

THE GENOMICS REVOLUTION IS UPON US



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Genetic progress just got faster with the release of Genomic Evaluations during the recent Dairy Sire Summary. A quick bit of history – prior to 1935 there was no national program for evaluating dairy cattle breeding and no real genetic progress was made. Over the past 74 years various programs and/or traits have been introduced, each increasing the rate of genetic progress in differing amounts and improving the dairy cow. The recent employment of genomic evaluations is projected to have one of the largest impacts on genetic gain for our industry, ultimately assisting dairy producers in selecting the best genetics for their herd.

GENOMICS...EARLY INNOVATIONS

Accelerated Genetics is the true A.I. industry leader and pioneer in DNA research and application of the test results. Over twenty years ago Genetic Visions, Inc., Accelerated Genetics' research subsidiary, began using genetic markers to assist with identifying young animals that had superior genetic potential. Most of the attention centered around choosing among full siblings, when the animals were young, when progeny or performance data was absent or for sex-limited traits. Genetic Visions also developed generic applications used in dairy herds including identifying carriers of recessive defects and finding parentage errors. Again, Accelerated Genetics was the leader in the industry offering these services for customers and A.I. partners around the world.

GENETIC VISIONS®



Dr. Mike Cowan, General Manager for Genetic Visions, Inc. and Vice President of Research for Accelerated Genetics, is running the genomic scanning equipment using Illumina's Bovine 50K SNP Assay. *Upper left corner:* This is a picture of four prepared Illumina Bead Chips (the black colored plates) being placed into a hybridization chamber ready to be scanned. Each Bead Chip can hold DNA of 12 different animals and each run can genotype 48 animals at once.

Accelerated Genetics along with other members of the Cooperative Dairy DNA Repository, provided critical DNA samples for the foundation studies of the USDA's Bovine Genome Selection research. And through Genetic Visions' extensive bovine DNA storage from its years of research, vast amounts of DNA with a wider ancestry was provided, thus further adding to the accuracy of the new genomic evaluations. In fact, Genetic Visions is the only bovine research lab with extensive records and blood samples of bull dams existing prior to 1996.

GENOMICS...OFFERS A GENETIC MAP

Traditionally for young bulls the only information available was their Parent Averages (PA) based on their pedigree. Now with genomics, a genetic map of what traits they inherited from each of their parents is available and summarized into genomic evaluations.

The genomic evaluation of a young sire includes the combination of their PA and genotypic data, providing more reliable results. Having an accurate estimate of young animals genetic merit will encourage the use of young sires as parents in various breeding programs and gives the potential to more rapidly increased genetic progress. For sires that have progeny with type and production data, their genomic estimates are a combination of their genotypic data, PA, and progeny data.

Genomic evaluation results look like Traditional PTAs (for yield, type, and management traits) and STAs (for linear traits), so producers don't need to learn a new evaluation system. The industry will label bulls that have been genomically tested. But some sires won't have their genomic estimates included in their January Sire Summary

information instead their Traditional PTA and STA data will be used, here's why:

- 1) Some bulls haven't been genomically tested by their A.I. company.
- 2) Some bulls have a higher reliability from their Traditional genetic evaluations, so the higher reliable estimate is used.
- 3) Some bulls have a MACE Interbull proof and currently there is no mechanism in place for them to handle genomic evaluations.

GENOMICS...OUR APPROACH

All Accelerated Genetics sires in the Holstein and Jersey breeds have been genomically tested, both young and proven sires. This policy was initiated so that our sire's evaluations would be more accurate and to help better manage our bull populations. Accelerated Genetics firmly believes in validating what the genomic research has shown, by continuing our PACE young sire program. Young sires will continue to go through our PACE program, randomly sampled by herds all over the U.S.

We have also incorporated the use of genomic results into how we acquire bulls for our PACE program. Meaning we are selecting sires with the highest quality genomic scores while keeping a diversified pedigree. Overall the PACE herds will have the advantage of much better genetics due to removal of bottom end bulls prior to sampling.

The genomic selection process at Accelerated Genetics can be easiest explained when looking at full siblings as all are assigned same Traditional PAs. Only after getting the genomic estimates for their PTAs and STAs can you really see the differences between full sibling bull calves. And sometimes the difference between full siblings can be significant.

For example in Table 1, we compared three full sibling bull calves using Net Merit (NMS) and Productive Life (PL) as traits. In the past a bull stud may have chosen Bull B, based on his physical appearance and conformation. Now, with the help of genomic analysis, it is clear that Bull B is not even close to his siblings

TABLE 1. APPLICATION OF GENOMIC PTAs TO CONTRACT BULLS

ANIMAL	TRADITIONAL NMS	GENOMIC NMS	TRADITIONAL PL	GENOMIC PL
BULL A	415.5	411	1.3	1.3
BULL B	415.5	207	1.3	-0.2
BULL C	415.5	472	1.3	1.4