

Questions about on genomic adjustments

This April's genetic evaluations featured imputed genomic calculations and adjusted cow evaluations. Animal Improvement Programs Laboratory (AIPL) scientists answer questions on both matters.

— THE EDITORS

Which cows have imputed (calculated based on progeny) genotypes?

Any nongenotyped cows where 90 percent of the single nucleotide polymorphism (SNP) genotype can be determined received an imputed evaluation. This usually requires four or five genotyped progeny. Some animals reach that threshold because daughters with imputed genotypes are included. The first offspring contributes about 50 percent, the second contributes about 25 percent, the third about 12.5 percent, the fourth about 6.25 percent, and so on until the 90 percent threshold is reached. Any additional offspring raises the accuracy.

Is phenotypic (production) information used to determine an imputed genotype?

No, the genotype of the animal is determined only by the genotype of her progeny and/or her ancestors.

How accurate are the imputed genotypes?

Imputed genotypes are, on average, between 96.6 and 97.9 percent accurate depending on the breed. For Brown Swiss, 96.6 percent; Holstein 97.4 percent; and Jersey 97.9 percent.

What about adjustments to PTAs in genetic evaluations? Why did the genotyped cows need genetic index adjustments?

Genotyped cows usually are the most valuable cows in a dairy herd. These cows needed an adjustment because they were being overevaluated. The high PTA values were causing the genomic predictions to suffer in accuracy because the marker effects were trying to explain a phenotype that was inflated compared to the bulls that carried those same genes.

A study completed over a year ago showed that the added information from genotyped cows was not increasing reliability, indicating that some type of adjustment was necessary. By adjusting the overevaluated cow PTA, it was possible to increase the accuracy of the genomic predictions.

What animals were adjusted and how were they adjusted?

All genotyped cows, heifers, and imputed cows were adjusted by reducing the mean and variance of the traditional PTA. All genotyped animals including bulls, were affected by the adjustment made to the maternal portion of the parent average, regardless of the genotype status of the dam. The adjustments were made to milk, fat, and protein and the percentage traits only. (The PTA shifts were reported in the April 25 issue on page 288). Brown Swiss adjustments were not implemented due to low numbers of genotyped cows.

If the adjustment of cows is needed, why was it only done to genomically tested cows?

The undesirable consequence of the adjustment is that nongenotyped cows are not fully comparable with genotyped ones. It may be useful to think of this as though genotyped cows have been converted to the evaluations comparable with those of bulls, and nongenotyped cows have evaluations that are the same as they have been.

A research project showed that a similar result can be achieved for all cows by lowering the heritability of the yield traits. The industry did not approve the change to heritability, so the focus moved to fixing those animals that are contributing to the genomic equations. However, not being able to compare genotyped and nongenotyped cows is leading us to reconsider implementing the change in heritability. For more information go to <http://aipl.arsusda.gov/reference/changes/aprilInformation.htm>

— THE AIPL RESEARCH TEAM