Changes to Net Merit ushered in with August proofs

by Tony Seykora and Paul VanRaden

While the August sire summaries may look similar to past summaries, the Net Merit (NM$) formula has received a face lift. It was revised to incorporate cow fertility for all breeds, calving ease traits in Holsteins, and updated economic values for the other traits.

NM$ is defined as the expected lifetime profit as compared with the breed base cows born in 1995. NM$ was first introduced in 1994 as an index containing production and health traits. It was revised in August 2000 when the type traits: udder and feet-and-legs composite, along with a negative emphasis on body size composite, were added.

So how much change really took place? The correlation between the 2000 NM$ formula and today's model is .98. In other words, revising the Net Merit formula caused only small changes in the rankings for most bulls. However, extreme bulls that are either good or bad for daughter pregnancy rate (DPR), service sire calving ease (SCE), or daughter calving ease (DCE) may have had their rankings change appreciably.

What does it look like?

The major change was adding DPR, SCE, and DCE to the index. As you may know, calving ease traits are only calculated on Holsteins. The relative weights placed on each of the traits are shown in Table 1. Under NM$ 2000, 62 percent of the emphasis was on production traits – milk, fat, and protein. For NM$ 2003, only 55 percent of the emphasis is placed on production traits fat and protein. Milk was dropped.

Table 1. Comparison of NM$ 2000 and NM$ 2003

Trait	Value		Relative weight	
	NM$ 2000	NM$ 2003	NM$ 2000	NM$ 2003
	$/PTA unit		%	
Milk	.18	0	5	0
Fat	2.14	2.54	21	22
Protein	4.76	4.81	36	33
Productive life	28	26	14	11
SCS	−154	−166	−9	−9
Udder composite	29	33	7	7
Feet & legs composite	15	15	4	4
Body size composite	−14	−12	−4	−3
DPR	…	17	…	7
SCE*	…	−5	…	−2
DCE*	…	−5	…	−2

*Available only for Holsteins

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The added emphasis was placed on selected fitness traits. Productive life's contribution was lowered slightly from 14 to 11 percent of the index because more emphasis is now assigned to the individual traits such as DPR that contribute to productive life. Because non-Holstein breeds do not have calving ease information, the relative weights on other traits for those breeds increase. For the non-Holstein breeds the relative weights are: fat, 23%; protein, 35%; productive life, 11%; SCS, -10%; udder composite, 7%; feet-and-legs composite, 4%; body size composite, -3%; and DPR, 7%.

More on the traits . . .

DPR: Evaluations for DPR became available for the first time in February 2003 and allow direct selection for increased fertility. Poor reproduction has been cited as the number one cause for culling cows. Additional costs associated with poor fertility include increased semen required; increased labor and supplies required for heat detection, inseminations, and pregnancy checks; and yield losses because of lactation intervals that are less than optimal. An average loss of about $1.50 per day open was calculated, which converts to $17 per PTA unit of DPR on a lifetime basis and receives a relative weighting of 7 percent in NM$.

DPR value is different for different herds and management situations. The value of getting cows bred on schedule is higher for herds with seasonal calving than for those that calve year round. As of August 2003, 8 of the 12 largest Holstein populations in the world include cow fertility in their national indexes with relative weightings of 1 percent in Germany; 7 percent in the United States and the Netherlands; 8 percent in Australia; 9 percent in Denmark; 10 percent in New Zealand and Sweden; and 13 percent in France.

Calving ease: A difficult birth reduces production, delays reproduction, increases incidence of metabolic problems in early lactation, increases likelihood of stillbirths, and may kill the cow. In addition, increased labor and veterinary costs are associated with difficult calvings. Calving difficulty is influenced both by the sire of the calf (SCE) and the sire of the mother (DCE). SCE evaluations have been available since 1978, and DCE evaluations first became available in August 2002. SCE and DCE are each valued at −$5 per PTA unit in NM$, which gives a relative weighting of about 2 percent for each trait and a total relative weighting of 4 percent for calving ease. As of August 2003, only 5 of the 12 countries with large Holstein populations include calving ease or incidences of stillbirths in their national indexes. Relative weighting on calving ease is 3 percent for Germany, 4 percent for the United States, 6 percent for Denmark, 10 percent for The Netherlands, and 12 percent for Sweden.

Dairy producers have used SCE evaluations since 1978 to avoid Holstein bulls that are poor for calving ease when breeding heifers, and that practice still makes sense. The value of −$5 per PTA unit of SCE used in NM$ is a weighted average of losses for cows and heifers. The actual calculated loss for heifers is −$9 per PTA unit of SCE, and the value for cows is only −$3 per PTA unit of SCE.

Productive life: The economic value of productive life depends mainly on the price difference in costs of replacements versus the salvage value obtained when selling cull cows. Even though the value for productive life was reduced in the new NM$, increased genetic progress is expected for productive life because the total emphasis on fitness traits is greater.

SCS: Selection for lower SCS leads to higher milk prices in markets where quality premiums are paid. Selecting for lower SCS also reduces clinical mastitis. Costs associated with clinical mastitis include increased labor, antibiotics, and discarded milk as well as a greater chance of accidental antibiotic residue in the bulk tank.

Yield traits: Milk prices vary over time and by use of the milk. A base milk price of $12.70 per hundred-weight was assumed after hauling and promotional charges were deducted. To account for various milk uses, fluid merit (FM$) and cheese merit (CM$) indexes are calculated in addition to NM$. Component prices per pound are shown in Table 3. Subtracting feed costs from the component price and than multiplying by an average of 3 lactations times .89 (ratio of actual production to mature equivalent yield) gives the value per PTA pounds that are used to calculate the lifetime merit indexes.

Table 2. Economic values for production traits						
	Component value			Index value		
Index	Milk	Fat	Protein	Milk	Fat	Protein
	—— $/lb ——			—— $/PTA lb ——		
NM$	.012	1.30	2.30	.000	2.54	4.81
CM$	−.009	1.30	3.00	−.056	2.54	6.68
FM$	.051	1.30	1.00	.104	2.54	1.33
Feed cost	.012	.35	.50	. . .	. . .	. . .

The majority of producers in the U.S. are paid for milk, fat, and protein such that they should select on NM$. However, producers in fluid markets that receive less than $1.65 per pound of protein will be better off selecting for FM$. Conversely, those producers that receive more than $2.65 per pound of protein should select for CM$.

Type traits: The conformation composites are calculated differently for different breeds as illustrated in Table 4. For Holsteins, the composite indexes are published by Holstein Association USA as standardized transmitting abilities with standard deviations for true transmitting abilities equal to 1. The published composite indexes are used directly to calculate NM$. For other breeds, the published PTAs for linear traits are first converted to standardized transmitting abilities by dividing by their standard deviations of true transmitting abilities. Then they are used to compute the composite indexes for NM$ calculations.

Table 3. Relative weights for composite traits			
Composite and traits	Holstein	Brown Swiss	Jersey and other breeds
Udder			
Fore udder	16	21	20
Rear udder height	16	6	18
Rear udder width	12	1	8
Udder cleft	10	2	3
Udder depth	30	35	26
Teat placement	16	11	7
Teat length	. . .	−24	−18
Feet & legs			
Rear legs (side view)	−8	−48	−30
Rear legs (rear view)	18	. . .	. . .
Foot angle	24	52	70
Feet and legs score	50	. . .	. . .
Body size	**Holstein and other breeds**		**Jersey**
Stature	50		50
Strength	25		40
Body depth	15		. . .
Rump width	10		10

The emphasis placed on udder composite in NM$ is 7 percent, and significant genetic progress is expected over the next 10 years. Better udders are associated with less mastitis, less labor for milking, and greater longevity. Emphasis on the feet-and-legs composite remains at 4 percent, but expected genetic progress per year has increased because of the positive genetic correlation with other fitness traits in the index. Body size composite receives a relative emphasis of –3 percent in NM$ because the cost of increased feed for growth and maintenance exceeds the income from selling heavier cull cows and bull calves. Many dairy producers in the past selected for larger cows, but body size has negative genetic correlations with longevity, fertility, and calving ease in the current U.S. Holstein population. Smaller size is also rewarded by the American Jersey Cattle Association in their Jersey Performance Index and by the American Guernsey Association in their Production Type Index because larger cows don't last as long.