Crystal-Ball Technology

The dawn of a new DNA-based genetic test for tenderness and marbling could turn today's cattle industry upside down, while Angus producers gain another competitive edge.

BY STEVE SUTHER

In these Dark Ages of beef production, whole pens of cattle with unknown backgrounds are harvested at the same time because, on the average, they are considered "close enough." Guesswork, fear, need and greed determine the target market and date of harvest.

At the close of the 20th century, many feeders consider merit-based sorting an idealist's dream, lacking technical and financial incentives to be anything more. The beef industry suffers from inconsistency due to differences in biotype and the lack of opportunity for focused management. However, that's all about to change with the dawn of the third millennium.

Two researchers at Ohio State University (OSU), funded by a grant from the Certified Angus Beef (CAB) Program, have spent years looking for answers. Their approach is influenced by Francis Fluharty's training as a feedlot nutritionist and Daral Jackwood's as a molecular biologist in the poultry field.

Fluharty noticed that some cattle simply had the potential to produce high-quality, tender beef; others didn't. Meanwhile, he knew there was so little variation in beef's main competitor, chicken, that quality problems could be corrected with dietary adjustments. That isn't possible in a beef industry that has 840 different quarter-blood variations in genotype.

"When you consider our feeding mix, is it any wonder we have a variable beef product?" Fluharty asks. "We're competing with an industry that calculates feeding data to the fifth decimal on animals that are identical except for lungs and beaks." On the other hand, the beef industry can't automate because of carcass variation. "And we have problems with differences in portion size, tenderness and marbling ability."

Certainly genetic advances in recent years have helped conception, growth and muscling rates, with expected progeny differences (EPDs) as measuring tools. But, Fluharty points out, management and environment determine age and weight at slaughter and dressing and carcass fat percentages.

■ End the guesswork

Now an exclusive DNA test for genetic potential can create opportunities for precision management.

The OSU researchers have developed a genetic diagnostic test for both tenderness and marbling potential that can be performed anytime after an animal is born. A U.S. patent application has been filed.

After four years of studies, the test appears to be more than 99% accurate and can be performed on a few drops of blood drawn from any area of the body, dried and stored in plastic zipper bags. "We are still performing tests on samples that are three years old," Fluharty notes.

The test can break marbling and tenderness down by degrees of potential, assessing each individually and in combination. Results could rank expected tenderness from tough to very tender, quality grades from Prime to Select or lower. The test takes less than a week to return results and should cost less than $10/head under mass production.

■ A more efficient system

An analysis shows that such a test could save producers $40-$50/head by properly channeling management. For example, total feed and yardage costs can amount to $1.85/head/day, or $43.50/month. When cattle don't hit the target on a value-based grid, that is wasted money.

While not endorsing specific technology, Fluharty suggests uses for such a diagnostic test. "Producers could collect blood samples when convenient — at birth, branding or weaning — then mail them to a central processing lab for sorting." Upon arrival at a feedlot, the calves would be penned and fed according to known carcass potential.

"When you know a group of cattle can't make the *Certified Angus Beef* ™ target, you could aim for 120 days, 0.4-inch external fat and 750-pound carcasses, eliminating the lights and heavies — there's no reason to incur more feeding expense when you know they won't grade," he says. Such cattle could be further sorted into those that are only suited for grinding because of toughness and those that are lean and tender.

Similarly, cattle that have the genetic propensity to grade can be segregated. Research trials have demonstrated properly sorted animals can grade Choice or better at less than a year of age. Say 40% of a pen of Angus cattle don't have the potential to grade upper Choice or Prime; after these are sorted into a high-yield target pen, the remaining cattle could achieve a 90% *Certified Angus Beef* acceptance rate.

Use of ultrasound in conjunction with genetic testing might further improve results.

In comparing the two, Fluharty notes, "Ultrasound can't really predict what an animal will do, only what it is at a given time. But this genetic test can't tell what an animal is at any given time, only its potential.

"Potential may not be realized unless there is proper nutrition and management throughout an animal's life," Fluharty points out. "Knowing potential value could make ultrasound calibration of management more economically feasible."

■ A competitive edge

According to CAB Program Executive Director Jim Riemann, the Program has entered into a licensing agreement with the OSU Foundation that will give it, Angus breeders and the American Angus Association exclusive rights to the use of this technology.

"Although we recognize there is still a lot of research to be done, we are excited about the potential for applying this new DNA technology," Riemann says. "It could really enhance the effectiveness of our licensed feedlots and improve the genetic-selection capabilities of Angus breeders throughout the United States."

The effects of a commercially available test for tenderness and marbling potential would be profound for the whole beef industry. For example, consider growth-implant research among replicated pens of animals with identical potentials for tenderness and marbling.

As the economic incentives for genetic sorting become clear, the beef industry would move from foot dragging to a preference for value-based systems that require sorting by carcass potential.

OSU studies during the past four years and current testing on 2,500 steers will continue to evaluate both the genetic merits and practical applications for the technology, including verifying parentage and biotype, Fluharty says.

Further studies in the area of carcass potential may lead to the development of an EPD or similar ranking for seedstock.

"If a bull had all the indications of potential for both tenderness and marbling ability, he would be worth more than a bull with only some of that potential," Fluharty notes. "There may be clear winners and losers. Those who don't want to know may be owners of some of the most popular bulls in use across the industry that won't measure up to the new form of genetic testing."

The new technology would foster selection for genetically tender, well-marbled *Certified Angus Beef*-type cattle; development of genetically tender lean animals for niche markets among those cattle that will never achieve premium marbling levels; and screening for animals that will be neither tender nor marbled, but can be least-cost fed for grinding.

Fluharty says widespread use of the technology could eliminate non-tender genetics over a 10-year period, because registered breeders wouldn't sell cattle that flunk the test for tenderness potential. A focus on flavor and uniformity could win back much more of the consumer dollar. And consider the expected *Certified Angus Beef* acceptance rate and carcass-size uniformity of a pen of steers calved within two weeks from parents with 99%-accurate high-marbling potential.

The carcass potential aspects of the diagnostic test will see pilot field trials in 2001, Fluharty says. AJ