A128 Sample Collection System for DNA Analysis of Forensic Evidence

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After attending this presentation, attendees will be familiar with recent advances in buccal swab and crime scene evidence collection devices compatible with microfluidic DNA purification protocols that enable forensic sample analysis to be performed rapidly and with minimal user intervention.

This presentation will impact the forensic science community by demonstrating a sample collection system that allows evidence collected on a swab to be processed microfluidically to yield purified DNA, a major step towards the development of a fully integrated, samples-in to results- out STR analysis system for both laboratory use and field forward operation. Such a system has the potential to reduce the time, labor, and cost of performing STR analysis.

A major challenge in bringing biochip-based DNA analysis tools to the forensic community has been in developing a robust, easy to operate

commercial instrument that offers reliable and reproducible performance. A fully integrated STR analysis system based on microfluidic biochip technology for forensic laboratory and field-forward operation would comprise modules to perfor: (1) DNA purification and, for casework samples, human specific DNA quantification; (2) multiplexed STR amplification; and, (3) separation and detection of the resulting amplicons.

The development of a sample collection system consisting of a sample collection device and a sample processing cartridge, referred to as the Smart Cartridge will be reported. The sample collection system is the critical interface between the user, real world samples, and microfluidics biochips for rapid automated DNA processing. Development tasks included the evaluation and selection of various evidence collection matrices, evaluation and selection of an evidence collection device, design and fabrication of the Smart Cartridge, and development of the computer controlled pneumatic drive system.

Data will show that mock casework and database samples can be extracted and purified with high efficiency and that the resulting DNA is compatible with subsequent microfluidic PCR amplification and separation and detection. The sample collection system is well-suited for incorporation into a fully-integrated microfluidic forensic DNA analysis system will be demonstrated.

STR Analysis, DNA Extraction and Purification, Biochip

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