One Genetic Test at a Time

By Jay W. Johnson, Texas Tech University Assistant Professor Beef Cattle

Remember when someone asked you, "tested your bull yet", it meant for fertility and breeding soundness? Today, it seems that question means for a multitude of genetic tests. And how, as producers, do we even know which test someone is talking about? There is a marbling test, two tests for tenderness, a couple for matching parents, a test for the leptin genotype, and numerous other DNA tests are coming.

Yet, it appears the age of genetic advancement is upon all cattle producers. Just as crossbreeding systems with Continental bulls on British females arrived in the 1960s and is still with us today, the use of genetic tests is here to stay. The number of tests will continue to grow. However, for now, producers need to understand the tests that are available, who provides the tests, what the results mean, and where to go for complete information.

The companies that perform these genetic tests share some similarities. Hair samples are the preferred method of collection for DNA samples, but blood and semen can be used. All offer discount pricing for volume sample sizes. All offer valid reasons for utilizing their tests.

Frontier Beef Systems

Frontier Beef Systems operates out of Lafayette, Colo. The company offers several DNA test services including *Tender*Gene, *Double*Black™, and *Parent*Match. Test kits may be requested for any of these DNA tests by visiting www.frontierbeefsystems.com.

*Tender*Gene's foundation is the calpain gene marker developed by the Meat Animal Research Center (MARC) in Clay Center, Neb. Geneticists identified two SNPs (Single Nucleotide Polymorphisms) for calpain. Calpain is a naturally occurring enzyme that plays a major role in beef tenderness by weakening muscle fibers, hence increasing tenderization at some stage in the post-mortem process. The *Tender*Gene test cost $35 per sample and volume discounts are available.

*Double*Black™ is a coat color test to ascertain if an animal is homozygous black. The cost of this test is $38 per animal and volume discounts are available. This test "looks" for three possible alleles (genes): black, red, and a wild type. A homozygous black animal carries two copies of the black gene, while a heterozygous black animal will only carry one copy of the black gene.

*Parent*Match is used in numerous settings for parentage identification. Commercial producers can use this test to identify the sires of their top and bottom producers for different traits. Seedstock producers can use this test to determine sires of calves in multi-sire pastures for breed registration. The cost of the test starts at $20 per sample for the "likely sire" (or dam) test. Volume discounts are available that include sample storage.

Bovigen Solutions

Bovigen Solutions is the exclusive licensee to the Americas for Genetic Solutions' DNA marker technology. Genetic Solutions is an Australian-based company. This technology includes SureTRAK®, GeneSTAR®, and SireTRACE™ DNA genetic tests. Bovigen Solutions is based out of Lafayette, Colo., and more information may be found at www.bovigensolutions.com. Test kits may be ordered from this site. GeneSTAR® tests start at $60 per sample for either marbling or tenderness or $95 if both tests are run on the same sample. Volume discounts can reduce the costs to $45 and $75, respectively. The SireTRACE™ test is $25 alone or $20 if run in conjunction with another test.

The GeneSTAR® test is broken into two tests: marbling and tenderness. The GeneSTAR® Marbling test identifies the presence of thyroglobulin, associated with marbling. Thyroglobulin is involved in metabolism and the creation of intramuscular fat (marbling). The

test is reported as a 0-STAR, 1-STAR or a 2-STAR, indicating the number of favorable copies of the allele. The more stars the better.

GeneSTAR® Tenderness 2 is a multi-marker, single trait DNA test that combines the results of two separate and independent markers for the same trait. The test is based upon the presence of two genes involved in the post-mortem tenderization process: calpastatin and calpain. The test is reported as a 0-STAR, 1-STAR, 2-STAR, 3 STAR, or 4-STAR, indicating the number of favorable alleles present from the markers independently.

A GeneSTAR® Black test is also available. This test determines if an animal is homozygous or heterozygous black for coat color.

SireTRACE™ is used for assigning sires to progeny in multi-sire pastures and determining parentage of individual animals if concern or uncertainty exists over the sire or dam of an individual animal. The test works by excluding all other sires until the most probable sire is identified. It matches DNA from the animal in question to the most likely sire. If sires are closely related and their DNA "fingerprints" similar, the test may not progress to a point where only one sire cannot be excluded.

SureTRAK® uses DNA analysis to trace animals and meat through the production system. Similar to SireTRACE™ in using an animal's unique DNA code, SureTRAK® provides traceability from the producer to the consumer. An individual animal's DNA must be on record in order to accurately match a carcass, a primal cut, or a meat product back to the animal in question.

Merial & IGENITY™ L Test

This test is different from the others discussed above. The IGENITY™ L Test identifies an animal's leptin genotype. Leptin has been associated with the regulation of feed intake, energy balance, milk production, marbling scores, fertility, and immune function in cattle. The IGENITY™ L Test recommends using hair follicles for collection of the DNA samples. The test cost is $60, but ordering over the Internet and volume can generate discounts. More information may be found at www.igenity.com.

There are three known genotypes for leptin: L-tt™, L-ct™, or L-cc™. The genotype can play a significant role in the performance of animals. Milk production is higher in dairy cattle for cows identified with the L-tt genotype *(Van Kessel et al.)* and feedlot cattle with the L-tt genotype can be up to five times more likely to grade Choice than L-cc cattle (Quantum Genetics, Inc.). The leptin protein aids in regulating appetite and energy utilization in cattle. The type of leptin protein an animal produces directly influences its appetite and the storage of energy as intramuscular fat.

All tests, regardless of the company, give the producer the ability to know the genetic potential of the animal in question for the traits tested. Knowing the genetic potential of the animal positions the producer with the opportunity to rapidly affect genetic change. Genetic change, if applied appropriately, may move a registered cattle operation forward for certain traits.