



Improvements made to PTAT calculations

Dr. Tom Lawlor

Director of Research, Holstein Association USA

When are 6.5 million cows not enough? When you're calculating the genetic evaluations for final score. Researchers at the University of Georgia have shown that a major improvement in the predictive ability of PTA Type (PTAT) and its subsequent stability can be achieved by adding the pedigree information on 1.7 million ancestors.

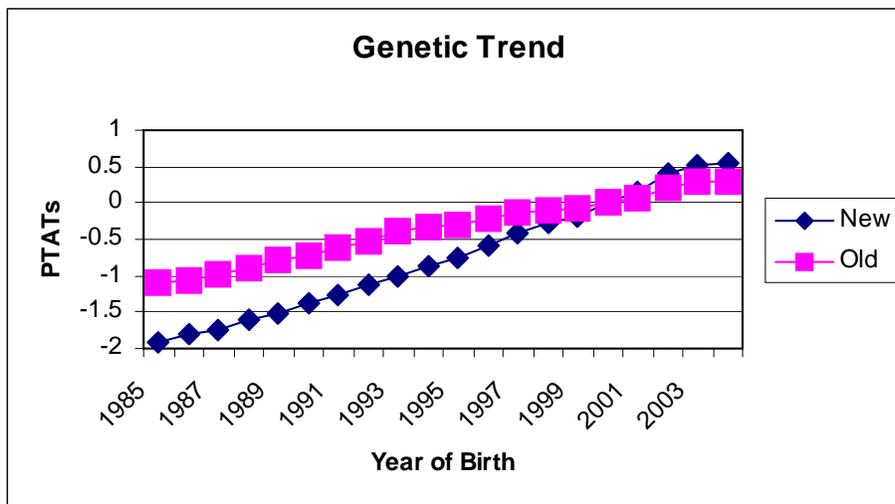
Currently, a cow needs to be first scored prior to 43 months of age; or be the dam of two or more offspring or be a bull mother in order to be included in the animal model evaluations.

Unfortunately, this still leaves out a large number of dams who have only one classified offspring. And the number of dams with only one classified offspring has been growing. Grade cows have become a more important part of the bull proving process and more registered cows are being classified under an optional program.

When a dam was missing from the evaluation, an average pedigree value for the dam's year of birth was utilized. This logic works fine for an average cow with an average pedigree. However, this is not the case for many of our cows. We found that the quality of the pedigree goes hand-in-hand with the quality of the cow. In other words, the missing pedigree information on a cow with a good PTAT was much higher than the missing pedigree information of a cow with a low PTAT.

Geneticists call this positive assortative mating. Good cows get bred to good bulls and poorer cows get bred to average or below bulls. Farmers see this happening all the time. Some breeders are very committed to improving the conformation of their cows and will select only high type

bulls or perhaps a breeder will breed only his good cows to good bulls.



Impact of additional pedigrees:

Including the additional 1.7 million pedigrees had a significant impact on the genetic evaluations. Within any given year, the top cows tended to go up and the low cows went down. For example, for cows born in the base year 2000, the top 20

PTAT cows increased from +3.08 to +3.24 and the bottom 20 PTAT cows decreased from -2.58 to -2.65. Across time, the amount of genetic improvement was calculated to be much larger than previously estimated, a gain of slightly more than five points has occurred in the last 20 years.

Expected changes in cow PTATs:

Some factors that will affect a cow's PTAT are her year of birth, the addition of new pedigrees on any of her relatives or changes in the PTATs of her contemporaries. For example, a cow born in 2004 is expected to go up +0.26, whereas a cow born in 1994 will decrease on average by -0.53 points. Cows adding an extremely good or bad pedigreed dam could change up or down by up to a point. Cows in top pedigreed herds should see an increase in their PTATs because of an adjustment to the PTATs of their contemporaries.

Bull rankings will be higher but familiar:

The increased genetic trend causes the genetic evaluations of the current population to be higher. The average PTAT of the top 400 TPI bulls increased by +0.4. This means that the number of bulls with a PTAT of +2.50 or higher and with at least 80% reliability goes from 14 to 58. In the new evaluations there are 20 bulls who have a PTAT of +3.00 or higher.

Correlation of Old PTATs with New PTATs and additional pedigrees

All bulls with at least 80% rel and born after 1994 **.985**

Although the bull proofs will look higher the names will all be familiar. There is a high amount of agreement between the

new and old evaluations. The correlation between the two evaluations are quite high (.985). For example, all of the new Top 10 PTAT bulls were amongst the previous Top 15 bulls. This means that bulls who were selected on the old PTATs will still be amongst the high type bulls of the breed.

Greater predictability and stability in the proofs:

Parent averages for type of young bulls will be more predictive. Less pedigree slippage was observed for bulls obtaining their first proof. On average, the PTATs of first crop bulls were within 0.1 of their PAT.

The main advantage of the new genetic evaluations is that there is much greater stability as a bull goes from his 1st crop to 2nd crop evaluation. The bulls summarized below were those receiving their 1st crop evaluation in 2004 and a 2nd crop evaluation in 2007. Under the old genetic evaluation system, a bull's PTAT would drop on average by -0.44, with the largest drop well

Stability of Proofs Change from 1st to 2nd crop evaluation.

Change in Bull's PTA 2007 vs. 2004

	Average difference	Largest drop	Largest Increase
Old Evaluations	-0.44	-1.81	+1.10
New Evaluations	-0.05	-1.39	+1.43

Bulls with Less than 100 Daughters in Feb. 2004 and More than 200 Daughters in Feb. 2007

exceeding the largest increase. Now, the changes in the proofs are normally distributed, i.e., the average change is close to zero (-0.05) and the largest increase is about the same size as the largest decrease.

We see a similar story when looking at the number of bulls changing. The number of bulls going up or down is much more normal, 61 up and 71 down. The number of extreme changes in either direction is more similar (14 up and 18 down) for the new evaluations.

Stability of Proofs				
Number of bulls going up or down when they received their 2nd crop evaluation.				
Total number of bulls (132)				
	Went Up	Went Down	Increased by + 0.5 or more	Decreased by + 0.5 or more
Old Evaluations	17	115	2	52
New Evaluations	61	71	14	18

Bulls with Less than 100 Daughters in Feb. 2004 and More than 200 Daughters in Feb. 2007

The main difference that breeders will see is an increase in PTATs of the older 2nd crop bulls. This means that the 2nd crop bulls were being under-evaluated in the old system. These changes should be well received by breeders who have been puzzled by the frequent drops in some of the more popular bulls.

Example of some changes for high type, second crop bulls (February 2007 US-only data).

	Current PTAT	New PTAT
Durham	2.61	3.13
Roy	2.43	3.02
Stormatic	2.12	2.78
AltaFinley	2.01	2.66
BW Marshall	1.88	2.42
Juror Bond	1.48	1.94
Pyrex	1.47	1.94

International Comparisons:

The new U.S. genetic evaluations for type have a better agreement with the type proofs from other countries. Most genetic correlations increased by 0.02 to 0.04. The only exception is France, who places 60% of their final score emphasis on udders.

Better agreement of Type proofs with most other countries.

Genetic Correlations

	OLD	NEW
France	.86	.85
Great Britain	.82	.87
Spain	.86	.88
Canada	.86	.88
Germany	.85	.89
Italy	.85	.90
Netherlands	.87	.90

Conclusions: An additional 1.7 million cows were added to the genetic evaluation system to obtain a more accurate estimate of the animal's ancestral contribution. This resulted in better predictive ability of PTAT and its subsequent stability. Our estimate of genetic improvement over the last 20 years has increased to slightly over 5 points. As a consequence, many present-day animals will see an increase in their PTATs. For example, the average proof of the top 400 TPI bulls will increase by +0.4. The main advantage of the new genetic evaluations is that there will be much greater stability as a bull goes from his 1st crop to 2nd crop evaluation.