Putting Genomics to Work

Speakers address the current value and future promise of genomics for beef improvement.

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The Promise of Genomics

Expectations for the benefits of genomics in genetic selection are being realized.

*by **Troy Smith**, field editor*

They promised a doubling of the accuracy of prediction for genetic merit. Looking back, it's easy to see that some early advocates of genomics were somewhat overzealous in promoting a still underdeveloped technology. Yet after getting off to a slow start, the science has advanced remarkably, and many of the early promises of genomics for improving genetic selection are being realized.

University of Georgia geneticist Daniela Lourenco recounted the history of genomics, as applied to selection of breeding animals, from early investigation of DNA to the latest method for calculating genomic-enhanced expected progeny difference (GE-EPD) values. She spoke during the first general session of the Beef Improvement Federation (BIF) Annual Meeting and Symposium hosted May 31-June 3 in Athens, Ga.

While livestock DNA studies began in the late 1970s and early 1980s, it was the human genome project that revealed some of the most valuable information. More specifically, according to Lourenco, it was information explaining that much genome sequence variation can be attributed to single-nucleotide polymorphisms (SNP). SNPs became important as markers for genes strongly associated with specific traits, and application of marker-assisted selection. However, the application for cattle breeding was limited.

"It did not work really well, because most traits of interest are polygenic, meaning they are influenced by multiple genes, with each having a small effect," explained Lourenco.

It was in 2009, she said, that the 50,000 SNP genotyping assay became available. By the end of that year, the dairy industry had genotyped some 30,000 animals. The American Angus Association was the first to embrace genomics as the beef industry initiated genotyping.

"The availability of more genotyped cattle drove the development of new methods to incorporate genomic information into national cattle evaluations," explained Lourenco. "The first method was called multi-step and, as the name implied, this method required multiple analyses to arrive at the final GE-EPDs. Distinct training and validation populations were needed to develop molecular breeding values (MBVs), which were blended with traditional EPDs or included as correlated traits."

Now, according to Lourenco, there is an alternative single-step method that combines phenotypes, pedigrees and genotypes in a single step offering a better estimation of relationships and greater accuracies.

Lourenco said genomic-enhanced EPDs are delivering the promises of increased accuracy of prediction on younger animals, allowing for reduced generational interval. Genomics also aid prediction for animals with no progeny and aid selection for traits that are hard to measure or are of low heritability.

While early promoters of genomics promised too much too soon, their expectations for the technology were mostly just premature, she emphasized. They were not off the mark.

To view the proceedings or the PowerPoint

▶ While early promoters of genomics promised too much too soon, their expectations for the technology were mostly just premature, said University of Georgia geneticist Daniela Lourenco. They were not off the mark.

that accompanied this presentation, or to listen to it, visit the Newsroom at *www.bifconference.com*.

Editor's Note: *Troy Smith is a freelance writer and cattleman from Sargent, Neb.*

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Learning from Dairy

The beef industry can learn from the dairy industry's use of genomics.

*by **Mayzie Purviance**, Angus Media intern*

Tom Lawlor, Springfield, Mass., provided insight regarding the use of genomics in the dairy industry as he addressed the first general session of the 2017 Beef Improvement Federation (BIF) Research Symposium and Convention June 1. Lawlor is a graduate of Cornell University and is currently serving as the director of research for the Holstein Association USA.

"Nearly every dairy bull worldwide chosen for widespread use is now selected on the basis of genomic predictions," he shared, noting the dairy industry's rapid adoption of the technology and the resulting increase in the rate of genetic gain.

Lawlor shared various figures, tips and general information that the beef industry could use in genomic research methods, following dairy's lead (see the PowerPoint

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and proceedings paper accompanying Lawlor's presentation in the Newsroom at *www.bifconference.com*). The Holstein industry is using genomics to

- determine the genetic merit of elite animals at a young age;
- manage the rate of inbreeding;
- keep undesirable genetic defects to a low level;
- identify breed composition of crossbreds;

► Although the genomic industry is more advanced than it was five years ago, it's not nearly as advanced as it can and will be, says Tom Lawlor, director of research for the Holstein Association USA.

- verify or discover parentage;
- assist in herd management, culling low-end replacement animals earlier and breeding lower genetics to beef bulls; and
- investigating other genetic issues.

With more than 1.5 million Holstein animals DNA-typed, Holstein breeders are using genotypes *to find* the best genetics in the world and *to develop* the best genetics in the world. Lawlor discussed utilizing genomic information, and how collecting more of this information and data over time can lead to genetic improvement throughout the beef industry.

Lawlor spoke on the business of genomics, explaining the business is booming in a competitive market. Lawlor's third and final point was made about the future, and how the beef industry can use the data and information it already has to produce desirable genetics.

If there is one thing to take away from his presentation, Lawlor said, it is that the genomic industry is ever-changing. Each and every day research is being conducted on genetic improvement, artificial insemination (AI) and embryology.

> **"Nearly every dairy bull worldwide chosen for widespread use is now selected on the basis of genomic predictions."**
> **— Tom Lawlor**

Although the industry is more advanced than it was five years ago, it's not nearly as advanced as it can and will be.

"It's not that we've done a lot; it's that we continue to do more and more." Lawlor concluded.

To view the proceedings or the PowerPoint that accompanied this presentation, or to listen to it, visit the Newsroom at *www.bifconference.com.*

Editor's Note: *A student at Texas A&M University, Mayzie Purviance was the 2017* Angus Journal *intern. These articles are part of the publication's online coverage of the 2017 Beef Improvement Federation (BIF) Research Symposium and Annual Convention found at* www.bifconference.com.