Réseau laitier canadien
Canadian Dairy Network

Genetic Selection for "Daughter Fertility"

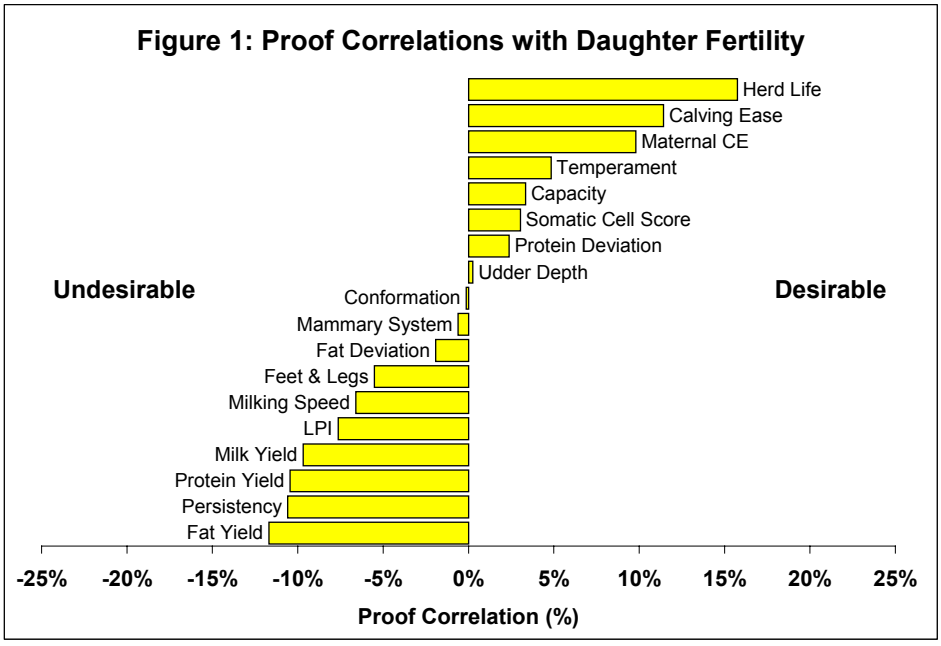
Previous articles have described the new genetic evaluation system for female fertility traits implemented by Canadian Dairy Network in conjunction with the November 2004 genetic evaluation release. Now that bull proofs for "Daughter Fertility" are available for each breed, this new information must be properly used to improve the reproductive performance of each dairy cow population.

Genetic Aspects

From a genetic perspective, it is well known that fertility performance is mainly controlled by non-genetic factors such as nutrition, health and disease, climate, etc. In fact, the portion of all differences in fertility observed within a breed that is due to genetics is estimated to be less that 5%. One may ask, therefore, why genetic evaluations for female fertility traits should even be calculated and published. The answer is simply due to the high economic impact that poor fertility, especially infertility, can have on farm profitability.

Figure 1 shows the correlations between Holstein bull proofs for Daughter Fertility and other important traits. On the positive side it is easy to understand that better fertility is generally associated with longer herd life and easier calving performance. Conversely, genetic selection for high yields of milk, fat and protein yield and better persistency have also reduced the genetic potential of those same dairy cows to reproduce, reflected by the negative genetic correlations of approximately 10%.

Figure 1: Proof Correlations with Daughter Fertility



In addition to genetic relationships amongst the traits, CDN also identified the genetic trend in Holsteins for each of the female fertility traits evaluated. For heifer and cow fertility, as measured by 56-day non-return rate, as well as for Daughter Fertility, the average deterioration at the genetic level has been about one-tenth of a percentage point per year, which is almost half the rate of the annual phenotypic decrease observed in Canada. For the interval from calving to first insemination in cows, there has been an undesirable increase of approximately 1 day per 4-year period genetically. In heifers, however, the average age at first insemination has been genetically decreasing by three days every four years, which is partially explained by the fact that it is significantly related to genetic gains for growth and body development traits such as capacity.

Bull Proofs

Tables 1 and 2 provide November 2004 proof information related to Daughter Fertility for the highest fertility bulls amongst the Top 100 for LPI and for the bulls with the most daughters evaluated for fertility, respectively. In Holsteins, the proof average for Daughter Fertility is 66% and the best bulls in the breed reach proofs near 75%. Due to the negative relationship between production and fertility, however, the sire with the highest daughter potential for fertility amongst the current Top 100 LPI is Cedarwal Raider at 72% and #81 LPI. The other eight bulls in Table 1 are also superior for Daughter Fertility since their proof is at least 3 percentage points (ie: one standard deviation) above breed average. A point of caution, however, is the fact that Reliability values are lower for this trait since it requires many more daughters to reach the same level of proof accuracy compared to other traits such as production or conformation.

Table 1: Highest Proven Bulls for "Daughter Fertility" Amongst Top 100 LPI

LPI Rank	Name	Sire	Total Herds	Total Daus	Daus NRRc	REL	DF
81	CEDARWAL RAIDER	FORMATION	67	94	79	56	72
72	PENNVIEW INCOME	MEGABUCK	781	1076	99	74	70
40	COMESTAR LEMPIRE	RUDOLPH	92	114	84	60	70
24	MACO SCOTTY	RUDOLPH	107	111	92	55	70
99	BRILEA TALISMAN	MARTY	87	110	90	54	70
22	COMESTAR STORMATIC	STORM	579	790	118	74	69
43	REGANCREST RBK DIE-HARD-ET	ROEBUCK	95	202	116	58	69
66	MARKSWAY RAFTER	MARTY	108	148	103	57	69
58	QG INSPECTOR ET	LORD LILY	51	70	62	48	69

The “reference” sires listed in Table 2 all have at least 10,000 total daughters contributing to their Daughter Fertility proof, yielding high Reliability levels. Some bulls that have had a major impact of the Canadian Holstein breed, such as Rudolph, Outside and Progress are now proven to also have been superior sires for the fertility of their daughters. On the down side, however, since no genetic evaluations for Daughter Fertility were available, some inferior bulls for this trait have also left their mark on the breed, namely Lee, Inquirer and James.

Table 2: Bulls with Most Daughters for "Daughter Fertility"						
Name	Sire	Total Herds	Total Daus	Daus NRRc	REL	DF
STARTMORE RUDOLPH	AEROSTAR	8389	52999	43719	99	70
MAUGHLIN STORM	AEROSTAR	8272	44618	36028	99	65
OLIVEHOLME AEROLINE	AEROSTAR	7607	34546	26697	99	64
COMESTAR LEE	RAIDER	6979	28903	21604	99	60
SHOREMAR MASON	LINDY	6999	25332	21880	99	67
COMESTAR OUTSIDE	PRELUDE	6235	22036	15868	99	69
DUNCAN PROGRESS-ET	PRELUDE	6199	21866	17013	99	70
COMESTAR LEADER	BLACKSTAR	5934	20171	16073	99	66
SHOREMAR JAMES	GRAND	5761	18399	13647	99	61
SUMMERSHADE INQUIRER	JUROR	5040	18133	6156	97	60
SUMMERSHADE IGNITER	JUROR	4353	11998	4831	96	65
HALDREY LEADERSHIP	INSPIRATION	4295	10453	8986	99	63

Words of Advice

Even though cow fertility is 95% controlled by non-genetic factors, the economic importance of this trait in combination with its negative genetic relationship with the yield traits, make the availability of Daughter Fertility proofs quite valuable. Caution is warranted so as to give this information an appropriate level of attention, especially given the relatively low accuracy levels of proofs for younger proven sires. The proof correlations in Figure 1 also show a negative relationship between Daughter Fertility and the current LPI, but this will change in February 2005 as modifications to the LPI formula are implemented including the addition of this new trait with an overall emphasis of 5%. From that point forward, additional consideration of a bull's proof for Daughter Fertility should be limited to sire selection decisions for poor fertility cows.