B73 Microfabricated Capillary Array Electrophoresis (μCAE) STR Profiling in a Forensic Laboratory

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After attending this presentation, attendees will have learned about a microfabricated device which may replace conventional capillary electrophoresis with a faster, smaller, cheaper high throughput system.

This presentation will impact the forensic community and/or humanity by presenting data produced by forensic scientists using a prototype microcapillary chip system for capillary electrophoresis. This system is small, fast, high throughput and will likely be much cheaper to operate than the conventional capillary systems currently available.

The Berkeley Microfabricated Capillary Electrophoresis (μCAE) device has previously been reported to provide high quality STR profiling using both simulated and non-probative forensic samples.[1] As an extension of that work, a pre-commercial prototype instrument has been set up at the Virginia Department of Forensic Science (VDFS) for testing in a forensic laboratory. The first step in the process was for forensic DNA scientists to master the operation of the instrument. Upon completion of instrumentation set-up and a series of calibration and implementation runs, single source samples, amplified with PowerPlex® 16, have been successfully electrophoresed and analyzed. PowerPlex® 16 STR profiles obtained are being compared to the profiles obtained for the same amplified samples using the ABI 310 Genetic Analyzer® for concordance evaluation. Also plan necessary tests Profiler Plus™ amplified DNA extracts. Experiments are underway to reproduce the work performed at the Mathies' laboratory at the University of California, Berkeley, which included mixture, sensitivity, database, and non-probative sample analysis, but also to assess chip instrument performance using additional measures. Resolution measurements beyond those previously published are being performed and precision data are being collected. Experiments designed to assess whether any capillary cross-talk occurs among the 96 capillaries are being performed. Moreover, performance enhancement measures will be tested and pursued.

Successful operation of the μCAE demonstrates the capacity of this technology to be transported out of the research venue and into a practitioner forensic laboratory. Not only does this demonstrate the feasibility of the paradigm shift from large capillary systems to a microfluidic system capable of electrophoresing and capturing the STR data for 96 samples simultaneously in less than 30 minutes, it demonstrates that this technological advance can be mastered by the forensic scientist.

Reference:

[1] Yeung, S, Greenspoon, S, McGuckian, A, Crouse, C et al. Rapid and High-Throughput Forensic Short Tandem Repeat Typing Using a 96- Lane Microfabricated Capillary Array Electrophoresis Microdevice. J Forensic Sci 2006;51(4):740-747.

STR, PowerPlex 16, Microcapillary Electrophoresis

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