

American Angus Association Genomic Enhanced EPDs

Genomic, or DNA, test results are used to enhance predictability of current selection tools, to achieve more accuracy on EPDs for younger animals, and to characterize genetics for traits that are difficult or expensive to measure, such as feed efficiency, carcass traits in breeding stock or maternal traits in bulls. With the investment in genomic technology, animals who were previously placed into single-animal contemporary groups benefit by receiving GE-EPDs rather than interim-EPD calculations, increasing the value of individual predictions.

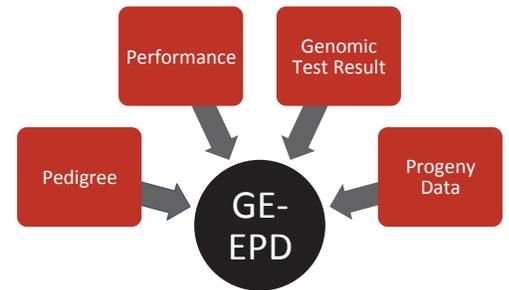


Figure 1. Information contributing to the GE-EPD.

Genomic-enhanced EPDs (GE-EPDs) are important because they utilize genomic test results in addition to pedigree, performance and progeny data for increased reliability of an animal's EPD (Fig. 1). Depending on the trait, GE-EPDs on unproven bulls have the same amount of accuracy as if they had already sired 7-24 calves. If genomic results are received by Tuesday on any given week, EPD changes will be seen in Friday's weekly genetic evaluation. If results are received after Tuesday, genomic results are incorporated into the following week's genetic evaluation.

Genomic impact on the EPD

In the American Angus Association genetic evaluation, the genomic results are incorporated into the EPDs as a correlated trait. Through AGI research and development, a genetic relationship is calculated between the values obtained from the genomic test results and the phenotypic data at the Association. Typically, two measures are used to report the relationship of a genomic test and phenotype: the genetic correlation (Table 1) and the percent of additive genetic variance accounted for by the test. These two measures are related; if one is known, the other can be calculated. The genetic correlation is the square root of the percent additive genetic variance; 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 for that particular trait. The more genetic variance a test explains, the more impact it will have on the EPD and accuracies for that trait.

Table 1. Genetic correlation between genomic and phenotypic data and progeny equivalents (PE).

Trait	Correlation	PE	Trait	Correlation	PE
Calving Ease Direct	0.67	24	Heifer Pregnancy	0.62	22
Birth Weight	0.69	13	Milk	0.37	14
Weaning Weight	0.56	19	Mature Weight	0.74	16
Yearling Weight	0.68	24	Mature Height	0.71	7
Dry Matter Intake	0.73	17	Carcass Weight	0.60	7
Yearling Height	0.75	12	Carcass Marbling	0.65	8
Scrotal Circumference	0.80	16	Carcass Ribeye	0.68	11
Docility	0.68	11	Carcass Fat	0.65	12

Importance of phenotypic performance data

Genomic results are used as indicator traits and do not completely describe the total 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/carcass data, and heifer breeding records). On the contrary, phenotypic measures continue to be an important part in further development of improved genomic panels and the refinement of this technology over time.

Available traits that include genomic results

Breeders and users of Angus genetics are strongly encouraged to use EPDs as the genetic improvement tool of choice, because EPDs account for all the available information on an animal, such as individual measures, progeny data, pedigree and genomic results.

Several considerations regarding genomic results merit special mention. The multi-trait genetic evaluation for mature weight and height includes the genomic prediction for only mature weight, because there is a high correlation between the genomic breeding values for mature weight and height. Likewise, the calving ease evaluation including calving score and birth weight phenotypes incorporates genomic results for calving ease direct only. The residual average daily gain (RADG) values provided in the weekly genetic evaluation include the genomic indicator for dry matter intake (DMI).

Percent ranks provided with genomic results

Percent ranks (1-100) are provided by the American Angus Association to assist in establishing direction of interest for each trait, as illustrated in Table 2. 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 EPDs and accuracies account for all sources of information available on the animal of interest (e.g., pedigree, own record, weights/measures, genomic results). Using EPDs and genomic percentile ranks separately lead to double counting information and will lessen selection efficiency.

Conclusion

Genomic-enhanced EPDs are the best estimate of an animal's genetic value as a parent combining all available sources of information. Genomics permit higher-prediction accuracies for younger animals and characterizes genetics for traits where it's difficult to measure the phenotype. To learn more about available genomic tests and place an order, go to <http://www.angus.org/AGI/default.aspx>.

Table 2. Establishing direction of percent ranks.

Trait	Percentile Rank	Observation
Calving Ease Direct	1%	More unassisted
Calving Ease Maternal	1%	More unassisted
Birth Weight	1%	Lighter
Weaning Weight	1%	Heavier
Yearling Weight	1%	Heavier
Milk	1%	More maternal milk
Yearling Height	1%	More hip height
Mature Weight	1%	Larger cow weight
Mature Height	1%	More cow height
Dry Matter Intake	1%	Eat less
Docility	1%	More docile
Heifer Pregnancy	1%	Increased pregnancy probability
Scrotal	1%	Larger size
Carcass Marbling	1%	Greater
Carcass Ribeye	1%	Larger
Carcass Fat	1%	Leaner
Carcass Weight	1%	Heavier
Tenderness	1%	More tender