



A New Look at Herd Life

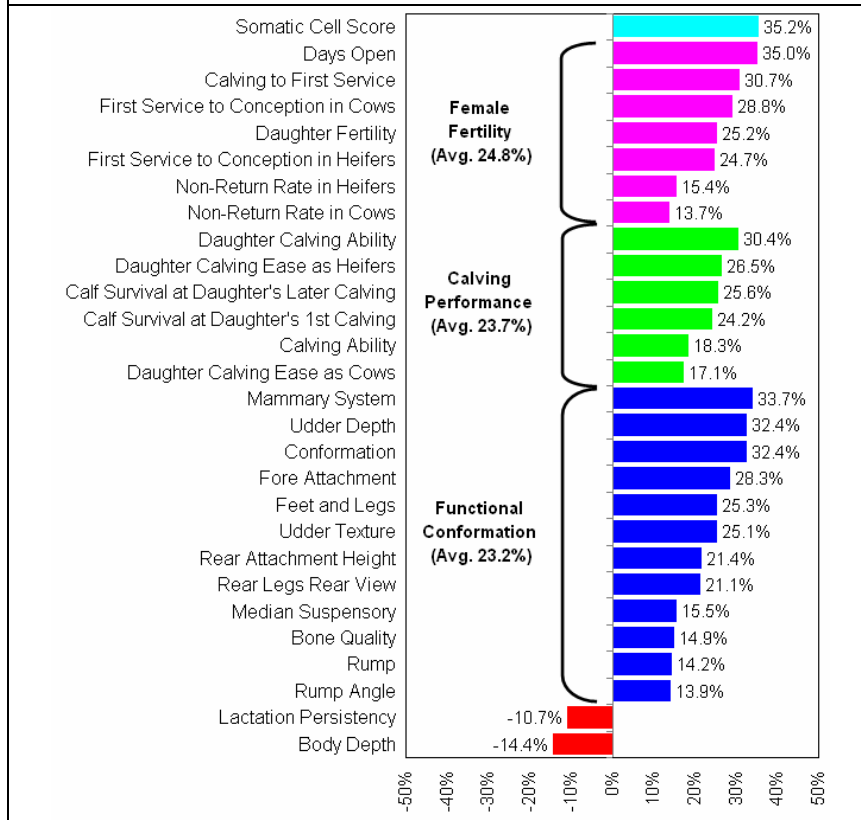
Imagine a whole herd of cows without any problems with disease, reproduction, locomotion, mammary system, or other important reasons for disposal. While this vision may not be totally realistic, sire selection based on Herd Life can help get closer to this goal. The key objective of genetic selection for improved longevity, as measured by Herd Life, is to improve the underlying genetic potential of the herd to a point whereby the owner has more control over which cows stay or leave. The main concern of producers related to longevity arises when this control of disposal decisions moves from the owner to the cow. Identifying sires that will increase the genetic potential of the dairy herd for improved Herd Life is an important factor for taking control of the culling decisions in future years.

Improvements to Herd Life Evaluations

The challenge with any evaluation for longevity is that it generally requires combining information from actual daughter survival as they age after first calving and predictions for daughter longevity based on other related traits with genetic evaluations. Recent research jointly conducted by Canadian Dairy Network (CDN) and Holstein Canada aimed at further improving the current prediction formula for deriving Indirect Herd Life. This follows previous research at CDN that enhanced the accuracy of official bull proofs for Direct Herd Life by fine-tuning the genetic evaluation model. Published Herd Life (HL) evaluations for progeny proven sires are a combination of their Direct Herd Life (DHL) and Indirect Herd Life (IHL) ratings depending on the relative amount of information in each.

Given the advanced state-of-the-art of the current genetic evaluation system for Direct Herd Life, which evaluates the rate of daughter survival to five stages of productive performance following first calving, the most critical research is to continually improve the prediction formula for deriving Indirect Herd Life. Figure 1 provides the list of evaluated traits that have a correlation of at least 10% with Direct Herd Life, based on proven sires that have sufficient actual data for daughter survival rate to fourth calving. In addition to Somatic Cell Score, which is the most highly correlated trait associated with daughter survival (35.2%), other important traits include those associated with female fertility (average correlation of 24.8%), calving performance (average correlation of 23.7%) and functional type traits (average correlation of 23.2%). These proof correlations reflect the complexity of longevity as a trait of interest since it is almost equally associated with measurements of disease, fertility, calving performance, mammary system and feet and legs. Note that bulls with high proofs for Lactation Persistency and Body Depth tend to be associated with poorer Direct Herd Life, and therefore daughter survival, with correlations of -10.7% and -14.4%, respectively.

Figure 1: Correlation (%) of Proofs for Various Traits With Evaluation for Direct Herd Life Based on Daughter Survival



Adding Genomics to the Picture

Sire proofs for Herd Life have been available in Canada for 15 years and their accuracy has continually improved over time. Since August 2009, the Holstein breed has also benefited from the inclusion of genomics in official evaluations for all traits, including Herd Life. One way to consider Herd Life sire proofs currently published is that they are a combination of three sources of information: genomics, predicted Indirect Herd Life and Direct Herd Life based on daughter survival. In general, genomics has been highly promoted due to the gain in accuracy for young sire and heifer evaluations but for Herd Life the benefits are also significant for progeny proven sires. In fact, the average published Herd Life Reliability for newly proven sires with their first official LPI increases from approximately 50% without genomics to 72% when it is included. For genomically tested young bulls, published Reliability for Herd Life increases from an average of 31% to 58%, yielding an increase of 27 percentage points. These Reliability increases represent a significant gain in accuracy of Herd Life evaluations for young and newly proven sires that warrant increased attention when making sire selection decisions.

Expected Outcome of Herd Life Selection

As with most functional traits evaluated in Canada, bull proofs for Herd Life are expressed in terms of Relative Breeding Values (RBVs) using a scale with an average of 100 and a range of 85 to 115 to include 99% of all proven sires. Table 1 provides the expected outcome in terms of daughter survival from first calving to either second, third or fourth calving depending on the sire's Herd Life proof. For an average sire rated 100,

70% of his first calving daughters are expected to start a second lactation, 50% are expected to start a third lactation and 31% are expected to survive to start a fourth lactation. These are population averages for the Holstein breed in Canada so become the expectation of daughters of the average proven sire. Highly rated bulls with a Herd Life of 115 are predicted to have 47% of their daughters survive to a fourth calving, which is substantially better than the 16% expectation for daughters of sires rated 85. This table clearly shows the impact of sire selection for improved Herd Life on the rate of survival of daughters to various stages in their productive life.

Table 1: Expected Survival Rate of Daughters by Herd Life Proof of Sire			
Herd Life (RBV)	% Daughter Survival to:		
	2nd Calving	3rd Calving	4th Calving
115	85	68	47
110	80	62	42
105	75	56	36
100	70	50	31
95	65	44	26
90	59	38	21
85	54	32	16

Summary and Conclusions

Herd Life is an excellent genetic evaluation tool for improving the underlying genetic potential of your herd, which gives the owner more control of culling decisions, instead of the cows. By enhancing the genetic evaluation system for Direct Herd Life based on daughter survival, as well as the accuracy of the formula to predict Indirect Herd Life, and then adding genomic information on top, Canadian dairy producers can have more faith and confidence in Herd Life evaluations to select for longevity.

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