

DNA: An Arriving Tool

by **Miranda Reiman**, Certified Angus Beef LLC

From today's vantage it may be hard to dream big enough, to stretch the imagination far enough, to envision how future tools will change our nation's cow herd, but there are some certainties. Here and now, heifer development is expensive — and that looks to increase. Feed and economic resources demand efficiency and consumers want quality. So how will cattlemen do it? Lifting a page from breeders of the agronomic sort, the spotlight turns to DNA.

"It takes so much time to develop a herd of cattle — a lifetime, honestly — that's designed to be feed-efficient or have high reproduction," says Cody Jorgensen, seedstock Angus rancher from Ideal, S.D. "The more knowledge you have about DNA to help you make the right decision, the better."

The Jorgensen Land and Cattle team has been DNA-testing standout bulls and donor cows for years, but Jorgensen plans to step up those efforts this fall.

"Undoubtedly, it's going to be a tremendous tool to add to the toolbox, along with the quantitative genetic research that we do," Jorgensen says. Although he expects the registered world to embrace the technology at a greater rate, he says the emerging lower-density, lower-cost tests "could impact commercial cattle heavily."

"Data is a power," he says. "You get a lot of cost and time and energy stuck into a bred female, and every day that it may be in the wrong group, it's very expensive.

If a guy knew early in a calf's life if it had the abilities we want, it would definitely improve the costs of raising replacement heifers."

Jorgensen sees the application to steer mates equally intriguing.

"It could be a really efficient means of putting cattle where they need to be," he says, referencing groups sorted for different management schemes.

Larry Kuehn, geneticist at the U.S. Meat Animal Research Center (USMARC) in Clay



PHOTO COURTESY JORGENSEN LAND AND CATTLE

► "If we could genetically select for all the things that challenge us — if that's the fescue grass or the elevation — if we could understand DNA that could handle that type of environment or that was resistant to respiratory disease — just imagine that. It would be a game changer," Cody Jorgensen says.

Center, Neb., says DNA is the best forecasting tool available right now for young calves.

"It basically helps you skip time," he says. "You're trying to increase your accuracy earlier. It's potentially cheaper to pay for a test to increase accuracy when a bull is born, for example, versus waiting for it to be ultrasounded itself, and especially waiting for it to be progeny-tested."

Back in the 1990s, researchers were talking about DNA changing everything in the future, Kuehn says.

That day is getting closer.

"The technology has just exploded over the last five years in terms of new platforms, greater efficacy and reduced costs to run," says Bill Bowman, American Angus Association COO and president of Angus Genetics Inc. (AGI). "With some of the very early DNA tests, we were using individual genes

or individual markers, and in many cases they didn't account for very much of the genetic variations."

Researchers streamlined the process when they began looking at changes in the DNA sequence — or "snips" (from single-nucleotide polymorphisms, SNPs) — and how they affect specific traits. That's when the 50K tests were born, looking at 50,000 of these snips.

Scientists hope that even higher-density tests and genome sequencing will allow them

to find "functional mutations," the specific points of differentiation from one animal to another. That will be important in trying to apply DNA tests across breeds, Kuehn says.

The accuracy of the high-density tests improves confidence in more basic, less-expensive ones that draw on a reduced number of SNPs. An example is GeneMax®, from Certified Angus Beef LLC (CAB), that evaluates gain and grade potential in commercial Angus cattle.

Today, DNA works especially well in predicting carcass traits.

"The genetic correlations derived at AGI suggest that 30% to 40% of the variation within a given carcass

EPD is explained by available genomic tests," Kuehn says. "You've got some potential to recoup the cost of genotyping in those areas right now, just maybe not as much as we'd like to if we focused on other profitable traits. Improving carcass merit can be economical, don't get me wrong, but we still have other places we'd like to tackle."

Reproductive traits, like longevity, and animal health seem to top the wish list.

"Just a few percentage changes in fertility would have a much higher impact in whole-system profitability than most of these carcass measures we're talking about," he says.

The Angus breed is working on measuring longevity and survivability currently.



PHOTO BY KASEY MILLER

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for Beef Cattle

“Once you get data and ways to measure traits like that, then a DNA test is soon to follow,” Bowman says. “Right now I would use caution using a DNA test promising to improve fertility, but down the road, we’ll definitely see that.”

Jorgensen dreams of a system similar to what has shaped the crop side of their business.

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E. coli resistance. Fertility. Ability to handle “hot” rations. Tests for these traits are all on the horizon.

“As an industry, we’ve really reduced our cattle numbers while maintaining the same or higher levels of production, in part due to selection,” Kuehn says. DNA may be one way to keep that momentum going.

“Any places we can increase efficiency by selling one more calf, because we have one more fertile female,” he says, “or have one more calf sold for slaughter because he made it through the feedlot without respiratory disease, or fewer foodborne pathogens are



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advantageous. Those sorts of changes are a boon for the industry in terms of perception and environmental footprint.”

The Jorgensens have been pulling DNA samples and storing them in a physical database that now numbers into the thousands.

“That doesn’t mean we’re going to send them in and analyze them, but it doesn’t hurt or really cost anything to take the sample and document it,” he says.

“It’s not like the poultry or swine business where they can do 2.4 turns per year. You just can’t make that much progress in a year’s time. It’s just critical to know whether those cattle will do it or not.”

It matters to each rancher, to the feeders who buy their cattle and to those even further removed from the production chain.

“Meat demand is not going down, especially worldwide,” Kuehn says. “It’ll take focus if we’re going to keep beef competitive to other protein sources.”

