

TALKING GENOMICS



with **Charlotte Broadbridge**, Technical Product Specialist, Neogen Australasia



Genomic Testing – The Laboratory Process

What happens to your livestock DNA samples once they leave your farm? This edition of 'Talking Genomics' details the journey of a DNA sample through the laboratory process.

The Neogen Australasian laboratory is located on the western side of Brisbane, Queensland at Bundamba in a custom-built facility. Once your samples arrive at Neogen, they are 'checked in' by Customer Service. For your samples to be checked in, there needs to be both a printed copy of your submission form with your samples along with a digital copy. Your samples are then transferred to Sample Reception.

The Sample Reception team complete a quality check to ensure the samples are all present and correct, and the samples align with the order form that has been provided. Some of the common reasons samples fail during the testing process is due to biological contamination (dirt/faecal matter or other foreign body in with the sample) or chemical contamination (pigment from animal markers) so if this is detected at this stage, we will request you send in a new sample for the animal affected.



Biological Contamination

- Cross contamination between samples/animals
- Faecal matter and dirt in sample – any foreign material in the sample may interfere with genotyping



Chemical Contamination

- Dye/Pigment from animal markers
- Insect repellent
- Cleaning agents

Once the samples pass the initial quality check, their barcodes are scanned, and they are loaded into LIMS (our Laboratory Information Management System). They are then transferred across to the first laboratory for DNA Extraction & Preparation. Samples are arranged and transferred into 96 well plates for extraction.

For TSU Samples

Barcodes are scanned into the system to confirm alignment with the batch in LIMS. This is done using a bed scanner that can process 96 samples simultaneously. The TSU rack is then placed into a decapping machine to remove the white caps and access the samples. The TSUs are then placed in an oven with a heat-activated enzyme (ProK), where DNA is extracted from the samples.



For Hair Samples

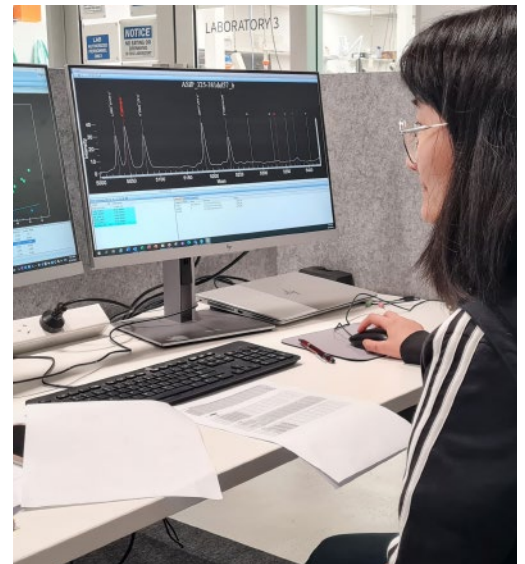
Each hair sample is individually scanned into the system. A lab technician then removes the sample, aligns the hair follicles using tweezers, and cuts the follicles into a test tube. This process will typically take 1 hour to complete one sample plate of 96 samples. Once a rack of hair samples is prepared, it is also placed in an oven with the ProK enzyme for DNA extraction. This process is more manual than the TSU process and takes more time to prepare.

After extraction, the DNA undergoes three rounds of purifying washes to remove any debris, leaving only pure DNA. A quality check is then undertaken to ensure there is sufficient DNA present to proceed to the next stage.

The purified DNA is then sent to Lab 2 to amplify into multiple copies of DNA for use in our genotyping processes. This generally takes a couple of days depending on the volume of samples.

In Lab 3 the amplified DNA is prepared with different reagents and incubations over several days so we can detect SNPs (Single Nucleotide Polymorphisms), insertions and deletions in the DNA. This includes loading DNA onto SNP chips. Scanning machines use lasers to detect these specific differences in the DNA and that data is exported.

The data is sent to our global data team for a QA check. This applies to all laboratories within Neogen Corporation to ensure data accuracy and compliance with standards. Once the data passes QA, our data



services team compiles the results into a readable file. This is where Parent Verification occurs and can take around 5 days to complete.

The job is marked as complete once the customer receives the final reports. Depending on the test ordered some reports go to breed societies so results can be loaded into breed analyses and contribute to

breeding values and other results may go directly back to you i.e. genetic condition or horn/poled results.

Further Information

To further discuss the genotyping process within the DNA laboratory, contact your local Neogen Genomics Specialist.

STAGE 1 Approx. 48 Hours

1. SAMPLE ARRIVAL

Samples are delivered to 14 Hume Drive, Bundamba QLD 4304 via post.

2. INITIAL INSPECTION

Customer Service date stamp incoming sample mail, and verify the contents to ensure all samples are accompanied by both a paper copy of the Submission Form and that a digital copy of the Submission has been received and is also on file.

3. SAMPLE COLLECTION

Customer Service collects the samples and transports them to Sample Reception

4. SAMPLE LOGGING AND QA

The samples remain in Sample Reception until they are logged into LIMS (our Laboratory Information Management System), sorted, and undergo a quality assurance inspection. Samples that pass QA are submitted to Lab 1. Any discrepancies identified between the physical samples received and the Submission Form are referred back to Customer Service for resolution with the submitting Customer.

STAGE 2 Approx. 4 - 7 days

5. DNA EXTRACTION AND PREPERATION

Samples are arranged and transferred into 96 well plates for extraction. Sometimes there will be a short wait untill the plate can be filled.

6. DNA PURIFICATION

After extraction, the DNA undergoes three rounds of purifying washes to remove any debris, leaving only pure DNA.

7. DNA QUANTIFICATION

This is an internal QA check to confirm that the DNA extraction was successful and sufficient DNA is available to proceed to the next lab stage. This check is at random, not all individual samples can be assessed. If there isn't enough DNA, the extraction process is repeated.

For TSU Samples: Barcodes are scanned into the system to confirm alignment with the batch in LIMS. This is done using a bed scanner that can process 96 samples simultaneously. The TSU rack is then placed into a decapping machine to remove the white caps and access the samples. The TSUs are then placed in an oven with a heat-activated enzyme (ProK), where DNA is extracted from the samples.

For Hair Samples: Each hair sample is individually scanned into the system. A lab technician then removes the sample, aligns the hair follicles using tweezers, and cuts the follicles into a test tube. This process will typically take 1 hour to complete one sample plate. Once a rack of hair samples is prepared, it is also placed in an oven with the ProK enzyme for DNA extraction. This process is more manual than the TSU process and takes more time to prepare.

STAGE 3 Approx. 5-14 days**8. PCR AMPLIFICATION
(Polymerase Chain Reaction)**

The purified DNA is then sent to Lab 2 to amplify into multiple copies of DNA for use in our genotyping processes. This generally takes a couple of days depending on volume of samples.

9. DNA SCANNING

In Lab 3 the amplified DNA is prepared with different reagents and incubations over several days so we can detect SNPs (Single Nucleotide Polymorphisms), insertions and deletions in the DNA.

This includes loading DNA onto SNP chips.

Scanning machines use lasers to detect these specific differences in the DNA and that data is exported.

STAGE 4 Approx. 5 - 7 days**10. QUALITY ASSURANCE**

The data is sent to our global data team for a QA check.

This applies to all laboratories within Neogen Corporation to ensure data accuracy and compliance with standards.

11. DATA PROCESSING

Once the data passes QA, our data services team compiles the results into a readable file.

This is where Parent Verification occurs and can take around 5 days to complete.

12. JOB COMPLETION

The job is marked as complete once the customer receives the final reports.



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