



A124 Development of a Forensically Integrated Microfluidic DNA Analysis System

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After attending this presentation, attendees will be informed of the progress made by this group on the development of a fully integrated device for the analysis of multiplex short tandem repeat DNA profiles from control buccal samples. Furthermore, attendees will understand the strategy of implementation of such a device within a forensic environment such as a police custody suite/booking office.

This presentation will impact the forensic science community by demonstrating a method for the delivery of a step change in the DNA analysis process: By the integration of an instrument and microfluidic cartridge with the forensic process, it will be possible to process a DNA sample taken from an individual in police custody and compare the profile with over five million United Kingdom samples held on The National DNA Database® in under two hours.

In urgent cases, control samples such as buccal swabs for DNA analysis can be processed in the laboratory in as little as six hours; more typically, however, processes allow for the routine analysis of DNA samples from control buccal swabs in 24-72 hours and require that the sample taken from a suspect is transported to a laboratory for processing, adding additional time to the overall process. Hence the suspect is very likely to have been released from police custody while the sample is processed. Frequently, where the suspect believes they will be subsequently charged with an offence, additional crimes are committed between release from custody and re-arrest following DNA database intelligence reports. The implementation of a rapid system whereby a control sample can be processed within the police custody area would be of value to the law enforcement community: a suspect's DNA sample could be processed and compared to a database of crime sample DNA profiles whilst the individual remains in custody. Rapid elimination of an individual from an investigation can also be achieved, reducing cost and releasing resources to focus on the investigation of alternative leads in a case.

The microfluidic cartridge-based system has been designed to operate in a non-laboratory environment. Contamination is minimized by implementation of a closed cartridge system which performs DNA extraction, DNA amplification using an 11 or 16 locus multiplex STR system, resolution of the STR alleles by microchip CE and detection using laser induced fluorescence. The disposable plastic cartridge is supplied prefilled with reagents required for the entire process and simply clips into the instrument which provides simple integration using embedded actuators and sensors. This avoids the need for complex fittings and fixings, reducing the complexity of integration and facilitating the goal of single push button processing. Data collected from the CE-LIF is processed using FSS software and the DNA profile is recorded in a format compatible with the data requirement for submission to the UK National DNA Database.

The whole system is designed to allow simple loading of a suspect's control DNA sample to the cartridge, and robust walk-away processing of the sample in under two hours.

Data will be presented describing the development process, the issues encountered and the solutions that were produced to develop a robust integrated prototype.

Forensic DNA, STR, Microfluidic