

By the Numbers

Pulling it all together: Genomic-enhanced EPDs

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Work is under way at the Association to provide enhanced selection tools to Angus breeders. With the arrival of Igenity® genomic profiles to the headquarters office, a new generation of expected progeny differences (EPDs) is at our door.

Original vision

This past summer, the Beef Improvement Federation (BIF) annual convention centered on the power of genomics in improving future selection tools. In-depth proceedings and presentation coverage by Angus Productions Inc. (API) is available at www.bifconference.com and was highlighted in the August 2009 *Angus Journal*.

Since those discussions have passed, Angus Genetics Inc. (AGI) and Merial have announced the result of nearly two years of research collaboration — an Igenity genomic profile specific to Angus cattle. The American Angus Association through AGI has a vision to provide Angus breeders with the most advanced solutions to their genetic selection and management needs.

Genomic-enhanced EPDs can now be calculated on your animals using the highly predictable American Angus Association database along with the Igenity Angus Profile results to provide a more thorough characterization of economically important

traits and improve accuracy on young animals.

Fig. 1 illustrates how samples, animal identification (ID) and genomic results move through channels to ultimately enter the Angus National Cattle Evaluation (NCE). Only Igenity profiles received through this data flow process will be incorporated into genomic-enhanced EPDs.

Genomic-enhanced EPDs for all

The new-age genomic profiles go far beyond the first DNA marker tests that were introduced in years past, which only included a handful of markers. The modern genomic profiles result from a panel of DNA markers. You may have heard them referred to by the common terminology — a panel of “snips” (SNPs, single-nucleotide polymorphisms). Each SNP alone doesn't tell you much, but a panel of critically selected SNPs for multiple traits provides molecular breeding values that can be used in the calculation of EPDs. Already, the EPD calculations use multiple sources of information. The genomic values become an additional piece of information.

Fig. 2 illustrates that animals receive an EPD from being included in the evaluation with varying amounts of information. In the classic example, an animal may have a weight and a pedigree, but no progeny. It

still receives an EPD from the NCE. With the introduction of genomic results into the NCE model for a trait, the molecular breeding value from the Igenity profile enters as an informative piece of data on an animal, which allows the calf to receive an EPD from the analysis even though no phenotypic measure has been submitted yet.

This also illustrates that Igenity profiles can be captured and implemented into selection tools from any age animal. Breeders can use the electronic calving book found in AAA Login to expedite the process of preparing their animals' genomic profiles to enter NCE.

Fig. 3 outlines the combinations of information that will result in an EPD. Granted, the extensive pedigree of parents of animals in these cases also are part of the NCE and receive EPDs, in addition to animals with performance phenotypes and Igenity profiles.

Trait listing

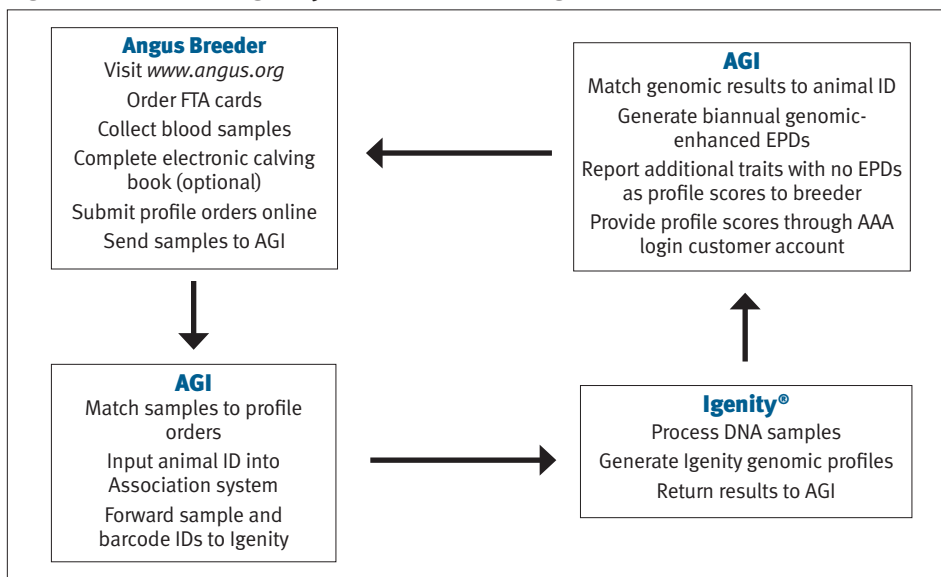
The following traits are expected to arrive in the Igenity profile results beginning with September 2009 receipt of samples. Keep in mind that the profile results take about three to four weeks to go through the process of samples arriving at AGI, and results appearing on the breeder's AAA Login account.

- Heifer Pregnancy Rate
- Docility
- Stayability
- Maternal Calving Ease
- Marbling Score
- Ribeye Area
- Fat Thickness
- Carcass Weight
- Tenderness
- Percent Choice (Quality Grade)
- Yield Grade
- Average Daily Gain (ADG)
- Yearling Weight
- Feed Efficiency

Additional tests can be added for each animal just by using the DNA sample submission process in AAA Login. These add-on components may include coat color,

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Fig. 1: Breeder-AGI-Igenity information exchange



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bovine viral diarrhea persistent infection (BVD PI), arthrogryposis multiplex (AM) and neuropathic hydrocephalus (NH).

How does this technology affect you and your EPDs?

Genomic profiles are a way to enhance our current selection tools to achieve more accuracy on predictions for younger animals and to characterize genetics for traits where it's extremely difficult to measure the phenotype. Some of the traits from the profile results do not even have EPDs in production as of yet for Angus breeders.

If the enhanced model for incorporating the Igenity profile result for a trait has not been developed, then an Igenity profile score will be provided back to the breeder. An example of this would be in the case of feed efficiency, where an American Angus Association EPD is not yet available. In the future, when the EPDs are available with genomic-enhanced results, then the Igenity profile score will be replaced by an EPD.

Plans to release the first genomic-enhanced EPDs are focused on carcass traits from the Association's Spring 2010 NCE. Igenity profiles received to the Association's

database by breeder cutoff in November 2009 will be included in the carcass EPD release the following month.

The current methodology is not structured to include scores from multiple companies. This initial project is the result of some four years of development and two years of collaboration with Igenity to incorporate the DNA information into our genetic evaluation system. At this time, we do not have a research project under way with the genomic values from additional companies. Research is needed to develop the genetic parameters and relationships among genomic panel results and the economically relevant traits to expand the cattle evaluation models powering the EPDs.

Choosing the Igenity profile is up to the Angus breeder. Only through the pathway described in Fig. 1 will breeders have access to the Angus-specific Igenity profile and those results entering the Angus EPDs. If breeders are already using a different genomic provider, then they can continue with their existing breeding plan and the use of current technologies they have in place. We encourage breeders to select genomic service providers that they find are the best fit for their program.

Through the evolution of these technologies, we plan to keep breeders advised of progress we make in incorporating genomic profiles into the EPDs. These updates will be provided on www.angus.org as they become available.

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Fig. 2: Types of information from which EPDs can be calculated

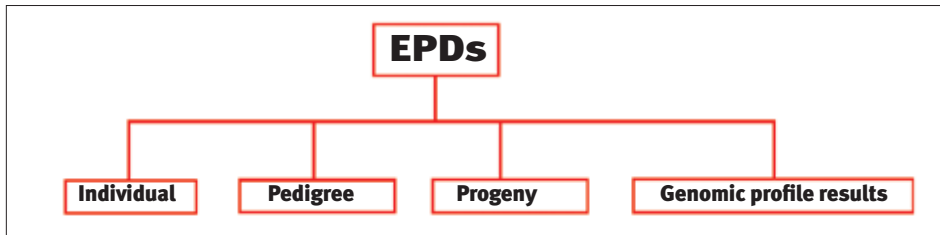


Fig. 3: EPDs generated from genomic-enhanced NCE

Igenity genomic profile	Phenotypes	
	No	Yes
No	—	EPD
Yes	EPD	EPD

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