SNP-Based Parentage Testing of Cattle: The SEQ Test

Background

Single Nucleotide Polymorphism (SNP) testing is one of the newest forms of genotyping in the field of animal genetics. It differs from the ‘traditional’ microsatellite testing in that this form looks directly at the nucleotides (AGTC) in the DNA strand rather than repeating fragments. Specifically, SNP testing looks at changes to single nucleotides at specific places (markers), i.e. A to G at position X as seen below in figure 1.

![Figure 1: Single Nucleotide Polymorphism](http://en.wikipedia.org/wiki/Single-nucleotide_polymorphism)

Then, using this data the conceptual base of AGL’s parentage testing remains the same - All animals, including humans, have two copies of each gene: parentage testing relies on the principle that an individual will inherit one copy from its mother and one from its father. Therefore, if a particular nucleotide change is present in the calf, but absent in both of the nominated parents, then the nominated parents must be excluded from the calf’s pedigree.

SNP Testing at the AGL

As there are a number of SNP based tests currently available at the AGL, with more expected in the coming years, we have named our SNP based parentage services “SEQ+PV”; we currently have 2 SEQ+PV services available.

The primary panel of SNP that will be employed for parentage verification consists of approximately 140 markers. This service is known as “SEQ1”. The panel contains the 100 markers that have been recommended by the International Society for Animal Genetics. An additional 40 markers were included in
the panel to increase the accuracy of a parentage assignment. The additional markers were chosen on the basis that they were informative across all the major breeds used in Australia, including Bos indicus influenced breeds, and include SNP from the GeneSeek and Zoetis parentage panels to ensure compatibility between laboratories.

The AGL also has a secondary test for parentage verification known as “SEQ2” and this consists of approximately 200 markers (SEQ1 plus 60 new markers). This test has additional markers specifically designed to be informative in Bos indicus influenced breeds. It is also more useful for finalising larger cases where the mating records have not been kept and the parent lists are extensive.

**Things to Consider**

One of the most important things to know about this new form of testing is that SEQ and MiP (microsatellite, pre-2014 DNA testing) profiles are not compatible; we are not able to perform parentage verifications on SEQ calves with MiP parents, or vice versa. If you decide to make the change to SEQ typing, you may need to re-genotype your current parents as well as the calf cohorts. This may be possible on the samples already held at the AGL from past use but we cannot guarantee that there will be adequate hair left for every animal.

Noting this incompatibility, it is then of upmost importance to get in contact with the relevant breed society to determine what type of testing they are currently utilising and what their future plans are. This will ensure that you undertake the testing required to remain eligible to register your animals.

Also worth considering is whether to genotype using the SEQ1 (140 markers) or SEQ2 test (200 markers). In our experience, parentage cases fitting each of the following criteria are easily solved:

- Animals of a Bos taurus influenced breed
- Mothering data available
- Small multi-sire/single sire nominations

Cases that do not meet this criteria are often best suited to the SEQ2 test, but give us a call to discuss your specific circumstances and we can recommend the best testing schedule for your herd.

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