

Introducing a New Genetic Evaluation System for Type Traits in all Dairy Breeds

In August 2005, a new, unified type classification system was introduced for appraising all dairy cattle in the Holstein, Ayrshire, Jersey, Brown Swiss, Guernsey, Canadienne and Milking Shorthorn breeds. This Multi-Breeds Classification System means that all animals are evaluated for a common set of 22 descriptive traits, of which seven are recorded as measurements. These descriptive traits are combined to create overall scores for major scorecard traits including Mammary System, Feet & Legs, Dairy Strength and Rump as well as the animal's Final Score and Final Class for Conformation. For further details of this new classification service, please refer to the previous article in the August 2005 issue of Holstein Journal as well as articles posted on the CDN (www.cdn.ca) and Holstein Canada (www.holstein.ca) web sites. In addition to the changes at the field level, the new classification system also affects the calculation of genetic evaluations for type traits in each breed. This article describes the new genetic evaluation system for type traits, effective May 2006, and the impact of the enhanced methods on resulting bull proofs and cow indexes.

Several Improvements

The new Multi-Breeds Classification System included new traits for the coloured breeds and changed the definition of some traits in all breeds. As a consequence, one of the main features of the new genetic evaluation system for type is the use of a pair-wise multiple-trait model that matches data for each new trait with classification data for a previously recorded trait that is used as an indicator trait with a given genetic correlation between the new and previous traits. The end result of this novel approach is that bulls and cows with official genetic evaluations for type will have values available for all traits even for the coloured breeds that have a short history of data collection for the new traits.

In addition to the change in methodology, there are several other enhancements that come with the introduction of the new type genetic evaluation system, including:

- New heritability estimates for all type traits in each dairy breed.
- Exclusion of Holstein classifications prior to Round 53 since this coincides with the implementation of the Enhanced Type Classification System in 1993.
- Use of actual measurement data for stature, rump angle, pin width, rear attachment height, rear attachment width, udder depth and teat length rather than the linear scores on the 9-point scale.
- Enhancement of the age adjustment factors, especially for cows that first calve at a young age and/or are classified very early in their first lactation.
- Refinement of the definitions of genetic groups assigned to unknown ancestors of animals in the genetic evaluation system, especially for domestic animals born in more recent years that have an unknown sire and/or dam.

Given the exclusion of data prior to round 53 in the Holstein breed, there are older sires that reduce the number of daughters in their official type proof and there is another group of even older sires as well as cows that no longer have an official type evaluation starting with the new system in May 2006. Given that the genetic evaluation system for production traits has a similar time limitation for data inclusion, most animals losing their official type evaluation will already not have one for production nor an official LPI.

Including Reclassifications

In response to several requests in the past made by producers and industry, the new type evaluation system includes all classifications in first lactation for the calculation of bull proofs and cow indexes for type traits in all breeds. This is an important change from the previous system for bull evaluations that used only the first classification in first lactation of each daughter and now first lactation reclassifications will be included. More importantly, however, is the improvement this change will have on the accuracy of cow indexes for type since the previous system used the most recent classification or reclassification of each cow but treated the data as if it were recorded in first lactation, which biased cow indexes upwards for most traits. The change to using all first lactation classifications and reclassifications creates consistency between bull and cow evaluations and improves the accuracy of resulting cow indexes but causes cows that were never classified in Canada during first lactation to lose their official genetic index for type and possibly their LPI. This would include cows in later lactations when the herd started participating in the type classification program as well as cows that were imported and only classified in Canada after their second calving. Research will continue at CDN over the next six months to examine possibilities of including all classifications for at least cow indexes for type traits in a manner that would maintain the desired level of accuracy for the resulting genetic evaluations.

Impact on Bulls and Cows

The combined impact of the new type evaluation system and all of the associated enhancements is quite small for bulls of interest within each breed, generally ranging up to two points for Conformation and less than 100 LPI points. Based on a parallel run done at CDN using the February 2006 data, the range and average change for Conformation and LPI are presented in Table 1 for proven Holstein bulls born since 1990. Similar statistics are presented in Table 2 for Holstein cows whereby the impact is more variable since older cows that were reclassified after first lactation have been systematically corrected downwards to better reflect their true genetic ability for conformation in first lactation. This one time major adjustment to cow indexes for type traits in each breed aims at improving how the effect of reclassification is considered for genetic evaluation purposes. Any possibility of using all classifications for type evaluations in the future is not expected to have a significant change in resulting cow indexes other than the addition of official genetic indexes for cows that were not scored in first lactation.

Birth Year	No. Proven Bulls	Conformation Proof			LPI		
		Maximum Decrease	Average Change	Maximum Increase	Maximum Decrease	Average Change	Maximum Increase
1990	428	-2	-0.15	2	-119	-14	104
1991	469	-2	-0.13	2	-110	-3	115
1992	456	-2	-0.11	1	-146	-13	110
1993	472	-2	-0.09	1	-151	-8	109
1994	420	-1	0.04	1	-110	-3	88
1995	421	-1	-0.05	1	-192	1	100
1996	415	-1	0.05	1	-99	7	99
1997	421	-1	0.13	2	-94	12	120
1998	335	-1	0.18	2	-83	8	114
1999	351	-1	-0.01	1	-115	-6	104
2000	344	-2	-0.01	1	-125	3	110
2001	126	-2	-0.22	1	-84	-4	78
TOTAL	4658	-2	-0.03	2	-192	-2.0	120

Birth Year	No. Publishable Cows	Conformation Index			LPI		
		Maximum Decrease	Average Change	Maximum Increase	Maximum Decrease	Average Change	Maximum Increase
1990	24389	-11	0.35	9	-843	4	426
1991	74638	-12	0.19	8	-829	-4	495
1992	81262	-12	0.08	7	-829	-11	479
1993	81196	-12	0.00	8	-833	-14	547
1994	83654	-12	-0.07	7	-807	-19	547
1995	86642	-11	-0.10	8	-776	-18	479
1996	82037	-11	-0.14	7	-844	-18	401
1997	86813	-11	-0.16	6	-781	-17	447
1998	88830	-13	-0.17	6	-802	-18	458
1999	87515	-13	-0.15	6	-785	-18	401
2000	87422	-11	-0.13	6	-750	-18	448
2001	97282	-14	-0.16	6	-838	-17	401
2002	94362	-11	-0.17	5	-807	-16	417
2003	37372	-9	-0.21	5	-593	-17	375
TOTAL	1093414	-14	-0.08	9	-844	-15.5	374

Summary

Following the implementation in August 2005 of the Multi-Breeds Classification system for all dairy breeds in Canada, enhancements have been made to the genetic evaluation system for type traits, effective the May 2006 release. Improvements in the genetic evaluation methods and adjustments combined with the use of more consistent classification data based on trait definitions and measures of recording all yield interesting advantages to this enhanced genetic evaluation system. The inclusion of all classifications in first lactations increases the data used for bull proofs but causes more change in cow indexes due to improved procedures for considering reclassifications. Research continues at CDN for further refinements to the new system including the possible use of all classifications for the calculation of cow indexes for type traits.