

Increased Accuracy of Genetic Evaluations for Production Traits

Canada was the first country in the world to implement a multiple lactation, multiple trait test day model genetic evaluation system back in February 1999. Now, following continued research supported by the industry, an important enhancement to the Canadian Test Day Model will be introduced starting in May 2003.

Canadian Test Day Model

Genetic evaluations for milk, fat and protein yields, fat and protein percentages, somatic cell score and lactation persistency are calculated using a very sophisticated system called the Canadian Test Day Model. The name of this methodology comes from the fact that every test day record on each cow from the first 305 days of her first three lactations are used rather than the traditional approach, which used lactation yields for each cow. Geneticists worldwide recognize the advantages of using test day information instead of lactation data and various countries are now also using a test day model including Germany, the Netherlands, Finland, Switzerland, Austria, Belgium and Estonia.

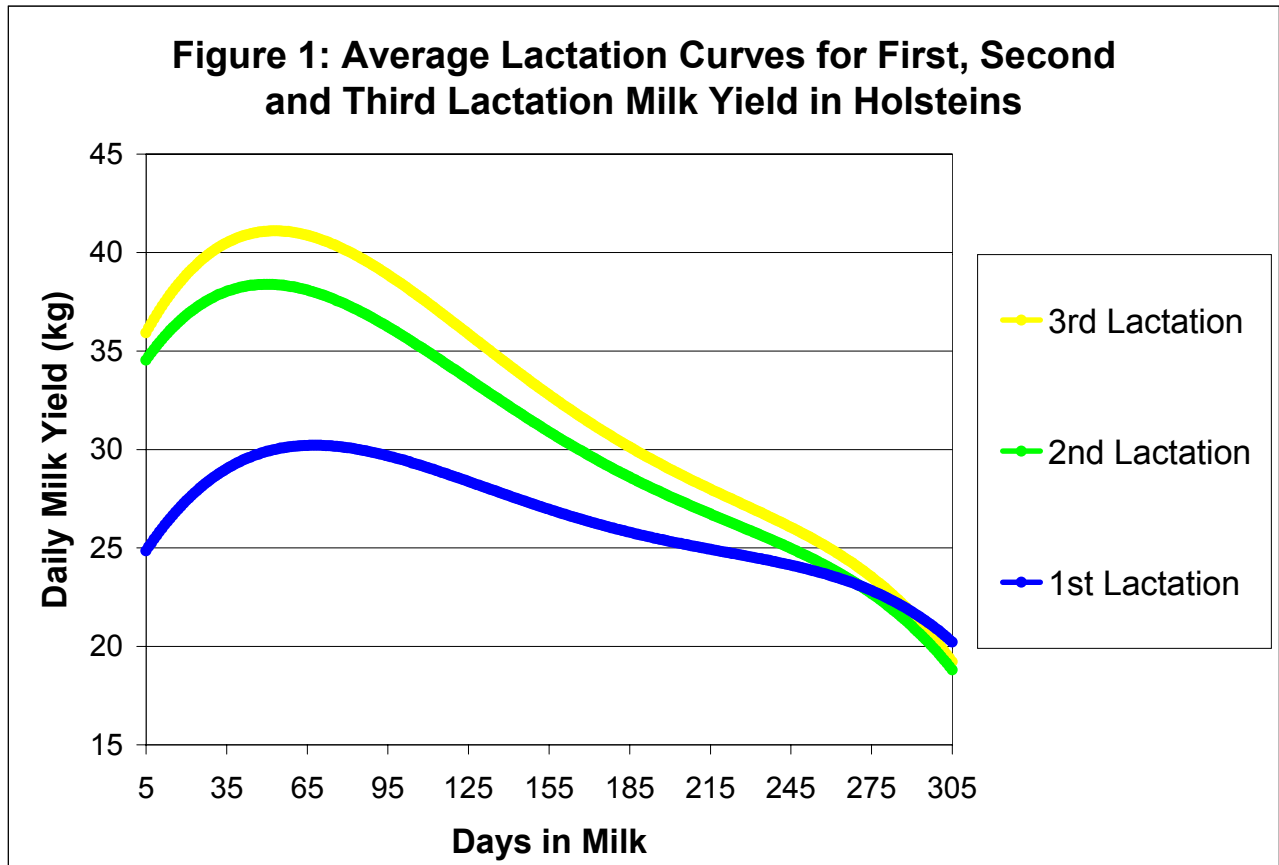
One important feature of the Canadian Test Day Model is that it uses each cow's test day yields for milk, fat and protein to derive a specific lactation curve that best describes her production in each lactation up to 305 days in milk. The accuracy associated with this process of estimating lactation curves has an impact on the resulting cow indexes and bull proofs that are published. Collaborative research over the past two years, involving geneticists at Canadian Dairy Network and the University of Guelph, has identified an improved approach to estimating lactation curves that increases the accuracy of genetic evaluations for all production traits.

Understanding Lactation Curves

Producers are well aware that older cows generally have higher lactation yields compared to first lactation cows. Figure 1 shows the average lactation curve for the first three lactations in the Holstein breed in Canada. A lactation curve basically describes how much milk the cow has produced on each day during her lactation. By accumulating the daily milk yields across the entire lactation, a 305-day lactation yield is calculated. Since milk recording is generally done on a monthly basis the exact daily yields for all other days during the lactation are never really known. Therefore procedures are required to use the recorded yields on each test day during the lactation for estimating the lactation curve for that cow's specific lactation.

A closer look at the lactation curves in Figure 1 shows that the average daily milk yields over the period from about 275 to 305 days in milk are essentially the same for each of the

first three lactations. The difference between the higher yields for later lactations compared to first lactation stems from the higher levels of production at the beginning resulting in higher peak yields. On the other hand, lactation persistency is, on average, much higher in first lactation with milk yield at 280 days in milk being 75% of that at 60 days in milk while this percentage moves down to 58% for second lactation and 56% for third lactation.



Improved Accuracy Coming in May 2003

During the past two years, a major research effort at Canadian Dairy Network and the University of Guelph has identified an improved approach for estimating lactation curves within the Canadian Test Day Model with the result being more accurate bull proofs and cow indexes for all production traits. The main reason for the improved accuracy is that the current methodology, which has been in place for four years now, has been shown to consistently over-estimate the lactation curves for cows just passed the middle of their first lactation. This systematic bias stems from the fact that these cows do not yet have actual yields at the end of their lactation so the over-prediction was basically associated with estimates of lactation persistency that were, on average, too high. The new method for describing lactation curves within the Canadian genetic evaluation system has been shown to remove this systematic bias and will be officially implemented for the Holstein breed starting with the May 2003 release.

Expected Impact of the New Approach

Since the existing system mainly over-estimates the lactation curves for animals in first lactation, it is expected that bulls with all or a strong majority of their daughters in first lactation, especially in the second half of first lactation, will experience the largest average decrease in their production proofs once the new methodology is introduced in May 2003. In general, this refers to bulls that are relatively newly proven and bulls that have started adding their second crop of daughters during the past few runs. On the cow side, general trends are less obvious since their genetic indexes are not only affected by their own estimated lactation curves but also by those for other cows in the herd and by any changes in the genetic evaluations of their sire and dam. Once the one-time impact of introducing this improvement is felt, bull proofs and cow indexes are expected to be more stable over time, with only the usual variations to be observed from run to run due to the addition of more daughters and/or more test day records on existing daughters. Further details of the impact of this enhanced methodology will be outlined in a second article to appear in the April issue of the Holstein Journal.