Genetic Evaluations for Somatic Cell Score

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Interest in genetic resistance to mastitis is expanding. Increase in productivity is believed to have led to a related increase in the occurrence of mastitis. Marginal costs of reducing the rate of mastitis increase through genetics are small. Somatic cell count (SCC) is related to both clinical and subclinical mastitis. The legal limit for SCC in the United States was lowered to 750,000/ml in July 1993 (2). Further reductions are likely. Incentive payments for milk with low SCC are becoming more common. Semen sales to other countries could be benefited by genetic information on mastitis. Any alleviation of mastitis through genetics would be preferable to total reliance on drugs and other management practices.

Somatic cell data are provided to USDA's Animal Improvement Programs Laboratory (AIPL) as lactation means of somatic cell scores (SCS), which are linearly related to incidence of mastitis and milk loss (1); each increase of one score represents a doubling of SCC. Mean SCS is the variable available for genetic evaluations.

Somatic Cell Scores

$$SCS = \log_2 (SCC / 100{,}000) + 3$$

SCS	SCC	SCS	SCC
0	12,500	5	400,000
1	25,000	6	800,000
2	50,000	7	1,600,000
3	100,000	8	3,200,000
4	200,000	9	6,400,000

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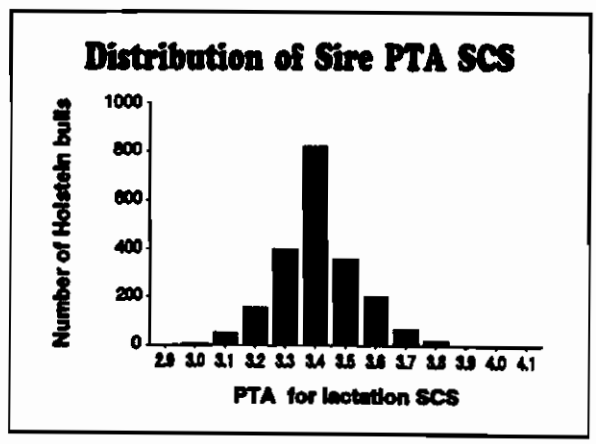
Evaluations for SCS are planned for January 1994, and the process will be similar to that for yield traits (4). Lactation mean SCS for the first five lactations will be edited and adjusted for incompleteness and calving age and season. To develop a plan for presenting SCS information, AIPL worked closely with the National Mastitis Council. An animal's evaluation is calculated relative to cows born in 1985 and then is added to the mean first lactation SCS (standardized for age, calving month, and lactation length) for cows born in 1985 (about 3.38 for Holsteins). This produces evaluations that are positive and in the same units as the trait measured. This approach solves two major problems of presenting the PTA for SCS: 1) 0 is not available for truncation selection and 2) larger numbers are undesirable. Providing evaluations relative to the mean SCS should solve the direction problem as lower SCS is understood to be better because of past educational programs.

Concern has been expressed that SCS might be given too much emphasis. Genetic selection to reduce SCS will never replace management as the most important means of mastitis control. An economic index that includes PTA for yield traits, SCS, and productive herd life is being developed. Giving SCS 5% as much weight as yield would help slow the increase in mastitis without sacrificing much in terms of yield (3).



Holstein evaluations currently range from 2.94 to 4.02. The differences between PTA SCS and the corresponding ranks are the important factors. However, the effect of the difference between bulls' PTA SCS in terms of expected SCC can be estimated by raising 2 to the power of that difference. For example, if two bulls have PTA SCS that differ by .5, then daughters of the bull with the higher PTA SCS would be expected to have 1.41 (or $2^{.5}$) times as high SCC.

Interpreting PTA SCS

D	2^D	D	2^D
0	1.00	.6	1.52
.1	1.07	.7	1.62
.2	1.15	.8	1.74
.3	1.23	.9	1.87
.4	1.32	1.0	2.00
.5	1.41		

The measure of accuracy will be expressed as reliability. These reliabilities will be lower than for yield because of a lower heritability (10% vs. 25%) and generally fewer records. Data for SCS have been available only since 1987; even now, only about 80% of tested cows have SCS data. Progeny-test bulls will likely not reach 60% reliability for PTA SCS. High reliability will be reached only through second-crop daughters. Likewise, reliabilities will be low for cows.

Genetic evaluations for SCS mark a first attempt to evaluate animals for genetic disease resistance in the United States. Genetic improvement in reducing SCS would be slow relative to yield traits because of lower heritability and reliability and because less emphasis is warranted. In fact, appropriate selection levels may only slow the increase in mastitis susceptibility, which is correlated with increasing milk yield. Nevertheless, genetic evaluations for SCS provide another tool to reduce dependence on drug therapy, to ensure milk quality, and to enhance the health of dairy cows.

References

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