By the Numbers

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Genomic-enhanced EPDs

Genomic results are a way to enhance predictability of current selection tools; to achieve more accuracy on expected progeny differences (EPDs) for younger animals; and to characterize genetics for traits for which it is difficult to measure the animal's own performance for the trait, such as carcass traits in breeding stock or maternal traits in bulls. With the investment in genomic technology, this means that in addition to the pedigree, performance and progeny information that are used in the calculation and reporting of Angus EPDs, genomic test results have also been incorporated into the EPD.

Genomic impact on the EPDs

Genomic-enhanced EPDs (GE-EPDs) are important because they make use of the results from the DNA test in addition to all other sources of information to provide added accuracy and reliability to the animal's EPD (see Fig. 1). In fact, depending on the trait, GE-EPDs on unproven animals have the same amount of accuracy as if they had already sired eight to 20 calves.

In the American Angus Association genetic evaluations, the genomic results are incorporated into the EPDs as a correlated trait. Through Angus Genetics Inc. (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, there are two measures used to report the relationship of a genomic test and phenotype — the genetic correlation and 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 0.60, then the genomic result explains 36% of the additive genetic variance for that particular trait. Simply stated, the more genetic variance a test explains, the more impact it will have on the EPDs and accuracies for that trait.

Across all traits, the genetic correlations that have been estimated between the high-density genomic tests purchased through AGI and the American Angus Association's phenotypic database effectively ranged from 0.60 to 0.70, except for milk, which falls just below 0.40. Also, for calving ease direct, the correlation for the GeneSeek® Genomic Profiler (GGP-HD) is 0.34.

Fig. 1: Information contributing to genomic-enhanced expected progeny differences (GE-EPDs)

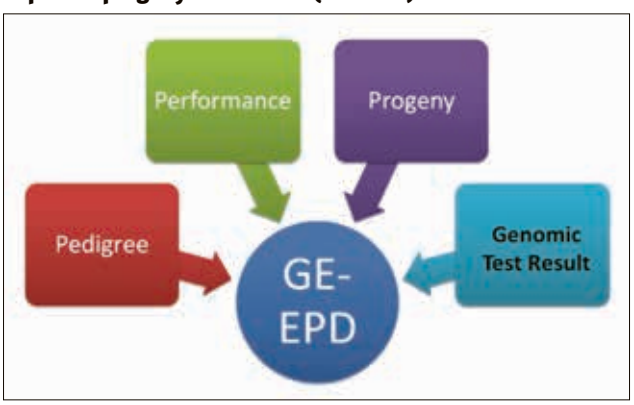


Table 1: Establishing direction of percent ranks

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

Traits including genomic results

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. Use the EPDs to make the most informed selection decisions among animals.

Several considerations regarding genomic results merit special mention. The majority of the EPDs have genomic test results included. An exception would be the heifer pregnancy (HP) EPDs, which do not include genomic indicators. Future research may lead to a genomic-enhanced HP EPD and potentially to a GE-EPD for tenderness, although these selection tools are not available at this time. Also, mature height and calving ease maternal genomic results are not part of the genetic evaluation procedures based on their high correlation to mature weight and calving ease direct, respectively.

Finally, residual feed intake (RFI) genomic test results are not part of any EPD calculations; however, the residual average daily gain (RADG) values provided in the weekly genetic evaluation include the genomic indicator for dry-matter intake (DMI).

Phenotypic data

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 (weaning weights, scan data and carcass measures, for example). 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, not to mention an important component in EPD calculation.

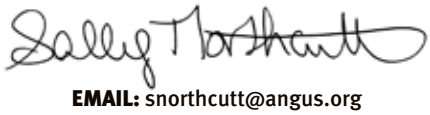
Percent ranks

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 1. 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 (pedigree, own record, weights/measures, genomic results). Using EPDs and genomic percent ranks separately leads to double counting information and will lessen selection efficiency.

For the percent ranks, a lower value indicates a more favorable ranking for the trait. Percent ranking format, ranging from 1% to 100% in integer increments, is similar to that used in EPD percent rankings. For example, a smaller numeric percent ranking for birth weight and carcass fat indicates an expectation of lighter calves and leaner carcasses.

Conclusion

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 for which it is difficult to measure the phenotype. To learn more about available genomic tests and place an order, go to *www.angus.org/AGI/default.aspx*.



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