers intend to develop selection tools to improve the nutrient content of beef without sacrificing flavor or a positive eating experience. "The research will advance the genetic improvement of the animal itself and the animal's meat composition, and also will aid producers looking for desirable growth and carcass weight characteristics."

In another three-year study at Colorado State University, also funded by Pfizer Animal Genetics and NBCEC, researchers are looking at links between genetics and animal health.

The study, which began in 2007, involves more than 3,000 steers. All animals originate from one large commercial beef operation and are being fed at a Colorado commercial feedlot. Scientists have genotyped each animal and will track their performance and health traits throughout the research and evaluate individual carcass quality after harvest. The team currently is using first-year data to identify possible genetic marker panels that are indicative of animals less susceptible to common feedlot diseases.

At Pfizer's Animal Health division, researchers anticipate a possibility of tailoring new products and protocols to groups of animals based on their genetic predispositions for carcass quality and tenderness, and susceptibility to common diseases.

MOM'S NUTRITION MATTERS

Genetics provide a starting point for beef quality, but for cattle to achieve their genetic potential, they need good nutrition, and that process begins before a calf is even born. University of Wyoming ruminant nutritionist Bret Hess, PhD, says producers and scientists have long known that inadequate cow nutrition late in gestation can negatively affect calf birth weights and the transfer of immunity to the calf. "We see about a 5 percent greater death loss among calves when cow nutrition is inadequate during the third trimester," Hess says. Among the survivors, susceptibility to disease also can affect beef quality, as research has shown a strong correlation between sickness and lower quality grades.

Hess says calves born light due to inadequate cow nutrition typically grow at the same rate as normal calves but, because they started light, have lower weaning and yearling weights and take longer to reach the same finished weight.

Recent and on-going research into the concept of fetal programming indicates that the cow's nutrition early in gestation — during the first and second trimesters — also is critical for the calf throughout its life.

Organ development of the fetus occurs during the first trimester, Hess explains, and research has shown that nutritional restriction in cows during this stage can result in calves with abnormal heart, lung or liver development, potentially leaving them more susceptible to disease.

Hess says muscle cell and fat cell development begin during mid-gestation. The dam's nutrition during this stage could affect the ultimate potential for the calf to produce a high-quality carcass.

Research at the University of Wyoming has shown that after finishing, calves from nutritionally deficient dams produce leaner carcasses than those from cows with good nutrition through gestation. In a recent trial, Hess says, cows grazing improved pasture during mid-gestation gained 65 pounds more than a similar group on native range. The researchers followed the calves from both groups through finishing and found that calves from the improved-pasture group performed better in the feedyard and had better marbling scores at slaughter.

Fetal programming research suggests that some fairly simple and relatively inexpensive nutritional management in the gestating cow herd can help assure healthy calves that perform efficiently at later production stages and produce high-quality beef.

GRAIN NOW, MARBLING LATER

For years, conventional thinking has maintained that marbling occurs late in the life of a steer or heifer, during finishing on a high-energy ration. But in recent years, research has shown that nutrition early in the calf's life lays the groundwork for its ability to produce marbled beef.

University of Illinois animal scientist Dan Faulkner, PhD, says starch, particularly from corn, in a young calf's diet allows it to develop the fat cells called pre-adipocytes that lead to marbling later. Faulkner says research at Illinois indicates starch in the young calf's diet could be more important for marbling than the finishing ration, with about a 15 percent improvement over an all-forage diet during the same period. Researchers have introduced corn-based supplements in creep-feeding systems to calves as young as 45 days, resulting in significant improvement in marbling.

Adequate milk from the dam also plays an important role in development of fat cells and eventual marbling in the calf, Faulkner says. Research results suggest that if a calf receives adequate milk and starch from a grain source early in its diet and continues to consume some grain through the post-weaning phase, it might not matter whether there is any grain in the finishing diet at all, he adds. Marbling scores and grading percentages for cattle in this system remain the same regardless of the amount of starch in the finishing diet.

In Illinois feeding trials, researchers have used blends of co-products including distillers' grains, soy hulls and corn gluten feed, with no corn in the finishing ration. Cattle on these rations, Faulkner says, gained weight faster than those on a grain-based ration — about 3.5 pounds per day — although feed conversions were slightly lower.

By introducing starch sources in a creep feed prior to weaning, managers could shift to a production system that reduces or even eliminates the need for grain in the finishing ration, while improving marbling and USDA quality grades. A finishing period on high-energy rations will remain an important component of high-quality beef production. But as scientists gain new understanding of genetics, maternal nutrition and calf nutrition, cow-calf producers will play an increasingly important role in beef quality and consumer satisfaction.