

# Veterinary Genetics Laboratory • Onderstepoort

## Faculty of Veterinary Science

Issue 2 – November 2014



## 2nd Newsletter of the Veterinary Genetics Laboratory

Following the interest in our first newsletter in August we have decided to produce a second one. November is usually the time of the year when the VGL, similar to other entities, focuses on finalising current projects and plans for the next year. Throughout the year, the laboratory has received a number of requests about the value of the DNA certificate and the DNA profile, parentage testing, colour variant testing in wildlife, sample collection for DNA profiling and individual animal identification and traceability systems and how this all relates to improving breeding of these animals. We have addressed a few of these queries in brief in this newsletter. We hope that these short explanations will be helpful.

### **VERY IMPORTANT NOTICE - CLOSING DATES DECEMBER 2014!!!**

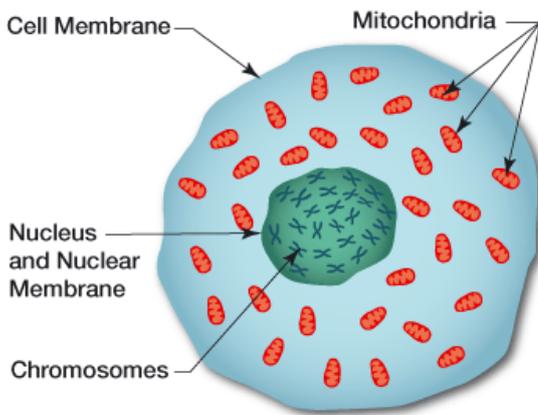
We need to finalise current cases and urge our clients to submit their last samples for the year before the end of this week (21 November), if possible. We will only send the results for cases submitted and paid on or before the 21<sup>st</sup> of November, by the 12<sup>th</sup> of December. All other results will only be available from the week of January 12 onwards. The laboratory will close on the 12<sup>th</sup> of December for the Christmas holiday. Please ensure that all submissions reach us before this date.

As always we encourage feedback and questions that we could discuss in the future newsletters as well.

## Mitochondrial and nuclear based DNA tests

There are two types of DNA in cells: nuclear DNA, which is found in the cell nucleus (core) and mitochondrial DNA, which is found in the mitochondria in the cell body. Mitochondrial DNA (mtDNA) is derived from the mother who provides the cell body. This DNA is used most often in forensic science to identify the species of animal from which an unknown piece of tissue is found. A short (400 to 700 base pair) section of the mtDNA is sequenced in an unknown piece of meat, tissue or material and the sequence compared to sequences from known animals that are stored on Genbank. Genbank is a collection of

publicly available sequences of many species uploaded by scientists from all over the world. It is managed by the National Centre for Biotechnology Information. A match of the sequence of the mtDNA of the unknown sample to a sequence on Genbank of a known animal provides the identity of the unknown material.



The mitochondrial DNA is also used for subspecies testing. Testing to differentiate the subspecies of sable and roan are most often requested, where the mtDNA sequence is used to identify the geographic origin of a specific animal. Since mtDNA is only inherited from the mother, this test only reflects the maternal contribution to an individual. The Veterinary Genetics Laboratory does not perform this subspecies testing but refers breeders to the most appropriate laboratory who will do this testing for them. Certificates that contain the subspecies test result can also only be obtained from the testing laboratory directly and not from the VGL.

Nuclear DNA, which is found within the nucleus of the cell, is packaged in structures called chromosomes. Chromosomes occur in pairs, the one representing the genetic contribution from the father and the other, the mother. Short fragments of repeated DNA code of variable length, or microsatellite markers, are used to compile an individual DNA profile. The DNA profile is unique to an individual and can be used as positive and irrefutable identification of the individual in forensic cases or can be used to confirm the parentage of an individual.

## The DNA Profile and the DNA Certificate

The DNA certificate provides a copy of the animal data on record including the individual information, parentage information and the DNA profile. The DNA profile does not provide any physical information, for example, breed, horn length, colour, disease or performance information.

For each species tested at the VGL we have developed marker sets that allow us to produce a unique DNA profile for each animal tested. When the data is generated, each animal will have one or two lengths, or "alleles", per marker, these are the numbers found on the DNA certificate. These alleles are inherited from the parents – one from the mother and one from the father. In order to generate a unique DNA profile, we use multiple markers or there would be animals with the same results due to random chance. As the number of markers increases, the chance of finding two animals with the same combination of alleles

decreases to the point where it is highly unlikely. The number of possible alleles per marker also has an effect: the larger the number of possible fragment lengths, or polymorphism of the marker, the more powerful the marker. When selecting marker sets for the tests at VGL, we have chosen highly polymorphic markers to ensure a unique DNA profile for each animal.

Therefore, the DNA profile information on the certificate only relates to individual identification. This can be used to verify its parentage – if its parents’ profiles are known – or to verify the parentage of its offspring. The DNA profile also usually includes the gender test which provides the sex of the animal tested using a genetic marker that occurs on the X and Y chromosome. This result may in rare cases, differ from the gender provided on the test request form. This happens as a result of the incorrect gender provided inadvertently, a sampling or sample labelling error or, more rarely, in cases where the animal has a sex chromosomal abnormality. Any additional information, such as the test results of specific traits and diseases for example the black mutation test result in the impala, the SCID test result in the Arabian horse and other specific genetic tests will be provided in a separate block with key, which explains the test result. This is only done when this result has been specifically requested.

**DNA Typing Certificate**

**Animal Information:**

Species	Bovine		
Database Number	B000001	Case Number	LR00229
Sample Number	B1300001	Owner	Green Farm
Animal ID	Blue 1		
Microchip Number	4C16F85018		
Ear Tag Number	1		
Sire	Bull	Dam	Cow

**DNA Profile:**

B1300001			
Sex	Female		
VGLWD0002	146	VGLWD0045	141
	160		141
VGLWD0004	152	VGLWD0046	167
	156		173
VGLWD0006	204	VGLWD0047	113
	206		127
VGLWD0010	241	VGLWD0048	105
	241		105
VGLWD0012	130	VGLWD0049	235
	134		237
VGLWD0013	189	VGLWD0050	76
	203		78
VGLWD0042	214	VGLWD0051	279
	222		281
VGLWD0043	98	VGLWD0054	249
	102		277
VGLWD0044	136	VGLWD0057	151
	144		151

**Additional Tests:**

**Signature:**


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**Certificate Date: 01 July 2014**

*Thank you for submitting your samples to the VGL for testing. The laboratory has taken every care to ensure the accuracy of the results reported. Results are reported for samples as they are submitted.*

## Parentage Testing

Parentage is confirmed by comparing the DNA profiles of the offspring and those of the suspected parents and showing that for each marker, one of the offspring's alleles is the same as one of the father's and the other, the same as one of the mother's. If there are any mismatches, the parentage is rejected.

### A parentage test example:

The following diagram illustrates a parentage using 12 markers. Profiles for the calf and both prospective parents were generated. Each allele designated as A or B. In the calf in this figure at Marker 4, allele A is 152 and allele B is 158. When the cow and bull here are examined as possible parents, the 152 allele was inherited from the bull and the 158 allele was inherited from the cow. Across all the markers, in this case, each allele in the calf was inherited from one of the parents and we can therefore, conclude that this calf is the offspring of these two animals.

Animal ID and Sex			Markers																							
			1		2		3		4		5		6		7		8		9		10		11		12	
			A	B	A	B	A	B	A	B	A	B	A	B	A	B	A	B	A	B	A	B	A	B	A	B
Calf	X	X	137	137	173	173	176	180	152	158	179	179	203	203	206	164	174	255	262	172	174	103	103	161	167	
Cow	X	X	135	137	173	173	180	186	158	158	179	183	203	203	192	206	164	174	255	257	172	174	103	103	153	167
Bull	Y	X	137	137	173	173	176	180	152	158	179	179	203	203	172	206	160	174	255	262	160	172	103	113	153	161

## Announcements

### WORKSHOP 2015

We hope that the explanations in this newsletter are helpful. However, we have decided that the number of queries we receive, justify a more comprehensive discussion and would best be addressed in a workshop specifically dealing with the genetic queries of the wildlife industry that we receive on a regular basis. We are planning such a workshop in March 2015. Further details will be made available early next year. Please send us any questions or issues that you feel need to be addressed.

## Other news

**WE WOULD LIKE TO WISH ALL OUR CLIENTS A WONDERFUL CHRISTMAS SEASON AND ALL THE BEST FOR 2015!**



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