Réseau laitier canadien
Canadian Dairy Network

Calf Survival: A New Trait of Interest

It can be argued that one of the most important traits in dairy cattle production is calf survival. Other than the initiation of a cow's next lactation, the main objective of each reproductive cycle (i.e.: calving, breeding, conception, pregnancy, next calving) is to produce a healthy heifer calf that will eventually become a profitable milk producer. Genetic selection has traditionally concentrated on the improvement of production and conformation with more recent emphasis shifting towards other traits such as longevity, somatic cell score, fertility and calving ease. Starting in 2007, there will be a new family of traits in the neighbourhood, specifically bull proofs reflecting the survival of their progeny and the survival of their daughters' progeny.

Direct versus Maternal Calf Survival

The genetic effect of a sire on calf survival is expressed at two levels, similar to calving ease. These are usually referred to as the "Direct" (or "Paternal") and "Maternal" effects. Direct Calf Survival reflects the survival rate of a bull's progeny (male and female calves) at birth or within 24 hours. Maternal Calf Survival represents the survival of the calf (male and female) when the bull's daughters give birth. These traits are analogous to stillbirth rates used in some other countries, including the United States, which represent the rate of death rather than the rate of survival.

Calf Survival at First versus Later Calvings

As with calving ease, there is also another important component of Calf Survival, for both Direct and Maternal, to consider. Survival rates for calves born from first calf heifers are lower than those for calves born from later lactation calvings (i.e.: cows). Table 1 shows the phenotypic average calf survival rates for progeny born from heifers versus cows within various dairy breeds in Canada. Generally, while there is very little difference across breeds for survival rates of calves born from cows (i.e.: 95%), there is more variation in the rate of calf survival when heifers give birth for the first time (i.e.: 90 to 95%). Simply speaking, a calf survival rate of 90% for first calvers means that one calving out of every ten from a first calf heifer will produce a dead calf. This represents an important loss that can significantly affect the herd profitability.

Table 1: Average Rates of Calf Survival (%) by Breed

	Holstein	Ayrshire	Jersey	Brown Swiss	Guernsey
First Calving	89.9	93.9	91.6	94.6	90.8
Later Calvings	95.5	95.1	95.8	95.0	94.0
Overall	93.9	94.8	94.8	94.9	93.1

Genetic Evaluations

Comprehensive research done at the University of Guelph and Canadian Dairy Network (CDN) in recent years has led to the development of a national genetic evaluation system that includes these calf survival traits. Genetic evaluations for calf survival are derived from the same data used for Calving Ease evaluations since producers report whether the calf was born alive or dead alongside their appraisal for calving ease. Later in 2007, it is expected that CDN will start publishing official bull proofs for Calf Survival with the focus being on improving the survival of calves born from first calf heifers. Table 2 provides correlations amongst Holstein bull proofs associated with both calf survival and calving ease. These proof correlations show that the relationship between calf survival and calving ease differs for first calf heifers (60-70%) versus cows (15% for maternal and 40% for direct). Another noteworthy difference is the relatively low proof correlation between Direct and Maternal Calf Survival (10-15%) compared to that for Direct and Maternal Calving Ease (≈40%). This means that bulls will often have a different proof profile for the survival of their calves compared to the survival of their daughters' progeny.

Table 2: Holstein Proof Correlations Amongst Calving Traits

Calving Traits	Correlation
Calf Survival – Direct vs. Maternal	10-15%
Calving Ease – Direct vs. Maternal	≈40%
Maternal Calf Survival – First Calf Heifers vs. Cows	55%
Direct Calf Survival – First Calf Heifers vs. Cows	65%
Calving Ease and Calf Survival for First Calf Heifers	60-70%
Maternal Calving Ease and Maternal Calf Survival in Cows	15%
Direct Calving Ease and Direct Calf Survival in Cows	40%
Calving Ease – First Calf Heifers vs. Cows	≈80%

While Calf Survival in its entirety is a combination of four different traits, each with their separate but inter-related genes for expression, the key component from a genetic improvement perspective is the survival rate of calves when a sire's daughters give birth for the first time. Specifically, this trait can be referred to as Maternal Calf Survival for First Calvers, but in Canada the general term of Maternal Calf Survival (MCS) will be used.

Summary

It is expected that 2007 will see the addition of a new group of traits to reflect each bull's ability to produce calves that are alive at birth. Of particular importance will be Maternal Calf Survival (MCS) as a measure of the expected survival rate of calves born when the bull's daughters give birth for the first time. Subsequent to official publication in Canada, it will also be possible to provide MACE evaluations for foreign-proven bulls via the existing services already provided by the Interbull Centre. Further analysis will be conducted at CDN to potentially develop an overall "Calving Index" that combines bull proofs for Calving Ease and Calf Survival into a single value as well as to examine the need and benefits of including any of these traits within the LPI formula.

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