B71 Development of a DNA Screening Method Using a Portable Microfluidics System and the D1S80 VNTR Locus

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After attending this presentation, attendees will understand how to perform DNA screening using a portable microfluidics system (Agilent 2100) and the D1S80 VNTR locus with amelogenin

This presentation will impact the forensic community and/or humanity by demonstrating how small microfluidic devices can be used as rapid and portable methods for the analysis of DNA.

The goal of this research is to develop a fast and portable screening method for human identification for DNA typing in remote areas or in situations involving mass disasters. In such situations, lightweight, portable genetic analyzers are necessary. Due to its small size and relative ease of use, the Agilent Bioanalyzer 2100 was chosen as a suitable instrument for this task. This system is an automated microfluidics system which uses capillary electrophoresis in a chip- based format. It contains 16 sample inlet channels coupled to a single separation channel with fluorescent detection. Operation occurs with minimal user interaction, and the chips are simply disposed of following each analysis. The system is currently being used in several types of biological analyses, including fragment analysis of double stranded DNA, and quantification and sizing of DNA. Individual sample runs typically take less than two minutes, and overall run times are about 30 minutes. Maintenance and buffer requirements of the instrument are minimal when compared to the larger genetic analyzers due to the disposable design and low volume of the microfluidic chips.

However, due to its lower resolution when compared to larger CE systems, the Bioanalyzer is unsuitable for analysis of small STR loci where resolution of one or two base pairs is required. This problem can be alleviated through the use of a DNA marker with larger simple repeat units. D1S80 is such a marker.

The characteristics of D1S80 make it a very useful marker for forensic DNA profile analysis. D1S80 has a basic repeat unit of 16 bp. Most individuals have alleles containing between 14 to 40 tandem repeats, with a size range of 224 to 640 bases. Due to the high number of alleles, it has a relatively high discriminatory power for a single locus. Amplification of D1S80 has been extensively validated for genetic typing used in forensic casework including extraction, quantification, amplification, and electrophoresis. The initial description of the D1S80 locus was published in 1988[1] and the locus can be multiplexed with amelogenin for sex typing[2].

In this presentation initial efforts in developing a separation of D1S80 using this device will be described. In particular, the separation efficiency and reproducibility of the system will be discussed. Efforts to develop and produce allelic ladders and to multiplex the system with amelogenin will be discussed and validation results from a set of population samples will be described.

1 Nakamura Y, Carlson M, Krapcho V, White R. Isolation and mapping of a polymorphic DNA sequence (pMCT118) on chromosome 1p (D1S80). *Nucleic Acids Res.* 1988;16:9364.

2 Isenberg AR, McCord BR, Koons BW et al. DNA typing of a polymerase chain reaction amplified D1S80/amelogenin multiplex using capillary electrophoresis and a mixed entangled polymer matrix. *Electrophoresis.* 1996;17(9):1505-1511.

D1S80, Microfluidic, DNA

 ** Presenting Author*