

NUMB3RS

WITH PURPOSE

*Collecting data in many shapes and forms,
AGI staff analyze the data and turn it into useful genetic predictions
to assist Angus members in improving their herds.*

Story & photos by Sheryl Smith-Rodgers

A little more than a decade has passed since Angus Genetics Inc. (AGI) launched as a subsidiary of the American Angus Association. From the start, its mission has been to “provide services to the beef industry that assist in the genetic evaluation of economically important traits.” Without a doubt, the company has succeeded over and over again by developing better tools for Angus breeders and producers to improve their herds.



“AGI produces more beef cattle EPDs in a year than all other organizations combined.”

— Dan Moser

No one could have predicted the full scope of groundbreaking advances — such as the powerful new Angus GS™ genetic test — that AGI would accomplish in the years that followed the company’s start in October 2007.

Not even Dan Moser, AGI president and Association director of performance programs since 2014.

“AGI is more active in research than anybody could have envisioned 10 years ago,” he says. “We’re involved in science and research through partnerships with universities and labs. We’re on the cutting edge of using that information in animal genetics. Plus, the uptake of both genomic testing and its benefits are more than we would have ever imagined in terms of how accurately we can now describe young animals based on their DNA, pedigrees, measurements and phenotypes.”

In less than a decade, AGI has also achieved status as an industry leader among breed organizations.

“We provide more genetic information to the industry than any other entity,” Moser says. That’s not just because of the expected progeny differences (EPDs) AGI calculates for the American Angus Association. AGI also calculates genetic predictions for the Canadian Angus Association, the American International Charolais Association and several other breeds.

“AGI produces more beef cattle EPDs in a year than all other organizations combined,” Moser notes.

In the beginning

Since the 1950s, registered Angus breeders have submitted their cattle’s performance records — basic weights and measures in the beginning, followed later by carcass and ultrasound data — to the Association. Genetic prediction methods came along in the 1960s when animal sciences professor Richard Willham published a journal article (*Biometrics*, March 1963) on the direct and maternal genetic effects on offspring. He went on to work with the Beef Improvement Federation (BIF, founded in January 1967) to author guidelines for an objective National Sire Evaluation (NSE) that could be used by breed associations.

In 1972, Willham presented an Angus evaluation program to the American Angus Association Board of Directors. The directors approved the unrestricted use of artificial insemination (AI), a controversial issue for several years, and then the NSE.

Quickly, the Association came up with 10 reference sires and began to deliver semen. The Association’s first *Sire Evaluation Report* was



AGI’s Dan Moser and Kelli Retallick prioritize turning member data into user-friendly tools to help Angus breeders improve their herds.

published in 1974, and the first field data report followed in 1980. Using records submitted by breeders, universities analyzed pedigrees, individual performance and progeny data to calculate EPD values for economically important traits. All those early genetic selection tools allowed Angus breeders to greatly improve their herds.

21st Century

Fast-forward to the mid-2000s, when the Association learned that universities would discontinue genetic evaluation analyses by 2009. As a result, the Association Board created AGI to perform EPD calculations for Angus and other breeds. Its work quickly broadened.

“Shortly after 2007, genomic testing became relevant to the beef industry,” Moser says. “Today, that’s a big part of what we do. We don’t operate a lab, but DNA samples come to AGI from Angus breeders.”

Bringing genetic evaluations in-house offered several advantages.

“We could make sure that the models supported the data,” explains Kelli Retallick, AGI’s director of genetic service. “It also allowed us to make weekly genetic evaluations, which started in 2010, instead of once every six months.”

Then and now, EPDs — which have grown from the original four (birth weight, weaning weight, yearling weight and milk) to 18 — play an important role in genetic selection. Nowadays, they’re commonly called genomic-enhanced EPDs (GE-EPDs) because of their integration with DNA tests.

“We’re moving more toward just calling them EPDs,” Moser says.

“Whether an animal is tested or not, its EPDs are still influenced by the DNA tests of other animals. You might have a bull calf that wasn’t DNA-tested, but his sire was and some of his

sisters at other farms were. All that influences his EPDs. So every Angus EPD is a genomic-enhanced EPD. The whole Angus breed benefits from the DNA test, not just the test animal.”

EPDs enable breeders to compare all animals, no matter their location.

“It used to be that breeders weighed their cattle and kept the biggest ones,” Retallick says. “They ranked animals within a herd, but the herd only. They couldn’t compare their animals to a neighbor’s. Now they can compare animals from coast to coast. The only equation you need is $P = G + E$, which translates on paper to Performance = Genetics (inherited) + Environment (management).”

More innovations

AGI continues to make huge strides in evaluating cattle genetics. In July 2017, the Association — in partnership with AGI and the University of Georgia — became the first major beef breed association to use a single-step evaluation to incorporate genomic information into the calculation of all EPDs. Overall, the statistically complex genetic evaluation has proven to turn out more-accurate, weekly EPD updates.

In November 2017, AGI announced another major innovation: the Angus GS genomic test. The high-density test includes 50,000 markers with new markers that target specific traits in Angus cattle. Additional markers, such as fertility, feed efficiency and tenderness, were included for future research.

“The previous genomic tests were designed for many beef and dairy breeds,” Moser says. “Some

markers on those tests weren’t useful for us, because on some markers, all Angus cattle are the same. That one-size-fits-all product made sense in the beginning because no breed was doing enough to justify something unique

AGI Mission

AGI’s mission is to perform genetic evaluations, conduct research, and develop and prove new science and technology to benefit all producers who use Angus genetics.

The company’s main functions include:

- *provide services to the beef industry that assist in the genetic evaluation of cattle traits;*
- *develop and promote technology for use by the beef industry, including DNA technology; and*
- *conduct research, develop and prove new science and technology to benefit all beef producers.*

Continued on page 56

and exclusive. But as our volume has grown, Neogen GeneSeek [Operations], one of our partner labs, said they could build something specific for Angus and that we could be involved in the design to help optimize it just for Angus cattle. AGI was pleased to be able to bring such an innovation to Angus breeders.”

So were many members.

“A few breeders sent boxes of samples ahead of time and told us to run them as soon as the new test was ready,” Moser says. “They liked the lower price of \$37 and that it was designed just for Angus. With our previous products, we had a higher-density test for a higher cost and a lower-density test for a lower cost. Now this is the best of both. The Angus GS is a higher-density test for a lower price. It’s a little more accurate than a lower-density test for a cheaper price. That’s the benefit for the volume of testing that Angus does. We can get a better price from the labs than others can because we do so much testing.”

Should members retest animals?

“We tell them that it’s not necessary,” Retallick says. “We do recommend that new animals be tested, which makes data more valuable. This new test replaces both the low- and high-density tests.”

“So far, more than 433,000 animals have been DNA-tested,” she adds. “We have more genotypes than the rest of the breeds in the U.S. combined. That’s a testament as to how producers use and trust these tests. There is power in numbers. In our database, we have 8.6 million animals with weaning weights. That’s a huge amount of data that can be incorporated into perfecting genomic predictions. How I like to explain it to members is that a genomic test is like a credit card: It allows you to get the goods up front, but you need actual cash to pay the bill.



“So far, more than 433,000 animals have been DNA-tested,” Retallick adds. “We have more genotypes than the rest of the breeds in the U.S. combined.”

The data is like the cash.”

What’s ahead?

A lot. Stephen Miller, AGI’s director of genetic research, envisions a day when every Angus calf will be genotyped, enabling breeders and producers to fine-tune genetic selections.

“The more we test, the more the database grows,” Miller says. “We don’t start seeing patterns, which we need for research, until we get a lot of data. In the future, we’ll be testing for new traits, like fertility health traits, feed efficiency, feed intake, meat quality and longevity.”

In 2015 the American Angus Association began accepting foot scores collected by members. Since then, more than 12,000 animals have been scored.

“Foot scoring will become an EPD like yearling weight or weaning weight,” Retallick says (see “Solid Foundation,” page 90). “Members have reported issues within the Angus breed with claw set. They want to know if there’s a genetic component, or is it something to do with the environment to cause that. If claw set is heritable, then we can use an EPD to select and change the trait because it’s influenced by genetics and passed down through sires and dams. For cattle to last and perform better, they have to support their own weight and have a good foundation to reach their genetic potential.”

Angus producers also ask about traits that are regionally important, such as hair shedding.

“There’s a genetic predisposition for that,” Moser says. “Some cattle shed their coats better than others. I think there will be a day when we have an EPD for that trait. In some parts of the country, it’s not important; in others, such as the Gulf Coast and South Texas, it’s essential.” **AJ**

Editor’s Note: Sheryl Smith-Rogers is a freelance writer and photographer from Blanco, Texas.

HOW AGI WORKS

Ever wonder what happens after you ship off your samples of blood cards, hair follicles and ear punches for DNA testing?

First, the samples are each barcoded, scanned and logged into the Angus Genetics Inc. (AGI) database. Then they are packaged and shipped to a partner laboratory.

At the lab, DNA is extracted from each sample and dissolved in a solution that separates the DNA strands. A robot applies the DNA to one of 96 tiny blocks on a rectangular chip about the size of a business card. One block contains a row of DNA data that's 50,000 columns long. A laser reads and imports the huge amount of data onto the lab's server, from which AGI can download.

After being tested, the samples return to AGI, where they are scanned back into the system and placed into archives, which now total close to 1 million samples.

Members of AGI's customer-service team work hard on many levels to make the process smooth.

"Our reps deal with everything from registrations and data sent by members to DNA testing and EPDs that result from DNA testing," explains Dan Moser, AGI president and Association director of performance programs. "They work with labs and update breeders on the status of their sample results.

They're on the phone with breeders to help them with online orders for DNA testing and issues with an animal's results."

Statistics and matrix algebra are used to analyze the collected DNA data.

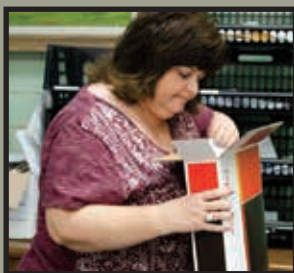
"The Association's information systems department runs the computer software, which is written by the University of Georgia, that analyzes the data," says Kelli Retallick, AGI director of genetic service.

"We combine DNA lab results with weights and measures from producers and pedigrees to do the analysis and produce the EPDs.

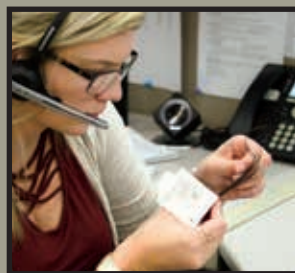
"We make sure the data is clean and processed every day," she continues. "It's updated online every week."

Retallick says an animal's data won't change much, unless an update has been made, such as a weight added or progeny data recorded. The weekly updates are necessary for Angus breeders because there are so many Angus cattle and so much data reported from week to week.

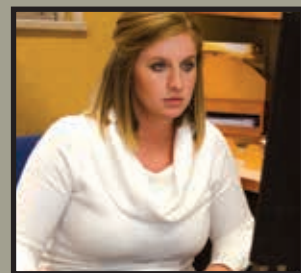
"As geneticists, we sit at our desks and analyze the data, such as genotypes, foot scores and other performance measures," Retallick says, "sometimes collaborating with other researchers and universities. We're always focused on improving the next generation of Angus."



Customer Service Representative Tanya Knadler opens a box of DNA samples, which arrive at the Association in a variety of packages.



Customer Service Representative Aleesha Ball checks a hair submission to ensure it has the root bulbs necessary for abstracting DNA.



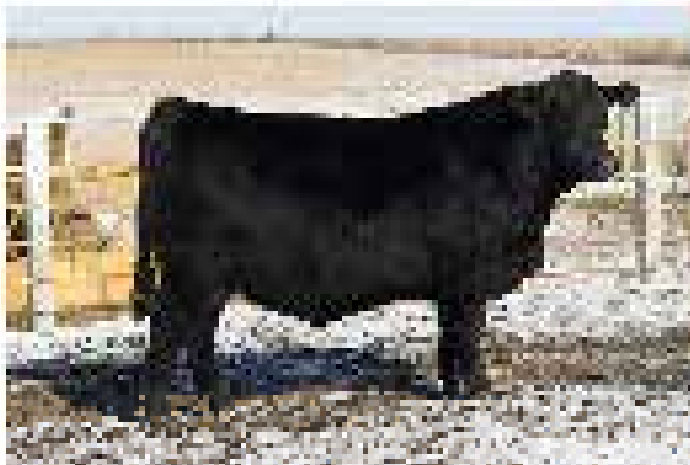
Analyzing producer data and collaborating with other researchers, AGI's team of geneticists focus on how to improve the next generation of Angus, says Kelli Retallick.

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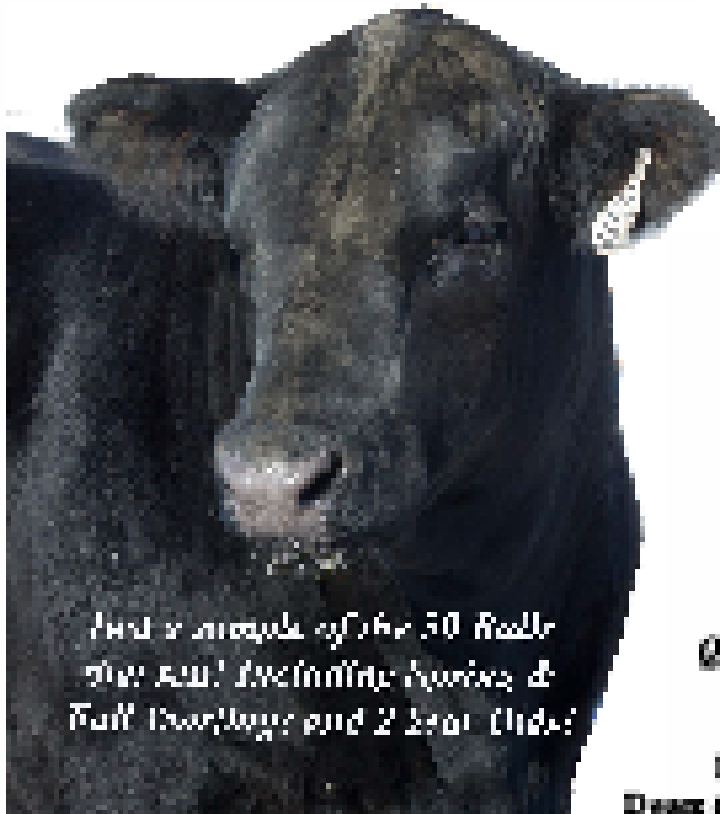


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7076H
100170
10170



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 100% Angus sire
 100% Angus dam
0217
100170
10170



KIM ON ON CH D'ON 0023
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 100% Angus sire
 100% Angus dam
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 100% Angus sire
 100% Angus dam
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 100% Angus dam
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