Science and Stockmanship

Reproductive and genomic technologies can accelerate genetic improvement.

by ***Katie Maupin Miller***

Genetic improvement often lies at the intersection of science and stockmanship, where technology and cattle sense meet to grow the profit potential of beef seedstock and commercial herds.

Consider genomic testing, which enables genomic-enhanced expected progeny differences (GE-EPDs) and improves genetic evaluation accuracy.

"Implementation of genomic-enhanced EPDs has allowed our breeding program to greatly accelerate the performance of our cattle. Traits such as growth (yearling weight) can be assessed around one year quicker versus data collection, carcass traits are about two years quicker, and maternal traits approximately three years quicker," explains Mark Herring, who owns and operates 111 Farms, Whigham, Ga., with his brother, William.

Adding genomics to genetic evaluation hastens the pace of genetic progress because it increases the accuracy of young breeding stock's EPDs before phenotypic data can be collected from them and their offspring. Genomics also enables faster and more accurate genetic prediction of traits that are difficult to measure quickly, such as carcass traits.

Keep in mind that even full siblings have differences in their genetic potential depending on which of the more than 22,000 genes they inherited from their sire and dam. Even in the most elite matings, some offspring will receive genes that lead to less performance than the performance of their parents for particular traits. Most will perform as expected, and some will be exceptional outliers with superior genetic potential.

Identifying elite individuals among flushmates, for example, can help producers select rising stars to use as herd sires and donor females in their programs more quickly. This enables cattle producers to fold exceptional genetics into their herds more rapidly than they could by sorting flushmates based on phenotypic and progeny data alone. With each generation theoretically holding more genetic potential than the last, these young guns of genetic improvement can quickly move the needle on seedstock operations.

"The real beauty of genomics is it helps you reduce mistakes in your breeding program. Genomics gives us more confidence in what we're doing with our young cattle and allows us to make more rapid progress with new genetics," explains Dale Venhuizen, Churchill Cattle Co., Manhattan, Mont. "We really like young cattle, and we can depend on them to do what we want them to do."

Leveraging cross-species knowledge

William Herring offers a unique perspective as a livestock geneticist and Hereford breeder. He cut his teeth as a beef cattle geneticist at the University of Missouri before working across all food animal species for companies such as Smithfield, Zoetis, PIC and Cobb Broilers. While the species may be different, the objective is always the same — use technology to identify the most elite animals and then multiply their genetics quickly and efficiently.

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>
> **— William Herring, 111 Farms**

Since the objective of breeding elite livestock is the same across species, William says that his role remains largely the same regardless of the species, and so do the results of advanced technologies. For example, genomic data consistently enhances the genetic trend for specific traits by 30% year over year across all species. As the use of genomics has become more commonplace within the livestock industry over the last decade, William notes certain species have established the standard for their implementation.

"In the industry today, if you look over at dairy, that is their model of genetic improvement," William says, noting the dairy industry's early, widespread adoption of genomics and data-driven selection led to massive industry-wide improvement.

Yet, few technologies can stand on their own, genomics included.

"Genomics by themselves can't function long term. It takes continuous data collection to get the data needed to train the phenotypes," William says. "If you stop doing that, the genomics will decay over time. The model, the phenotypes and the pedigrees all train with each other; as long as the data continues to come in, the data will be right."

Moreover, utilizing complementary technology in tandem with genomics provides the most potential for genetic improvement. In this case, using advanced reproductive technologies such as AI, embryo transfer (ET) and in vitro fertilization (IVF) quickens the pace of genetic improvement with genomics. That's especially true given the inherently long generation interval of beef cattle.

It will be two years before today's heifer calf produces her first calf. Using advanced reproductive technologies shortens the generation interval. Of course, the extra cost associated with these technologies encourages producers to be sure of the genetics behind each mating.

"Life is too short, and the breeding cycle is too long to have to turn around and take a different path," William says.

Implementing technology at home

Whether producers have 10 head or 1,000, they can advance genetic progress by using these technologies.

Churchill Cattle Co. has enough cattle to reduce the risk of trying new technologies.

Yet, 111 Farms is able to employ these techniques just as extensively, with a smaller herd size to create elite carcass-oriented cattle.

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Venhuizen notes, there is always a cost to cattle producers seeking genetic gain. It could be $30 for the straw of semen from a bull you believe adds to the genetic direction of your program. It might be spending more than $50 to collect genomic data and test for any genetic abnormalities in an individual calf. Or, maybe it's a larger economic investment to deploy ET or IVF more broadly. Determining whether any such investments fit an individual operation depends on goals and the cost of implementation.

"In the cattle operation, I am looking for the technology to provide a competitive edge and value differentiation. Does the tool allow quicker payback for both financials and performance?" Mark says. At the end of the day, he notes that defining the value of advanced technologies and the genetic potential of the next generation is nothing but a math problem.

Like any industry, agriculture is constantly evolving, and so are its technologies. Today's novel tech could be tomorrow's commonplace, and progressive producers dream of ways technology can further push the potential of their cow herd.

For example, Mark ponders what the industry would be like if genomic panels could be run on an embryo to decide whether it should be implanted. He also muses about artificial intelligence-supported applications for smartphones that could help evaluate phenotypic data within the herd or simply inventing new synching protocols to reduce labor and improve conception rates.

It's all there at the intersection. HW

Diving into the Data

111 Farms, Whigham, Ga., with brothers Mark and William Herring at the helm, put themselves on the map for producing elite carcass-oriented genetics in a relatively short time with a modest number of cows. They have done so largely by using data to drive their breeding decisions.

"We're using the Hereford database (MyHerd), doing our search and staying strict with it. We have a multi-trait set of criteria, and we don't deviate from it," Mark says.

William laughs and says he and his brother are likely among the most frequent users of MyHerd. They have saved searches that they run each week to review the most up-to-date data and help identify the most elite animals across all the traits they value in their program, both in their own herd and across the breed.

"It's extremely easy. It is not complicated," Mark says, of using MyHerd. "Technical tools don't bother me a bit, but if we can get people to get comfortable, there is a vast array of information once you get into the tools and set your criteria. That changes the game."

Suppose you're searching for the genetics to move your herd forward. The American Hereford Association (AHA) has tools to help. You can easily search for genetics that will match your breeding goals by using the comprehensive MyHerd Search tool. Visit *Hereford.org* and click on "EPD Search" at the top of the site. If you're an active MyHerd user, sign in; if you're not yet enrolled, click the "Guest User" option on the next screen to access the MyHerd software.

For a simple MyHerd Search to find animals that match your operation's goals, scroll through the choices on the left-hand column and select any parameters you'd like to search. For example, you may be looking for high-performing yet feed-efficient genetics. Just set the minimum and maximum values of the expected progeny differences (EPDs) you're evaluating. In this example, you'd likely use Weaning Weight, Yearling Weight, Dry Matter Intake and Mature Cow Weight EPDs. Searching for animals that ring the bell for several important and even antagonistic traits at one time, such as high growth and modest mature weight, can help you identify outliers that can push the needle forward without setting your herd back.

"Today more so than ever, the information is free," William reminds. "All you have to do is spend time in the database." HW