

DNA Genotyping for Females in Canada

Third article in a series on including DNA information in official genetic evaluations in Canada starting in 2009.

The current plan at Canadian Dairy Network (CDN) is to include information from DNA genotyping into official genetic evaluations for Holsteins starting April 2009, with research continuing for other breeds for future implementation, when feasible. Recognizing the importance of this significant change to genetic evaluation procedures, Holstein Canada will act as an agent for Canadian producers to get their cows and heifers genotyped to improve the accuracy of their official genetic indexes. While Holstein Canada is the official contact organization for this new service, the following provides basic information about the procedures to follow and the associated information exchange.

DNA Sample Collection for Testing

The DNA of an animal is contained in every cell it produces. Standard sources of DNA for genotyping of dairy cattle include blood, semen (for males), hair follicles or tissue samples punched out from the ear when tagged for identification. While ear tissue collection is expected to be the main source of DNA collection in the future, the current protocol coordinated by Holstein Canada for DNA genotyping Canadian females will be based on hair follicles. For each cow or heifer to be genotyped, breeders must adhere to the following steps:

- (1) Write the animal's official registration number and within herd identification (i.e.: barn name, chain number, etc.) on a genomic application form (available at www.holstein.ca/English/Services/index.asp) or at the top of a blank piece of paper.
- (2) Firmly pull 30 hairs with visible follicles (i.e.: roots) from the animal's tail, ensuring that it is clean and dry.
- (3) Using thick transparent tape placed across the hair roots, attach them to the paper paying attention to not mix up samples.
- (4) Fold the paper and insert in a regular letter envelope or a clean plastic bag with only one animal per envelope or plastic bag.
- (5) Place the envelopes/bags for all animals to be tested into a single larger envelope for mailing to Holstein Canada's head office in Brantford, Ontario.

This new service, offered by Holstein Canada on behalf of the industry, started in November and is now fully functional. It is currently only available for genotyping

Holstein females in Canada but should be expanded in the future to also include the testing of females in other dairy breeds. Within the North American agreement between CDN and USDA, bulls of any age can only be genotyped when DNA is submitted by one of the authorized A.I. organizations. This restriction for the testing of bulls, which will be in effect until early 2013, results from the fact that the authorized companies have invested in the research and development that has led to the inclusion of genomics into national genetic evaluation systems in both the United States and Canada.

DNA Genotyping

Holstein Canada has established an agreement with DNA LandMarks laboratory located in Saint-Jean-sur-Richelieu, Québec, for providing services to extract the DNA from the submitted hair samples and conduct the genotyping using the Illumina BovineSNP50™ BeadChip, known as the “50K” panel. Upon receipt of the genotyping requests sent by Canadian producers, Holstein Canada will inventory each DNA hair sample and add a barcode for automating the laboratory processes. Samples, as well as each animal’s pedigree data, will be forward in batches of approximately 100 animals or at least monthly, whichever is first. Under the agreement, DNA LandMarks will provide its services within a maximum turnaround time of two weeks with the resulting DNA genotype profile for each animal sent electronically back to Holstein Canada. The genotyping cost is expected to be roughly \$250 CAD but may vary with exchange rates since DNA LandMarks will be invoicing in US dollars.

Genomic Evaluations and Reporting

Once the DNA profiles are received by Holstein Canada, they will be forwarded on a weekly basis to CDN and to USDA for loading into a national dairy cattle genotype database, which can then be linked to each animal’s pedigree as well as any recorded performance data (i.e.: lactations, classifications, inseminations, etc.) in Canada and United States, accordingly. Starting in April 2009, CDN will be including the DNA profile information for all genotyped animals in their officially published genetic evaluations, yielding increased levels of accuracy. Genetic evaluations that include genomic data for genotyped animals will be clearly labelled to distinguish them from evaluations for non-genotyped animals. Canadian Holstein females genotyped prior to February 2009 would be expected to receive official genomic evaluations with the April 2009 release. Lists of elite cows and heifers such as the Top 1000 LPI will be separated into one list that includes only genotyped cows and a second LPI list for non-genotyped cows. Given the significant increase in accuracy associated with genomic evaluations for females, owners of Top LPI cows and/or heifers are encouraged to have them genotyped to ensure their inclusion in the Top LPI lists for genotyped females, since this list will surely be the primary focus of those interested in merchandising elite Holstein genetics.

From April 2009 onwards, CDN is aiming to provide a regular service (i.e.: monthly) that will calculate a Direct Genomic Value (DGV) for each trait for newly genotyped animals and then update the official genetic evaluations accordingly, especially for young bulls and heifers to produce a Genomic Parent Average (GPA). Each animal’s Direct Genomic Value (DGV) and blended genomic evaluation for various traits will be forwarded to Holstein Canada for reporting back to the owner and posted on the CDN and Holstein Canada web sites.

Summary

With the arrival of official genomic evaluations for Canadian Holsteins planned for April 2009, Holstein Canada will act as an agent for producers by coordinating a DNA collection and genotyping service for heifers and cows at an approximate cost of \$250 CAD. Details of this new service can be obtained by contacting Holstein Canada directly. The resulting DNA genotypes will be forwarded to CDN for storing in the Canadian DNA genotype database and contribute to the calculation of each animal's genomic evaluation for official publication, starting in April 2009.

Author: Brian Van Doormaal
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