AMERICAN ANGUS ASSOCIATION®: GENOMIC ENHANCED - EPDs (GE-EPDs)

Genomic tests, or DNA results, are used to enhance the predictability of current selection tools to achieve more accuracy on EPDs for younger animals and characterize traits difficult or expensive to measure, such as feed efficiency, carcass traits or maternal traits.

GE-EPDs uniquely use 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 8-35 calves. If genomic results are received by Friday on any given week, EPD changes will be seen in the following Friday's weekly genetic evaluation.

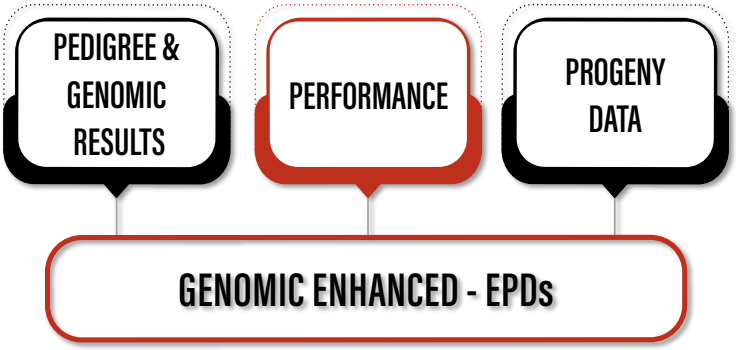

Figure 1. Information contributing to the GE-EPD.

GENOMIC IMPACT ON THE EPD

In the American Angus Association's weekly genetic evaluation, the genomic results are incorporated using a single-step method to calculate EPDs. Incorporating genomic results helps to better define the genetic relationship among animals. With the traditional pedigree based approach of EPD predictions without genomics, relationships between animals are determined by pedigree alone. For example, pedigrees would dictate all full-sibs 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, differences in these relationships are present. The animal's genotype allows us to determine which flush-mates or siblings are more genetically related. In fact, genomic testing allows all pedigree relationships to be better defined.

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	25	Pulmonary Arterial Pressure	17
Calving Ease Maternal	19	Hair Shed Score	8
Birth Weight	23	Heifer Pregnancy	17
Weaning Weight	27	Maternal Milk	35
Yearling Weight	22	Mature Weight	14
Yearling Height	15	Mature Height	9
Dry Matter Intake	11	Carcass Weight**	14
Scrotal Circumfrence	13	Marbling Score**	10
Docility	11	Ribeye Area**	16
Foot Claw Set	13	Backfat Thickness**	13
Foot Angle	13		

These relationships are quantified using SNP data (genomic results) known as an animal's genomic relationship. For example, if a newly tested animal shows to have a strong genomic relationship to an animal who is proven to excel for a trait like marbling, then the newly-tested animal's marbling EPD will increase. On the contrary, if an animal is found to be more related to a low performing animal 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 will experience a greater benefit from genomic testing, including greater EPD accuracy and spread, than those with less data in the Association's database.

IMPORTANCE OF PHENOTYPIC PERFORMANCE DATA

Genomic testing is an additional 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, such as weaning weights, scan/carcass data, and heifer breeding records. On the contrary, phenotypic measures continue to be an important part in further developing improved genomic panels and refining 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 percent ranks separately leads to double counting information and will decrease 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.

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 characterize genetics for traits where it's difficult to measure the phenotype. To learn more about available genomic tests and place an order, go to *www.angus.org/AGI*

Table 2. Establishing direction of percent ranks.

TRAIT	PE	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
Foot Claw Set	1%	Less Toe Curl, More Symmetrical Toes
Foot Angle	1%	Less Extreme Angle and Toe Length/ More Ideal Angle (45°) and Toe Length
Pulmonary Arterial Pressure	1%	Lower PAP Score
Hair Shed	1%	Earlier Summer Shedding
Heifer Pregnancy	1%	Increased Pregnancy Probability
Scrotal Circumference	1%	Larger Size
Carcass Marbling	1%	Greater
Carcass Ribeye	1%	Larger
Carcass Fat	1%	Leaner
Carcass Weight	1%	Heavier
Tenderness	1%	More Tender