The Future is Here!

ASA's New DNA Test For EPD Enhancement

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Approximately a year and a half ago we ran an article in *SimTalk* to update readers about the state of genomic use in our industry. The article closed with the following paragraph: "Unless you have Angus cattle that are evaluated in the American Angus Association's genetic evaluation, currently available DNA tests are of little to no value to you for EPD enhancement; however, don't be dismayed if you don't fit this description. The recent evolution in genomic technology has spurred organizations to take the steps necessary to harvest its value. For example, ASA is presently working on the development of DNA tests specific to our population, as well as the capacity to incorporate test results into ASA's genetic evaluation."

In April of this year, we announced that the future had arrived at ASA. We are now offering a DNA test that, when incorporated into our genetic evaluation, can add significant enhancement to lower accuracy EPDs. The result of a multi-year collaborative effort, test development was fueled by ASA members and staff, carcass merit cooperators, USDA, University of Illinois, University of Missouri, Montana State University, GeneSeek and the National Beef Cattle Evaluation Consortium.

Test development was initiated several years ago through requests for donated semen on high-accuracy sires. ASA members stepped up to the plate and delivered, with hundreds of DNA samples being collected via donation. Besides older sires, virtually all of the current 500 most heavily used sires were sourced. Samples were also collected on the sires and their offspring fed at the University of Illinois. In total, over 2,700 samples were genotyped.

The genotypes, along with the equivalent of millions of phenotypes (data submitted by breeders and the Carcass Merit Program over the years) were amassed and analyzed by University of Iowa researchers. The analysis resulted in the parameters required for genetic evaluation.

The multi-tiered effort culminated in a very successful outcome. The standard measure of a DNA test used in EPD prediction is the correlation between test results and the traits of interest. Table 1 displays correlations for ASA's test when used on ASA's population. To provide prospective, correlations for Pfizer and Igenity's tests gleaned from the American Angus Association's website are included in the table.

Table 1. Correlations between DNA test results and trait

Trait	Igenity[a]	Pfizer[a]	ASA[b]
CE	0.47	0.33	0.45
BW	0.57	0.51	0.65
WW	0.45	0.52	0.52
YW	0.34	0.64	0.45
Mlk	0.24	0.32	0.34
MCE	NA	NA	0.32
Stay	NA	NA	0.58
CW	0.54	0.48	0.59
Mrb	0.65	0.57	0.63
REA	0.58	0.60	0.59
BF	0.50	0.56	0.29
SF	NA	NA	0.53

[a] When used on the American Angus Association's population
[b] When used on American Simmental/SimAngus™ population

As you can see, correlations for ASA's test are stronger for some traits and weaker for others compared to the commercially available Angus tests. All in all, however, ASA's test sizes up well. The relevance to genetic evaluation is that the stronger the correlation the more information the test adds — and, therefore, the greater the increase in EPD accuracy and potential EPD movement.

The usefulness of ASA's DNA test will be greatest on traits having a strong correlation with the test (e.g., birth weight, marbling, etc.). It will also add more value to animals with lower base (i.e., starting) accuracy values. Table 2 provides examples of this.

Table 2. Average impact of ASA's DNA test on Acc. at base Accuracy of .00, .20, .40 and .60*

Trait	Base Acc.	New Acc.	Base Acc.	New Acc.	Base Acc.	New Acc.	Base Acc.	New Acc.
BW	0.00	0.24	0.20	0.34	0.40	0.47	0.60	0.62
YW	0.00	0.11	0.20	0.26	0.40	0.43	0.60	0.61
BF	0.00	0.04	0.20	0.22	0.40	0.41	0.60	0.60

*BIF accuracy gain for any base accuracy can be obtained with ASA's DNA-Enhanced Accuracy Tool @: http://www.simmental.org/site/index.php/herdbookhome

As can be seen from Table 2, since the test has the strongest correlation with BW (see Table 1), the increase in BW accuracy is greatest at all base levels; however, as the base level for BW increases, the smaller the increase in accuracy. For the trait with the weakest correlation, BF, the increase in accuracy is miniscule, even at low base levels. As we would expect, since the YW correlation is intermediate to that of BW and BF the increase in accuracy is intermediate as well. One take-home message from Table 2 is that, though the test is relatively powerful, it is minimally effective for some traits and only has utility on animals with low to mid accuracy EPDs.

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Results from ASA's DNA test will be incorporated into our multi-breed genetic evaluation system in a new, more precise method than the current industry standard — culminating in more informative EPDs. Under the standard approach, each animal's DNA test results are assumed to add an identical amount of information to genetic evaluation. Though this approach lends itself to ease of incorporation, it glosses over the fact that there can be large difference between animals in the actual amount of information harvested from their DNA tests.

Because the amount of information added by a DNA test varies by animal, assuming that it does not vary (i.e., the standard approach) will over or underweight the information depending on the animal. Since ASA's system will individually assess the amount of information added by each animal's DNA test, the resulting EPDs will be more accurate.

The difference in the information contributed to an animal's EPDs by a DNA test is largely due to how well connected the animal being tested is to the population of animals used to develop the test. For example, the information gleaned from a test on an animal with several close relatives in the development population will tend to be greater than that gained from testing an animal with few or no close relatives.

The animals represented in the development population for ASA's DNA test were primarily Simmental and SimAngus™. Because of this, ASA's test works most effectively on those groups. Table 3 illustrates this fact.

As can be seen from Table 3, ASA's test is not as effective for Simbrah, on the average, as it is for Simmental and SimAngus. Keep in mind that some Simbrah animals will achieve levels of accuracy above that of some Simmental and SimAngus animals — but because Simbrah were sparsely represented in the development population compared to the other groups, Simbrah will not be evaluated as accurately on the average.

The 50K genotyping required for the test is being performed by GeneSeek. Upon completion of genotyping, results will be interpreted and incorporated immediately into an animal's EPD profile. The test is currently priced at $90. As a bonus, the test also generates the DNA profile required for parental validation — a $45 cost if performed separately. Contact Leoma Wells at ASA for more information on how to participate in ASA's revolutionary genetic enhancement program. ◆

Table 3. Average Acc. increase of ASA's DNA test at base Acc. of .00 by group.

Group	CE	BW	WW	YW	MCE	Mlk	Sty	Mrb	BF	REA	SF
Simmental	0.09	0.22	0.13	0.09	0.04	0.04	0.19	0.19	0.03	0.14	0.22
SimAngus™	0.10	0.26	0.18	0.12	0.04	0.05	0.20	0.20	0.04	0.18	0.15
Simbrah	0.06	0.18	0.11	0.06	0.01	0.01	0.17	0.15	0.01	0.06	0.01

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