

## The Road to Genomic Evaluations in Canada

The industry and producers delivered a clear message:

***“It is more important to get genomic evaluations right than to get them fast!”***

This was the key conclusion following the Open Industry Session organized by Canadian Dairy Network (CDN) on February 17<sup>th</sup> as part of the consultative process used by the Genetic Evaluation Board when making recommendations regarding genetic evaluation methodologies to the CDN Board of Directors. Canadian genetic evaluations are widely respected globally for high accuracy and stability. While many advantages and benefits associated with genomic evaluations have been clearly identified by research jointly conducted by CDN and the Centre for Genetic Improvement of Livestock (CGIL) at the University of Guelph, some important questions require additional research before official implementation. For this reason, CDN will commence a service of providing unofficial “research” genomic evaluations in the Holstein breed for genotyped bulls and Canadian females to their respective owners starting April 2009 with the objective of publishing official genomic evaluations starting the genetic evaluation release on August 18, 2009.

### **What is Known About Genomic Evaluations?**

One fact that has been clearly demonstrated by research in the area of genomic evaluations, regardless of the country, is that DNA genotypes provide useful information for significantly increasing the accuracy of genetic evaluations, especially for young bulls, heifers and cows. Even for proven sires, important gains in accuracy are achieved for lower heritability traits, such as Daughter Fertility and Herd Life, when genomic information is added to their daughter performance data. To help quantify this point, Table 1 presents the average gain in Reliability for some key traits of interest for various groups of animals in the Canadian Holstein population when the estimation of genomic associations is based on the current group of 6,600 genotyped proven sires in Canada and the United States.

When these Reliability values are translated into accuracy levels for LPI, the estimated Reliability is approximately 30% for non-genotyped young bulls with a traditional Parent Average, 55% for genotyped young sires without any progeny and 80% to 85% for genotyped sires with an official progeny proof based on their first crop of 100 daughters. In terms of sire selection decisions within a herd, these levels of Reliability should be used to evaluate the relative risk of using semen from any one bull from each group. For example, for decades the general recommendation regarding the use of young sire semen based on a traditional Parent Average (Reliability  $\approx$ 30% for LPI) was to select several different young sires with a maximum of five doses per bull. In this manner an average of one daughter would result per young sire in each herd and the risk of having selected, by chance, inferior individual young sires within the group was appropriately

spread out. For proven sires with only first crop daughters, yielding an average Reliability of at least 80% for LPI, producers could afford to breed a quarter or even a third of their herd to elite individuals in the breed, while balancing an acceptable level of risk. As young bulls with a Genomic Parent Average (GPA) are promoted as a new category of sire with semen available, the use of semen from any individual bull in this category must also reflect the associated risk, as indicated by the level of Reliability. With the average LPI Reliability for GPA sires currently estimated at 55%, it is prudent to spread the risk by selecting multiple sires and restricting the usage of any individual GPA sire to 10 or at most 15 doses.

Table 1: Average Reliability of Genetic Evaluations With and Without Genomics for Various Traits and Groups of Animals					
	Protein Yield	Conformation	Somatic Cell Score	Herd Life	Daughter Fertility
Young Sires & Heifers:					
• Parent Average (PA)	35	32	32	25	23
• PA with genomics	65	60	60	54	48
1st Lactation Cows:					
• EBV	57	51	43	29	30
• EBV with genomics	73	67	66	59	56
Canadian Proven Sires:					
• EBV	94	87	89	82	76
• EBV with genomics	94	89	91	86	82
MACE Sires from USA:					
• EBV	81	67	73	58	43
• EBV with genomics	86	77	81	72	62

### What Remains to be Verified?

Given the current stage of research in Canada, some key questions remain to be answered to ensure that genomic evaluations to be officially published in August 2009 will follow along the current industry requirement for accurate and stable genetic evaluations for all traits and animals.

The April 2009 launching by CDN, in collaboration with Holstein Canada, of a routine service to provide unofficial “research” Holstein genomic evaluations to A.I. bull owners and to owners of genotyped cows and heifers in Canada will clearly quantify the observed level of stability in the resulting GPAs for young bulls and heifers and GEBVs for cows. Research has been done to validate the increased accuracy of prediction when GPAs are used instead of traditional PAs but sequential runs of genomic calculations have not yet been conducted to evaluate the expected stability of GPAs and GEBVs over time.

Another question of importance is the need to ensure that GPAs for bulls without daughters are directly comparable to GEBVs for progeny proven sires. While it is expected that the pool of younger bulls with GPAs includes several that are genetically superior to the best proven sires with 100 or more daughters, research needs to confirm that the highest GPAs for young bulls are not overrated compared to progeny proven sires, therefore creating inaccurate expectations of superior future daughter performance. The provision of an unofficial genomic evaluation service commencing in April 2009 prior to the publicly available implementation on an official basis starting August 2009 allows CDN and CGIL time to conduct such validation research.

## **Summary**

Canada has decided to take a stepwise approach to the implementation of genomic evaluations for the Holstein breed. A routine service will start in April 2009 to provide unofficial “research” genomic evaluations to A.I. companies and the owners of genotyped females in Canada and official implementation will commence with the August 2009 genetic evaluation release. Genomic information substantially increases the accuracy of genetic evaluations for young bulls, heifers and cows to a point where bulls with GPAs and no progeny will be actively marketed in the industry. The genetic superiority of this newly promoted class of sire warrants consideration for use in the herd as long as the level of use reflects the intermediate level of risk as reflected by their proof Reliabilities.

Author: Brian Van Doormaal  
Date: February 2009