



March 21, 2012

## Parentage Genotype vs. Parent Verification

Parentage is an “umbrella” term that refers to DNA testing to establish an animal’s genetic identity.

Parentage Genotype refers to the genetic Fingerprint (Finger-type) of an animal as determined via DNA technology.

Parent Verification, also referred to as Parental Validation, is the process of determining if an animal is the progeny of the reported sire and/or dam.

### Slang translation:

Parentage Genotype = Who I Am

Parent Verification = Who’s Your Daddy

March 28, 2012

## RAAA Rules and Regulations: Parent Verification

A.I. Sires and parents of E.T. calves are required to be parent verified to their reported parents, given the parents have a ‘DNA fingerprint’ determined through approved DNA technology.

- Parent verification rules only apply to A.I. Sires and parents of E.T. calves.
- DNA sample must be submitted to a DNA lab for establishment of a DNA fingerprint.
- If one, or both, parents also have a DNA fingerprint on file, parent verification is performed to determine if the reported pedigree is correct.
- If a parent DOES NOT have a DNA fingerprint on file, RAAA Rules don’t require further action, i.e. collecting and submitting a DNA sample on that parent.
- A DNA-based fingerprint CANNOT be compared to a bloodtype-based fingerprint; therefore, no further action is required if the reported parent ONLY has bloodtype information.



April 4, 2012

## Bloodtyping vs. DNA Fingerprint

We ended last week's "DNA 101" with:

*A DNA-based fingerprint CANNOT be compared to a bloodtype-based fingerprint; therefore, no further action is required if the reported parent ONLY has bloodtype information.*

Some members may recall that the first technology used in parentage verification was simply comparison of bloodtype. The analysis was performed by determining the bloodtype of the animals (possible bloodtypes: O, A, B and AB). Parental verification was performed by comparing the bloodtype of the animal of interest to the bloodtype of the reported parent. The obvious weakness of this technology was its inability to differentiate between two sires that had the same bloodtype.

Advancements in DNA technology provided a solution to this growing problem – Short Tandem Repeat (STR) DNA testing. Also known as microsatellites, STR technology allowed for more precise parent verification through evaluating up to 20 regions on an animal's DNA strand in developing the animal's fingerprint (bloodtyping only considered one region in developing the animals fingerprint).

As the transition was made from bloodtyping to DNA technology, the largest obstacle was the inability to compare the DNA-based fingerprint to the bloodtype-based fingerprint. In fact, this obstacle still exists – if we obtain a DNA-based fingerprint on an animal, we are unable to compare it to a bloodtype-based fingerprint in order to perform parentage verification. Due to this, if a potential parent only has a bloodtype-based fingerprint, that is equivalent to not having a fingerprint on file; therefore, no further action is required.

April 11-25, 2012

## DNA 101 – Pop Quiz

**Question 1:**

*Do the RAAA Rules and Regulations require Embryo Transfer calves to be parent verified in order to be registered?*

**Answer: No**

Covered in the March 28th eNews, RAAA's Rules and Regulations regarding parent verification only apply to A.I. sires and parents of E.T. calves. Therefore, for registration E.T. calves are not required to be parent verified; rather, their E.T. parents must be parent verified to the greatest extent possible.

**Question 2:**

*Scenario – You have decided to use an outstanding bull that you raised as an A.I. sire. Being proactive, prior to registering the resulting calves out of your new A.I. sire, you send a DNA sample on the bull to RAAA for parentage. You find out that the A.I. sire parent verifies to his recorded sire (SuperBull); however, the recorded dam (PowerCow) does not have a DNA fingerprint on file to facilitate parental validation.*

*Do the RAAA's Rules and Regulations require you to collect and submit a DNA sample on the dam (PowerCow)?*

**Answer: No**

Also covered in the March 28th eNews, RAAA simply requires parent verification of the submitted A.I. sire or parent of E.T. calf to the greatest extent possible using the current database of DNA fingerprinted animals. Thus, if a parent does not have a DNA fingerprint on file, RAAA does not require collection and submission of DNA for that missing parent.



May 9, 2012

## Why is SRT Becoming Obsolete?

In the April 4 “DNA 101” segment we discussed how the DNA technology of Short Tandem Repeat (STR) allowed for more precise parentage determination as compared to bloodtyping. As it’s name suggests, STR technology basically observes specific landmarks on a strand of DNA characterized by various repeats of base pairs (ex: AGAGAG). Because unrelated animals have different numbers of repeats at a particular location, this information can be used to ‘exclude’ reported parents that don’t fit the pattern.

While STR technology has served the beef industry well, numerous weaknesses of the technology will likely result in it becoming obsolete:

1. STRs on a particular animal cannot be shared across different labs. Therefore, if numerous labs are used, each animal would be forced to have a STR fingerprint ran at each lab.
2. The results of STR tests are presented in an analog format, forcing human interpretation and introducing human error. In a digital world, STR results are analog.
3. The scientific community considers STR ‘old technology’; therefore, no research is being performed to make improvements or efficiencies in the process. Thus, costs to obtain a STR fingerprint on an animal will not decrease in the future.
4. Seeing the writing on the wall, RAAA has entered into a transition phase away from STR and towards the DNA technology of the future: SNP.

Next week we will discuss SNP technology.

### DNA fun fact:

*It’s estimated that human and cattle genomes are 83 percent identical.*

May 16, 2012

## The New Era of DNA Technology – SNP

### (Single Nucleotide Polymorphism)

Single Nucleotide Polymorphisms (SNP) – while the terminology may seem complex, what it measures is surprisingly simple. DNA consists of long strands of nucleotides, commonly referred to as A, T, C and G, which are the building blocks of DNA. Amazingly, the order of these nucleotides are largely the same in every animal. However, when a single nucleotide is altered to a different nucleotide, genetic variation is expressed. For example a SNP could change AATGGC to ACTGGC. SNP technology simply identifies and measures these differences.

The scientific community has accepted SNP technology as the ‘gold standard’ in DNA research. Thus, STR (see last week’s “DNA 101”) technology has become obsolete. Not only is SNP superior to STR in its ability to detect genetic differences, but as well, the strengths of SNP replace the weaknesses of STR.

1. SNPs on a particular animal CAN be shared across different labs. Thus, eliminating duplicative genotyping costs.
2. The results of SNP test are presented in DIGITAL format, which eliminates the need for human interpretation and resulting human error.
3. All current and future planned research is based on SNP technology.

*Realizing the need to upgrade to SNP technology for parentage purposes, the RAAA Board of Directors voted in favor of transitioning to SNP-based parentage by July 1, 2012.*

Next week we will discuss the steps RAAA has taken to assist in this process, and how members can further aid in the transition.

### DNA fun fact:

*More than 99% of human DNA sequences are the same. It’s the 1% that’s responsible for the genetic variation.*



May 30, 2012

## **All Parentage DNA Must Be SNP Based**

**Beginning July 1, 2012, all parentage performed by – or submitted to – RAAA must be based on SNP technology.**

In an effort to assist members in the transition from STR-based parentage to SNP-based parentage, RAAA has taken the following proactive steps.

- Acquired SNP parentage fingerprints on the vast majority of commercially available AI sires. This would include previously used and currently available A.I. sires.
- Through leveraging the buying power of our membership's 100,000+ head of Red Angus, RAAA is able to offer the industry's most economical parentage. A DNA fingerprint or parent verification now costs only \$15 – a 42 percent savings from STR-based parentage.
- Through the 50K project, RAAA has provided membership a cost-effective means of acquiring 50K SNP genotypes on natural and A.I. sires that impact their herds as well as the breed. In addition to developing a Red Angus DNA product that will allow our breed to better compete by selling higher accuracy yearling bulls, each 50K genotype includes the SNP parentage fingerprint that will be necessary for the parent verification of future progeny.

What else can be done to make for a smoother transition to SNPs?

- Members can help themselves and fellow breeders by requesting archived DNA samples be shipped to RAAA. The lab where these samples are archived may charge shipping and handling, but having these samples in storage at RAAA can greatly reduce the need to acquire new samples on sires or donors that were previously fingerprinted via STR technology.
- Have a new herd sire or donor dam? Don't wait until after you have turned them out to collect a DNA sample.

