

*Réseau laitier canadien*



*Canadian Dairy Network*

## **Accounting for Pregnancy in Production Evaluations**

Coinciding with the January 2009 genetic evaluation release is the official implementation by Canadian Dairy Network (CDN) of improvements to production evaluations. While this release marks ten years using the Canadian Test Day Model, research efforts at the University of Guelph and CDN have maintained this sophisticated genetic evaluation system over the years to remain among the best in the world. The most recent developments for improving the accuracy of genetic evaluations for production traits include an adjustment to account for the number of days pregnant on each test day during lactation.

### **Underlying Principles**

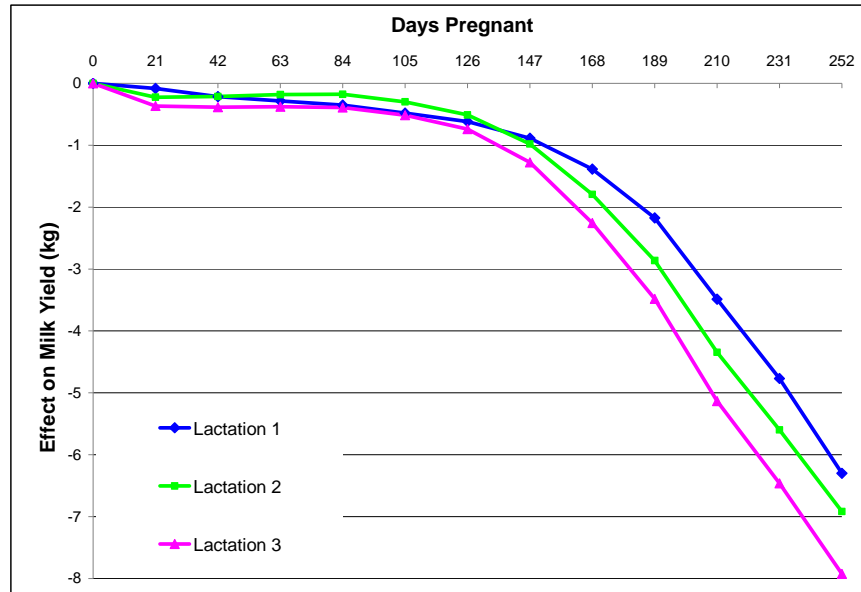
The dairy cow consumes feed that provides her with energy and nutrients for various bodily functions. In simple terms, the energy available gets distributed as needed for body growth and/or maintenance, milk production and, when pregnant, for the development of the fetus. Once the fetus has reached a certain stage of development, the energy required for further growth tends to reduce the amount of energy remaining to be allocated to milk production. For this reason, pregnant cows generally have lower persistency in the latter half of lactation compared to non-pregnant cows.

### **Measuring the Effect of Pregnancy**

Recent research conducted jointly between CDN and the University of Guelph estimated the effect of days pregnant on test day records for milk, fat and protein yields during each of the first three lactations. In order to obtain accurate estimates of these effects, only cows with known insemination data during the lactation and a known calving date to initiate the next lactation were used.

The results of this research for milk yield in Holsteins are shown in Figure 1 for first, second and third lactation. There are two major points of interest. Firstly, the effect of pregnancy to reduce 24-hour test day milk yields is relatively small (i.e.: less than 1 kg) for the first four months of gestation, regardless of lactation number. Secondly, as expected, since older cows tend to have higher lactation yields, the effect of pregnancy after the first four months increases from first to second to third lactation. Given that the average stage of lactation when pregnancy occurs in Holsteins is roughly 125 days in milk, a standard 305-day lactation would be affected by pregnancy for up to 180 days pregnant (i.e.:  $305 - 125 = 180$ ), which translates to an effect of up to 2 kg on test day milk yield and a cumulative effect of nearly 100 kg for first and second lactations and close to 150 kg for third lactation. Cows pregnant at 125 days in milk that continue to complete a 365-day lactation end up with a cumulative loss of approximately 300, 350 and 440 kg of milk yield for first, second and third lactation, respectively, compared to cows that are not pregnant at all.

Figure 1: Effect of Days Pregnant on Test Day Milk Yield in Holsteins



### Adjusting for Days Pregnant on Test Day

Due to the impact of pregnancy to reduce resulting yields of milk, fat and protein for pregnant cows versus open cows, CDN has introduced an adjustment according to the number of days pregnant on each test day. To achieve this, a conception date is estimated for each lactation, including those still in progress, for which test days are used within the Canadian Test Day Model. Various methods for estimating the date of conception are used by CDN depending on the information available including calving dates, breeding records collected by A.I. and milk recording and/or inseminations done for embryo transfer, which are also identified using embryo retrieval data provided by breed associations.

Table 1 provides the adjustment values added to the 24-hour milk weights for test days during first lactation in each dairy breed, according to the number of days pregnant on test day. Analogous tables of adjustment values are used for second and third lactation as well as for fat and protein yields in each lactation. Cows identified as not pregnant on test day do not have any adjustment applied to the 24-hour yields recorded.

Days Pregnant on Test Day	AY	BS	CN	GU	HO	JE	MS
30	0.2	0.3	0.0	0.2	0.1	0.2	0.0
60	0.3	0.3	0.0	0.2	0.3	0.2	0.0
90	0.5	0.5	0.0	0.5	0.4	0.2	0.0
120	0.7	0.7	0.0	0.7	0.6	0.4	0.0
150	0.9	1.0	0.1	0.9	1.0	0.5	0.1
180	1.6	1.5	0.3	1.3	1.8	0.8	0.5
210	3.0	2.5	0.8	2.1	3.5	1.4	1.3
240	4.4	3.5	1.8	3.3	5.4	2.1	2.6

## **Summary**

With the availability of a national database that includes breeding data collected by A.I. technicians and milk-recording staff, the Canadian Test Day Model has been improved with the January 2009 release to account for the effect of pregnancy on production yields. This adjustment improves the accuracy of genetic evaluations for production traits, especially for cows, since it credits back the lost production for pregnant cows when estimating their genetic indexes for milk, fat and protein yield as well as lactation persistency, compared to cows that are open for most or all of their lactation.

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