

American-International Charolais Association

Genomic Enhanced EPD

Genetic evaluations are a way to enhance selection and characterize genetics for animals for those traits that impact the profitability of beef production. Improvements in genomic technology have now made it possible to further enhance predictability of our current selection tools with the incorporation of genomic values into our genetic evaluations and thereby improving accuracy of EPD, particularly for younger animals. Genomic technology now along with pedigree, performance and progeny information can be used in the calculation and reporting of EPD.

In the AICA genetic evaluations, the genomic results are incorporated into the EPDs as a correlated trait. Through coordinated research and development between Iowa State University, AGI and AICA, a genetic correlation was calculated between the values obtained from the genomic test results and the phenotypic data at the Association. The stronger the genetic correlation the more the genomic value will impact the EPD and accuracy for a trait.

Trait	Correlation
Calving Ease Direct	-0.39
Birth Weight	0.30
Weaning Weight	0.15
Yearling Weight	0.22
Maternal Milk	0.26
Ribeye Area	0.29
Marbling	0.12
Scrotal Circumference	0.29

Through these research efforts genomic predictions for eight traits were identified to incorporate into the Charolais National Cattle Evaluation; Calving Ease Direct, Birth Weight, Weaning Weight, Yearling Weight, Maternal Milk, Ribeye Area, Marbling and Scrotal Circumference.

In regards to selection based on genomic enhanced EPD, use has not changed as the EPD remains the industry standard. But with the addition of genomic enhanced EPD selection now has the added benefit of increased accuracy of selection for those younger or non-progeny proven animals that have a genomic enhanced EPD.

FAQs

? **Does DNA testing replace collecting actual phenotypic data – birth weight, weaning weight, yearling weight, carcass and ultrasound?**

No. Genomic results are an indicator trait and do not completely describe the genetic variation in traits of interest. Therefore, collection of phenotypic data continues to be the most important information breeders collect to identify high accuracy sires. Additionally, as AICA works to further improve genetic selection tools overtime as our DNA database expands phenotypic data is an important part of the refinement and development of genomic panels.

? **What animals should be tested?**

Genomic tools have the greatest impact for those

animals with lower accuracy, mostly young non-parent animals or those animals with few progeny records as part of the Charolais National Cattle Evaluation. Certainly, as more genotypes are recorded with AICA for animals that also have performance and/or progeny data recorded the more accuracy AICA can expect in the further development of genomic panels in the future.

? **Should I DNA test my herd bulls or my donor dam?** Matt Spangler, University of Nebraska Beef Cattle Extension Specialist

Yes. In the case where these animals are low accuracy, genomic information will help increase accuracy and provide more insight into the animal's true genetic potential as a parent. If they are moderate to high accuracy already, genomic information will not change their EPD substantially if at all. However, these animals are critical to the continued building of the training set to refine and improve the Charolais genomic predictions.

? **Should I DNA test my commercial bulls and will it add value for commercial bull buyers?** Matt Spangler, Associate Professor, University of Nebraska Beef Genetics Extension Specialist

It can be used to help decide which bulls should be marketed, as an early sorting stick if you will. It will add value for your commercial bull buyers. Not only will it correct potential pedigree errors (parentage testing), but it will also increase the accuracy of their EPDs. The willingness of commercial bull buyers to pay more for tested bulls will likely depend on their understanding of accuracy or possible change. This technology is a means of mitigating risk by increasing the confidence of the EPD of young sires. Essentially they can buy bulls that have similar accuracies to those that have already sired calves. This added confidence should command a premium but will undoubtedly take education. Any marketing advantage will likely favor early technology adopters.

? **If I do a DNA test on my animals will there be any changes to their EPD?**

As the accuracy of the EPD for an animal increases adding genomic information has less impact on the EPD. Higher accuracy animals are already well characterized through progeny records and the genomic information may have no impact on the EPD or accuracy. However, for lower accuracy animals the genomic test should improve accuracy. As before, with increases in accuracy, some



These logos represent animals with Genomic Enhanced EPD. Those with performance are represented by the Plus logo. Visit the AICA website for additional information.

animals EPD will go up, some will go down and some will change very little. Additionally, as performance data is submitted for these animals or progeny records collected, changes to EPD values and accuracy will be further impacted with the additional information. Genomic information is simply another part of the puzzle to characterize the genetics of an animal.

? Will genomic enhanced EPD on parent animals affect progeny pedigree estimates?

AICA computes pedigree estimated (PE) EPD for those animals whose sire has an accuracy value published and also whose dam and/or maternal grandsire likewise has an accuracy value published along with their EPD. AICA does not compute PE EPD for those animals where one of the above does not have an EPD or has a PE EPD published.

This rule is unchanged for genomic enhanced EPD in consideration of pedigree estimates. PE EPD remain a simply calculation of ½ of the EPD for the sire and ½ of the EPD for the dam.

? In the future will genomic predictions be available for other traits?

Yes. Genomic information will expand in the future for more complex traits and those traits more difficult and costly to collect phenotypic data for. These may include traits such as disease susceptibility, feed efficiency, reproduction and adaptation. This requires phenotypic databases to develop and validate these genomic tests. AICA works closely with research organizations in various projects in this regard. The National Program for Genetic Improvement of Feed Efficiency in Beef Cattle is one such program. This project and others are ongoing, including work at the ARS Meat Animal Research Center, with the anticipation that results will allow for more traits to be added to the list of published genomic enhanced EPD in the future.

These research efforts also lead to additional genotypes which have and can be further incorporated into the Charolais National Cattle Evaluation as the pipelines to coordinate genotypes and phenotypes between researchers, service providers and associations are refined.

? As the AICA DNA database expands, will lower density, less expensive testing be used? Jared Decker, Assistant Professor, University of Missouri Beef Genetics Extension Specialist

Yes, as the DNA database grows additional genotyping options will become available. Once a sufficiently large reference population exists we can infer a large number of genotypes (i.e. the 50K SNPs) from a smaller set of genotypes (i.e. genotypes from a 10,000 SNP test) using pedigree or population information. We can predict the genotypes at the 50K locations based on a subset of these SNPs. The fancy word for this process is called imputation. But, the DNA database needs to grow first so that genomic predictions can become more accurate and sufficient data is available for reliable imputation.

? What is the merit of the 78K test versus the 50K test?

Jared Decker, University of Missouri Beef Cattle Extension Specialist

Charolais breeders should be assured that the two tests provide very similar information. The 50K test was

designed in 2007 to place 54,000 SNPs evenly across the cattle chromosomes. In 2010, a test with 777,000 SNPs was designed (referred to as the 777K chip). Later, GeneSeek designed the GGP-HD test that examines 78,000 SNPs that were selected from the 777K test to work well in United States beef breeds. The GeneSeek GGP-HD test for 78K SNPs also contains proprietary SNPs, so that traits like Horned/Poll, coat color, and genetic defects can be tested simultaneously as the data for genomic-enhanced EPDs is being produced. Once sufficient data is available, data from the 50K test and the 78K test can be combined through the process of imputation.

? I have utilized labs or other tests in the past for DNA testing. Are these useable for Charolais Genomic Enhanced EPDs?

Depending on the type of test that was requested, many of the tests are trait specific marker tests which are run on much smaller SNP panels and therefore are not usable. What AICA needs at this time is the 50K genotype.

? What is the cost to do a 50K DNA test? Does this include parentage verification?

\$85 50K DNA Test (includes parentage)

\$45 Horned/Polled (stand-alone test)

? How do I obtain a DNA test kit? In what format do I receive a kit?

DNA test kits must be requested through AICA. AICA can either mail or email the test kit to the producer.

We will need either the registration number or performance number for the animal a request is being made for. For those animals not in the AICA database we will need the ID, sex, date of birth and the registration numbers for all possible parents.

What type of sample is required for a DNA test?

Several different types of samples will work effectively including hair follicles, blood card, semen and tissue notches (ear notch). The tissue notches are the least reliable.

Hair sample collection instructions: Inspect the hair to make sure it is dry and free of any debris. Animals over 90 days of age require 40-50 hair roots while animals under 90 days of age require 60-70 hair roots. Follicles must be present for DNA testing. Pull, do not cut hair from the tail switch and tape the center of the hair shafts to the submission form.

Semen sample shipping instructions: Inspect the semen straw to make sure the registration number is clear and readable. Package one thawed semen straw in protective wrapping to avoid breakage during shipment in a padded envelope or small box. Semen sample must be sent overnight to arrive on a business day.

Blood cards are available by contacting the AICA office.

Allflex TSU tissue sample tags are available through GeneSeek.

? How much time should I allow when DNA testing?

Approximately one month after sample arrives at lab.