

High sample throughput SNP genotyping of cattle using the Fluidigm EP1™ system

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Fluidigm

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Abstract

The Fluidigm EP1™ system is the ideal solution for high sample throughput SNP genotyping for plant and animal studies because it offers outstanding data quality and the most efficient workflow available. The system routinely achieves 99% or higher call rates and takes only four hours to obtain results.

The performance of the Fluidigm system is demonstrated using cattle samples obtained with the Performagene™ kit from DNA Genotek. The samples have been tested against a parentage panel of 96 SNPs that were developed by a USDA-led cattle consortium.

Fluidigm 96.96 Dynamic Array™ IFCs and the EP1 System

Dynamic Array IFCs are integrated fluidic circuits (IFCs) including a network of microfluidic channels, chambers, and valves.



Each 96.96 Dynamic Array IFC (left) is capable of running 96 samples against 96 SNP assays generating a total of 9,216 genotypes. The advantages include:

- Outstanding data quality using gold standard assays, e.g. TaqMan® assays.
- A fast and easy workflow that provides results in only four hours.
- One hundred times reduced reagent and pipetting requirements.
- Better data from samples that may be low in concentration or quality, through the optional use of Specific Target Amplification (STA).

Performagene by DNA Genotek

All genetic applications start with the collection of DNA samples. Blood samples are expensive to collect, as well as complex and costly to ship, store and process. Hair follicles and ear punches are inefficient to process and can provide low quality and quantity DNA, resulting in failed samples and a requirement to recollect, incurring additional cost, effort and time.

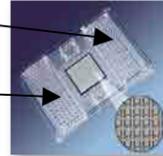
Eliminate these challenges by collecting superior samples with Performagene.

- Easy, reliable and cost effective collection, transportation and processing.
- Barcoded for full sample traceability.
- Efficient sample preparation and extraction of high quality, high quantity DNA.
- DNA is stable for 1 year at room temperature.

Fast and Easy Workflow

The Fluidigm EP1 system runs 96.96 Dynamic Array IFCs, which offer a fast and easy workflow that can be integrated into a high throughput laboratory.

1. Samples are filled in the Sample inlets.
SNP assays are filled the Assay inlets.



2. The 9,216 individual reactions are assembled automatically by the IFC controllers, requiring 100 times fewer pipetting steps and reagents.



3. Samples are amplified on a thermal cycler using a standard program.



4. The 96.96 Dynamic Array is imaged in the EP1 reader in a matter of minutes.



- The format of the dynamic array is compatible with the SBS (Society for Biomolecular Sciences) standards, allowing the use of standard liquid handling robots.
- The 384-style pitch between inlets means there is no need to re-configure existing 96 or 384 sample layouts.



SNP Genotyping Experiment

The Fluidigm system was used to genotype 48 cattle nasal samples in duplicate against a 96 SNP parentage panel. The nasal swab samples were obtained using the Performagene kit from DNA Genotek and STA was used, although not required.

- The SNP genotyping results were obtained in only one half day and with minutes of actual hands-on time.
- 96 custom TaqMan assays were designed and ordered using standard protocols.

SNP Genotyping Results

The SNP genotyping results demonstrate the excellent performance of the Fluidigm system using cattle samples.

- Results have shown 99.3% call rates, with the majority of no calls coming from one sample.
- 99.9% call rates and 100% concordance are achieved in duplicates after that sample had been removed from the analysis.

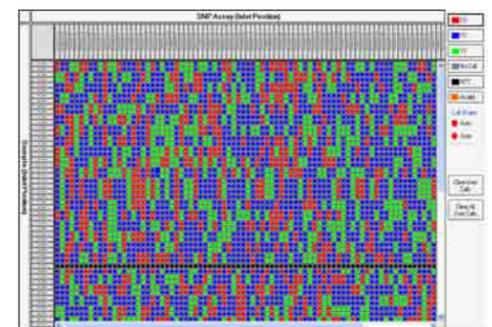


Figure 1. A call map view displays the overall calls for the Dynamic Array IFC, displaying 9,216 results at one time.

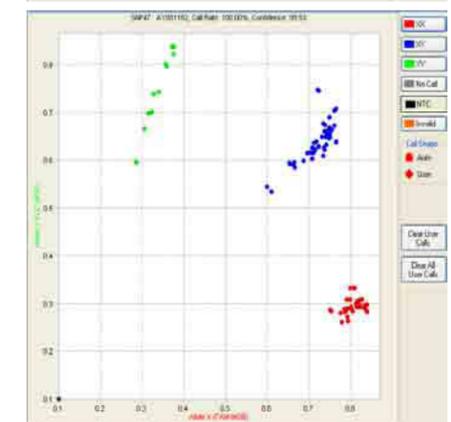
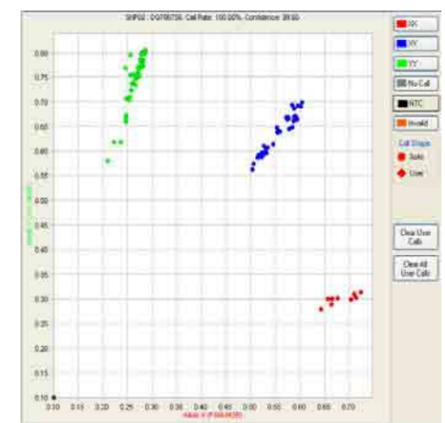


Figure 2. Cluster plots for two of the 96 SNP assays represent typical results obtained from Fluidigm Dynamic Array IFCs.

Conclusions

- SNP genotyping experiments using Performagene cattle nasal samples have demonstrated 99.9% call rates and 100 percent concordance on the Fluidigm system.
- The workflow for Fluidigm Dynamic Array IFCs requires only a few hours of total time and minutes of actual hands-on-time.
- The Fluidigm system has been designed to be easily integrated into a high throughput laboratory.

The Fluidigm system provides the ideal solution for high sample throughput plant and animal studies because it offers outstanding data quality and the most efficient workflow.