Réseau laitier canadien
Canadian Dairy Network

Genetic Selection for Persistency

Canadian dairy producers have had access to bull proofs for Lactation Persistency for five years now. Early on, the benefits of selecting for more persistent lactations were only speculative since very little research had been done. As time goes by, more is learned about this trait and its relationships with other important traits. In addition, adjustments have been made by Canadian Dairy Network (CDN) regarding the expression of bull proofs for Lactation Persistency. It is therefore opportune to review this trait and how it may be included in your genetic selection program.

Proof Expression

Bull proofs for Lactation Persistency are expressed in terms that are easily understood by dairy producers. Basically, they reflect the average daughter milk yield expected at day 280 in lactation compared to day 60 in lactation (Holsteins), and expressed as a percentage. Since peak yields are generally achieved earlier in lactation for coloured breeds a reference point of 50 days in milk is used rather than 60. For each bull, proofs for Lactation Persistency are calculated separately for first, second and third lactation and these are combined into an overall proof, which is commonly published by A.I. organizations and breed associations. Due to very different average lactation curves within each lactation and breed, the average and range of the resulting bull proofs for Lactation Persistency vary accordingly. Table 1 clearly shows that persistency of milk yield in first lactation is quite higher compared to later lactations and research has shown that this is mainly due to later and lower peak yields in first lactation. When the three individual lactation proofs for persistency are combined to produce the published value, 50 percent of the emphasis is placed on the first lactation proof while second and third lactation persistency each receive a weight of 25 percent.

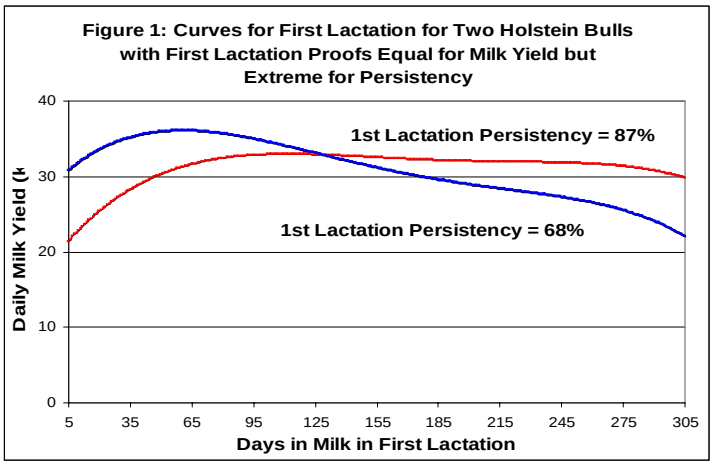
Table 1: Average and Range of Lactation Persistency Bull Proofs

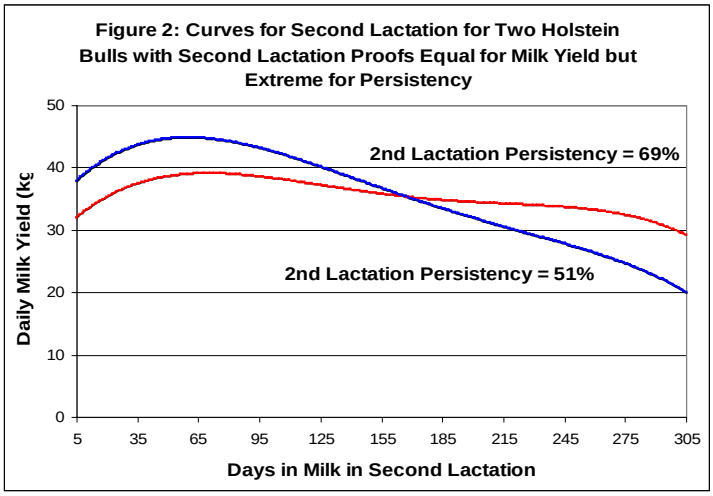
Breed	First Lactation	Second Lactation	Third Lactation	Combined Proof		
				Average	Min.	Max.
Ayrshire	66%	49%	46%	56%	48%	67%
Brown Swiss	75%	61%	63%	69%	62%	74%
Canadienne	63%	42%	41%	52%	43%	60%
Guernsey	70%	60%	57%	64%	56%	71%
Holstein	75%	59%	57%	66%	56%	75%
Jersey	72%	62%	60%	67%	59%	73%
Milking Shorthorn	68%	51%	47%	59%	49%	66%

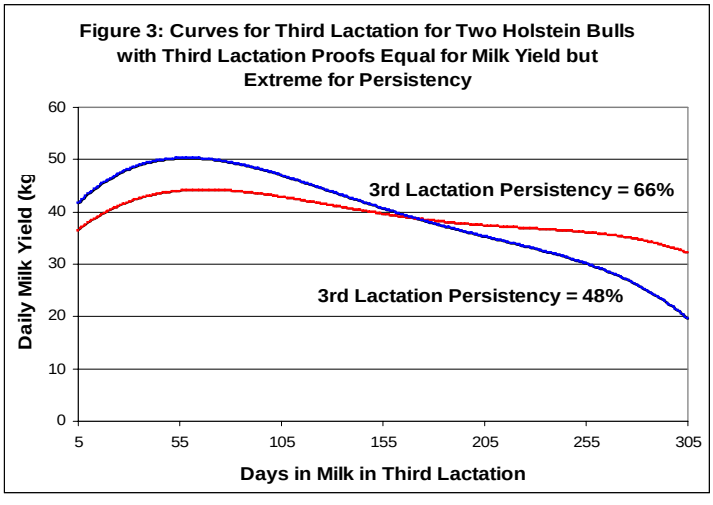
Genetic Variation

When looking at genetic variation that exists for persistency, it is interesting to visualize proofs for actual bulls by plotting the expected lactation curves of their daughters. For example, Figure 1 shows the average curve in first lactation for two Holstein bulls, one with a persistency in first lactation of 87% and the other with 68%, which are +12 and -7 percentage points from breed

average, respectively. Both of these bulls have the same first lactation proof for milk yield but the different lactation curves show how the total 305-day production is distributed from calving to the end of lactation. Daughters of the bull with the extremely high first lactation persistency proof of 87 percent are expected to have a consistent daily production of 30 to 33 kg of milk starting from 50 days after calving until day 305 in lactation. The bull with the poor persistency proof, however, has daughters that start producing at 30 kg, peak at about 36 kg at 60 days in milk, and subsequently decrease gradually to 22 kg at day 305 in milk. Figures 2 and 3 show similar examples of bulls with extremely different persistency proofs that exist for second lactation (69% versus 51%) and third lactation (66% versus 48%) but, for these lactations, it is common to have peak yields after 60 days in milk with a more rapid decrease in daily yield to the end of lactation.







Genetic Relationships

Relatively little research has been done to examine the genetic relationship between persistency in each lactation and other traits of importance in dairy cattle improvement. Recently, a doctorate thesis was completed by Bethany Muir at the University of Guelph, which concentrated on the relationships between persistency, reproduction and milk production. One of the key results of interest was the relationship between fertility and calving ease with persistency. In general, cows that start their first lactation with a difficult calving will tend to have a more persistent lactation (genetic correlation of 43%), likely because they have a poorer start to their lactation and therefore have a lower and perhaps later peak yield compared to easy calvers. On the favourable side, first lactation cows with high persistency also tend to have better conception within 56 days after their first insemination (genetic correlation of 32%). In terms of milk production, the same research found that higher 305-day yields in first lactation were genetically associated with peak yields later in lactation (correlation of 63%) and a longer interval between first and second calvings (correlation of 51%). Interestingly enough, no genetic relationship was found between 305-day yields and fertility in first lactation.

In a separate study at CDN, Holstein bull proofs for persistency were correlated to proofs for other traits. Those traits most related to persistency were milk, fat and protein yields with correlations for combined proofs varying from 27 to 31 percent, several mammary system type traits with correlations for first lactation persistency reaching 20 percent, and lower somatic cell score with a correlation of 22 percent for proofs combined across lactations. The net effect of these relationships also yields a favourable relationship between persistency proofs and LPI, with a correlation of 28 percent. In fact, amongst the Top 100 LPI Holstein sires in February 2004, 80 percent are breed average or better for overall persistency. Also, further analysis of the individual lactation proofs for milk yield has shown that bulls with a higher first lactation persistency proof are more likely to have an above-average increase in their proof for milk yield from first to second lactation, with a correlation of 35 percent.

Summary

While lactation persistency proofs have been available for bulls evaluated in Canada since 1999, relatively little selection emphasis has been placed on this trait. Within each breed it is clear that persistency in first lactation is higher and quite different compared to later lactations but significant differences exist amongst currently proven bulls. Analysis of relationships between persistency and other traits show signs that genetic improvement for persistency is possible and favourable as long as calving ease is monitored at the same time.