American Angus Association Genomic Enhanced EPDs

Genomic, or DNA, test results are used 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 are previously placed into single animal contemporary groups benefit by receiving GE-EPD rather than interim-EPD calculations increasing the value of individual predictions.

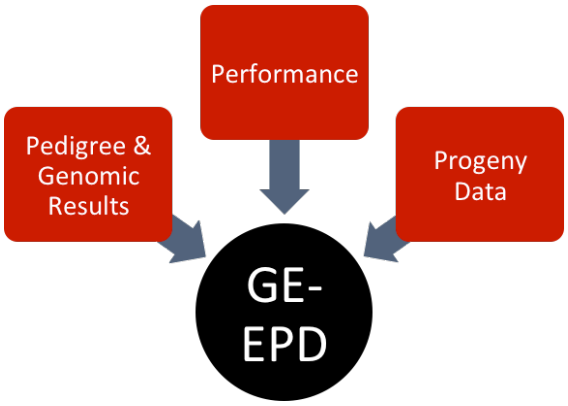

Figure 1. Information contributing to the GE-EPD.

Genomic-enhanced EPD (GE-EPD) 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-EPD on unproven bulls have the same amount of accuracy as if they had already sired 10-36 calves. If genomic results are received by Friday on any given week, EPD changes will be seen the following Friday's weekly genetic evaluation.

Table 1. Progeny equivalents (PE) – Carcass trait PE equate to actual carcass harvest data not ultrasound scan equivalents.

Trait	PE	Trait	PE
Calving Ease Direct	26	Heifer Pregnancy	17
Birth Weight	23	Calving Ease Maternal	20
Weaning Weight	27	Milk	36
Yearling Weight	23	Mature Weight	15
Dry Matter Intake	12	Mature Height	9
Yearling Height	17	Carcass Weight	15
Scrotal Circumference	15	Carcass Marbling	11
Docility	12	Carcass Ribeye	17
Claw Angle	10	Carcass Fat	14
Foot Angle	10		

Genomic impact on the EPD

In the American Angus Association weekly genetic evaluation, the genomic results are incorporated into the evaluation using a single step method to calculate EPDs. Incorporating genomic results in this way helps to better define the genetic relationship among animals. With the traditional pedigree based approach (EPDs predictions without genomics), the relationships between animals is determined by pedigree alone. Pedigree would dictate all full-sibs, for example, would have a genetic relationship to one another of 0.5, and the relationship between grand-parent and grand-progeny would be 0.25. Because of the way DNA is inherited (passed down), differences in these relationships are present. The animal's genotype will allow us to determine, for example, which flush-mates, or siblings, are more genetically related. In fact, genomic testing allows all pedigree relationships be better defined.

These relationships are quantified using SNP data (genomic results) known as an animal's genomic relationship. For example, if a newly tested animals shows to have a strong genomic relationship to an animal who is proven to excel for a trait like Marbling, than the newly-tested animal will increase for Marbling EPD. On the contrary, if an animal it found to be more related to a low performing animals in the pedigree its EPDs will adjust accordingly.

Animals more closely related to ancestors with large amounts of actual performance data (weaning, weights, yearling weight, carcass data, etc.) and genomic results recorded will experience a greater benefit from genomic testing than those with less data recorded in the Association's database.

Importance of phenotypic performance data

Genomic testing is one more tool for breeders to use to more accurately predict the future performance of animals as parents in the population, but this is not a replacement to performance data recording. 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.

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 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 percentile ranks separately leads to double counting information and will lessen selection efficiency. With that, the EPD provides the most accurate and up-to-date information as it is updated every week; whereas, genomic percent ranks only update once a year and are a by-product of the system.

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

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.