

Introducing Bull Proofs for Daughter Fertility

This is the first of two articles describing the new genetic evaluation system for daughter fertility traits to be introduced in Canada in August 2004.

Introduction

As dairy producers worldwide become more concerned with the reproductive performance of their herd, many countries have implemented genetic evaluations for traits associated with cow fertility. In Canada, thanks to the establishment of a national database at Canadian Dairy Network (CDN) for storing insemination data, which was initiated a few years ago, bull proofs representing the genetic ability of their daughters for fertility will soon become available for all dairy breeds. This accomplishment, to be officially launched in August 2004, is the fruit of a strong collaborative research effort involving geneticists at CDN and the University of Guelph as well as important input from producers and industry organizations.

Available Data

The CDN database currently includes all inseminations since 1998 that were conducted by A.I. technicians associated with CIAQ in Québec, Eastern Breeders in Ontario and New Brunswick, Gencor in Ontario and Westgen in British Columbia, as well as other insemination data provided by producers through their milk-recording agency. The combination of information provided through these sources has resulted in a total of over 8 million insemination records for animals registered in the breed association herdbook, spanning slightly more than six years. Table 1 shows the distribution of this data at CDN by province and breed for the five major dairy breeds in Canada. Since several provinces have no A.I.-based technician service, all insemination data from those regions is sourced through milk recording. In total, milk recording collected one-third of the accumulated insemination data at CDN and the remainder was A.I.-sourced.

Table 1: Distribution of Insemination Records at CDN

| Province | Holstein | Ayrshire | Jersey | Brown Swiss | Guernsey |
|-------------------------|------------------|----------------|----------------|---------------|---------------|
| Price Edward Island | 58,390 | 3,647 | 386 | 74 | 142 |
| Nova Scotia | 82,582 | 2,522 | 579 | 110 | 316 |
| New Brunswick | 109,407 | 6,056 | 3,153 | 4 | 2,348 |
| Québec | 3,720,488 | 206,902 | 18,366 | 20,410 | 53 |
| Ontario | 2,679,930 | 42,309 | 111,352 | 13,897 | 10,779 |
| Manitoba | 151,502 | 1,789 | 2,805 | 2,264 | 232 |
| Saskatchewan | 118,816 | 845 | 1,238 | 66 | 0 |
| Alberta | 291,287 | 1,908 | 2,578 | 849 | 371 |
| British Columbia | 312,884 | 2,121 | 9,076 | 465 | 729 |
| CANADA | 7,525,286 | 268,099 | 149,533 | 38,139 | 14,970 |
| Breed Percentage | 94.0% | 3.3% | 1.9% | 0.5% | 0.2% |

Fertility Traits

Using this accumulated database at CDN, a genetic evaluation system has been developed for traits associated with daughter fertility. Specifically, four measures of daughter fertility have been established and bull proofs will be calculated for each individual trait. The first trait is the age of the daughter when she is first inseminated as a heifer (ie: Age at First Service). This trait reflects how well the daughters grow and mature to a point where the heifer initiates ovarian activity and shows signs of heat that are observed by the herd owner and then the decision is made to breed the heifer for the first time.

The second trait considered is a measure of how successful that first heifer insemination was in yielding a conception. The trait definition selected for Canada is the 56-day Non-Return Rate (ie: Heifer NRR), which is commonly used in other countries. This trait is determined by searching for other inseminations on the same heifer within the 56-day period immediately following the recorded first insemination. Security inseminations performed within two weeks of the first insemination are not considered. In addition, first inseminations performed for purposes of embryo transfer are excluded from the calculations since any resulting embryos are flushed and conception is therefore impossible to determine with confidence.

Complementing the two heifer fertility traits, the genetic evaluation system also includes two traits that reflect cow fertility, which can be observed and recorded within each lactation. One of these traits is the interval from calving to the first insemination (ie: Calving to First Service) in that lactation while the second is the 56-day Non-Return Rate (ie: Cow NRR) associated with that first insemination. This translates to one trait that indicates the cow's ability to start a new reproductive cycle after each calving and the other trait reflects her fertility level at that time.

Implementation Plan

In August 2004, the first official bull proofs representing the genetic potential of their daughters for fertility will be published. While the genetic evaluation system will provide an estimated proof for each of the four traits for every bull, only one single Daughter Fertility proof will be published, based on a combination of the four traits evaluated. In this way, genetic selection for these fertility traits can be achieved by using only one published proof rather than trying to interpret the results for each trait and evaluate each bull's strengths and weaknesses.

Since fertility levels differ across breeds, the Daughter Fertility proofs will be expressed using a descriptive scale relevant to each breed. Following the release of official bull proofs in August 2004, industry discussion will continue to determine how much emphasis Daughter Fertility will have in a revised LPI formula expected to be implemented in February 2005.

The calculation and publication of the proposed genetic evaluations for four traits related to daughter fertility is an important step forward for monitoring genetic trends for fertility and applying appropriate emphasis on this trait while selecting for increased production and longer-lasting cows. Down the road, however, CDN intends to offer an expanded genetic evaluation system for a wider spectrum of traits associated with the reproductive performance in heifers and cows. This expanded system is expected to include the same four measures of daughter fertility as well as traits associated with conception plus days open, gestation length, calving ease and stillbirth rate.