Genomic Choices

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The most frequently asked question of the month on the subject of genomics and EPDs, is "Which test do I pick?" Breeders hate the answer of "It depends", but as of the date you read this article that's all we can say at this time. Below are the points to consider in your decision-making process. Ultimately you will still be using the EPDs to make the most informed selection decisions among animals. The EPDs should be considered the genetic improvement tool of choice, since EPDs account for all the available information on an animal, such as individual measures, progeny data, pedigree and genomic results. The details below will help you gauge the areas where genomics are having the most impact by trait.

Point 1: Available traits that include genomic results

At the American Angus Association®, we incorporate the genomic results into the trait evaluation when the research is completed and trait relationships to the genomic results are established. Table 1 summarizes the traits impacted by genomic results. Both company genomic results, Igenity® Profile for Angus, and Pfizer HD 50K for Angus, are included into the calculations for the traits as indicated.

Table 1. Weekly evaluation traits with genomic data

	Igenity	Pfizer
Calving ease (CED)	✓	✓
Growth (BW WW YW Milk)	✓	✓
Residual Average Daily Gain (RADG)	✓	✓
Docility (DOC)	✓	✓
Yearling Scrotal/Height (SC,YH)	✓	✓
Mature Weight (MW)	✓	✓
Carcass (CWT MARB RIB FAT)	✓	✓

Point 2: Correlation between genomic results and trait

Through Association research, we take the genomic results received from the companies initially and compute a genetic relationship between the genomic result and the phenotypic data at the Association. Table 2 presents the genetic correlations by trait associated with calculating the Association's genomic-enhanced EPDs. Typically there are two measures

used to report the relationship of a genomic test and phenotype, genetic correlation or percent of additive genetic variance accounted for by the test. We report the genetic correlation to illustrate this relationship. These two measures are related and can be transformed equally. The genetic correlation is the square root of the percent additive genetic variance and, conversely, the percent additive genetic variance is the squared value of the genetic correlation.

For example, if the genetic correlation between the genomic result and the phenotypic measure is .60, then the genomic result explains 36% of the additive genetic variance. Simply stated, the more genetic variance a test explains, the more impact it will have on your EPDs and accuracies for that trait. Angus breeders must consider these relationships and then make the best choice for their breeding programs and traits of interest.

Table 2. Genetic correlation between genomic results and phenotypic trait of interest (AAA data) by genomics company

	Igenity	Pfizer
Calving Ease Direct	.47	.33
Birth Weight	.57	.51
Weaning Weight	.45	.52
Yearling Weight	.34	.64
Dry Matter Intake (component of RADG)	.45	.65
Yearling Height	.38	.63
Yearling Scrotal	.35	.65
Docility	.29	.60
Milk	.24	.32
Mature Weight	.53	.58
Mature Height	.56	.56
Carcass Weight	.54	.48
Carcass Marbling	.65	.57
Carcass Rib	.58	.60
Carcass Fat	.50	.56

Additional Considerations

EPDs -Profile Scores – Percentile Ranks. Table 3 describes by trait the Igenity profile score and Pfizer percentile rank systems to assist in establishing direction of interest for each trait.

Table 3. Establishing direction for Igenity profile scores and Pfizer percentile ranks

	Igenity Score 'Favorable'	Pfizer Percentile 'Favorable'
Calving ease direct (more unassisted)	10	1%
Calving ease maternal	10	1%
Birth weight (lighter)	1	1%
Weaning weight	10	1%
Yearling weight	10	1%
ADG postweaning	10	1%
Milk (more maternal milk in daughter calves)	10	1%
Carcass marbling	10	1%
Carcass rib (larger)	10	1%
Carcass fat (leaner)	1	1%
Carcass weight (heavier)	10	1%
Dry-matter intake (eat less)	1	1%
RFI (lower feed intake than predicted)	1	1%
Tenderness (more tender)	10	1%
Docility (more docile)	10	1%
Yearling height (more hip ht.)	10	1%
Scrotal (larger size)	10	1%
Mature weight (larger cow wt.)	10	1%
Mature height (more cow ht.)	10	1%
Heifer pregnancy	10	

The Igenity Profile for Angus scores are presented as a 1-to-10 scale. The scores reflect the animal's genetic potential for that particular trait based on the combination of the DNA markers analyzed. The higher scores do not necessarily indicate that it is the most desirable, as illustrated in Table 3.

For the Pfizer HD 50K for Angus percentile rankings, a lower value indicates a more favorable ranking for the trait. Percentile ranking format, ranging from 1% to 100% in integer increments, is similar to that used in EPD percentile rankings. For example, a smaller numeric percentile ranking for Pfizer result in birth weight and carcass fat indicates lighter calves and leaner carcasses as the expectation.

If you are making selection decisions for traits that have an EPD provided by the Association, then the EPDs should be considered the selection tool of choice. The EPD and accuracy account for all sources of information available on the animal of interest (e.g., pedigree, own record, weights/measures, genomic results). Using EPD and genomic scores separately leads to double counting information and will lessen selection efficiency.

Weights and Measures. Genomic results are used as indicator traits in the evaluations to compute EPDs. Genomics do not completely describe the variation in the traits of interest. Breeders sometimes ask if it is no longer necessary to collect weights and measures (e.g., weaning weights, scan data, carcass measures). On the contrary, phenotypic measures collected by Angus breeders continue to be an important part in further development of improved genomic panels and the refinement of this technology over time.

Conclusion

Angus breeders must consider the available genomic options and then make the best choice for their breeding programs to impact traits of interest. Genomic results are a way to enhance the current selection tools, to achieve more accuracy on predictions for younger animals, and to characterize genetics for traits where it's difficult to measure the phenotype.

Through the evolution of these technologies, we plan to keep breeders advised of progress in the development of genomic EPDs. These updates, when available, will be provided on http://www.angus.org. For the most up-to-date list of traits with genomic data contributing to results, go to http://www.angus.org/Nce/WeeklyEvalGenomicData.aspx.