Idiopathic Epilepsy Update

*by **Craig Huffhines,** executive vice president*

In the July 2007 *Hereford World*, the American Hereford Association (AHA) Board announced the discovery and determination of the genetic defect called idiopathic epilepsy (IE). For the past few years, Jon Beever, geneticist from the University of Illinois, has been studying the patterns of inheritance that led toward the actual proclamation that the condition was genetically linked. And as recently as January of this year, Beever positively isolated the actual recessive gene that causes the condition.

With this confirmed validation, producers can now test suspect sires, dams and progeny for the causative gene. Beever's findings opened a new frontier for managing deleterious traits in the Hereford breed. The test has in recent months substantially reduced the fear of defect propagation and given the breed great confidence in a new and precise scientifically based solution to genetic abnormality identity.

The IE gene proved to be a recessive gene, which requires an infected individual to inherit the same recessive gene variant — variants of the same gene are called alleles — from both parents in order for the individual to show the trait (see July *Hereford World* Page 70).

There are countless genetic recessive genes within the beef cattle population; most have no or at least undetermined significance to production. Every so often a recessive gene surfaces that causes economic, or worse lethal, harm to cattle. These recessive genes can remain in a population for decades or may mutate overnight. Many times they run through pedigrees undetected until breeders at some point indirectly select for them. Or perhaps a high profile sire line or cow family evolves that, unbeknownst to the industry, carries the gene. As the frequency of the pedigree use grows, fate will determine when the trait raises its ugly head. These deleterious recessives are likely somewhere in every breed population and, for that matter, in every species population.

Determining the risk of an animal being a carrier of a recessive gene becomes a very simple math problem once you can positively identify the carrier status of the animal either through a diagnostic genetic test or through controlled mating that determines if the animal has produced infected progeny. The Punnett Square model is a very simple way to demonstrate simple probability. For example, consider the IE allele to be represented by the letter "a" (little "a" to represent the recessive diseased allele and big "A" to represent a dominant normal allele). An IE "carrier" animal would be represented as "Aa" because the dominant allele masks the diseased allele, and, therefore, the animal appears to be a normal animal but can pass on the diseased allele to its progeny.

If an IE-free animal, an animal that has been proven to be a non-carrier of the diseased gene ("AA"), is mated to a "carrier" animal ("Aa"), then there is a 50% chance that the progeny will be a carrier, because the parents will randomly pass on one of the two alleles. It's basically a coin flip.

In January 2007 the AHA Board announced the discovery of the gene marker test currently being performed at the University of Illinois. It was also announced that the test would be free of charge through March 15. Further costs of the tests are currently being determined with the University of Illinois. Watch in the May/June *Hereford World* and future *Hereford eNews* issues for information regarding test costs.

The DNA test has virtually revolutionized the methods by which a breeder can manage a problem such as IE. The following are a few highlights of what breeders are doing to objectively manage their breeding decisions while enhancing the genetic progress of the Hereford breed:

- More than 10,000 DNA samples on cows and herd bulls were sent in and analyzed by Beever's laboratory before March 15.
- Several production sales this spring listed IE free status of the entire bull and female offerings based on the test results performed by the University of Illinois lab. Breeders could purchase carrier-free genetics with confidence.
- Most breeders are cautious to not use an IE carrier bull, but there has not been and should not ever be a fear of using a bull or breeding a cow that has been tested "free" of the diseased allele whether it has IE carriers in its pedigree or not. The DNA test definitively determines zero risk for the specific diseased allele.
- Some breeders have identified cows with exceptional performance characteristics that are IE carriers. Each breeder should make a judgment call as to whether or not the cow is good enough to continue in his breeding program. If she is, then all of her progeny should be tested for IE carrier status. The DNA test allows for a breeder to keep superior genetics in the herd despite carrier status, providing progeny are tested.

AHA policy for listing animals

Many breeders have asked two common questions: 1) why aren't more animals listed, and 2) can I list my animals to be free of the IE gene if they are tested clean?

In answer to the first question, the only animals that have been listed up to this point are those animals that have at least two progeny documented as having the IE condition. There are only a few animals that we have on record as producing at least two cases of infected calves.

However, there have been a number of herd sires and cows that tested positive for the IE allele in recent months. The AHA does not currently have a testing contract with the University of Illinois, per the request of the university. Therefore, the testing that has been conducted in recent months free of charge has been on a voluntary basis. The information shared from the laboratory with the breeder is proprietary information owned by the breeder. In other words, it is not the property of AHA. However, the AHA asks each breeder that has tested his animals to voluntarily share those results with the Association.

Before the AHA will label a pedigree, a breeder must share his IE DNA results with the AHA and then the Association must parentage verify the carrier animals and non-carrier animals. Any DNA parentage testing for carrier status purposes will be at the breeder's expense. **HW**