B79 Joint Validation of a High Throughput Multi-Capillary Electrophoretic System Using Fluorescent Multiplex Short Tandem Repeats

Bridget M. Tincher, MSFS, Marshall University, Forensic Science Center, 1401 Forensic Science Drive, Huntington, WV 25701-3628; G. Sue Rogers, MSFS, and Angelo Della Manna, MSFS, Alabama Department of Forensic Science, 501 12th Street South, Birmingham, AL 35233; Terry Fenger, PhD, Marshall University, Forensic Science Center, 1401 Forensic Science Drive, Huntington, WV 25701-3628; and Rhonda K. Roby, MPH, Identity Quest, LLC, 13203 Astoria Hill Court, Suite J, Germantown, MD 20874*

Attendees will learn procedures for high throughput processing of samples for STR analysis. The presentation will demonstrate the positive impact of collaboration with the NIJ supported Forensic Resource Network (FRN) when validating a new system.

This presentation will impact the forensic community and/or humanity by validating and implementing high throughput systems in order to reduce the offender backlogs at state laboratories.

Over the past eight years, state and federal laboratories have processed greater than one million convicted offender samples and subsequently uploaded the resultant data into the national level of the COmbined DNA Index System (CODIS). As of June 2004, greater than one million convicted offender samples have been uploaded into NDIS and have produced over 15,100 matches which have assisted in more than 18,100 investigations nationwide [http://www.fbi.gov/hq/lab/codis/success.htm: online]. In order for a state to upload DNA profiles developed from convicted offenders to NDIS, each sample must be comprised of the standard 13 core STR loci. Prior to this NDIS requirement, the Alabama Department of Forensic Sciences generated a state level convicted offender database containing eight (8) of the core 13 STR loci.

The Forensic Resource Network (FRN) is a National Institute of Justice (NIJ) supported group of four institutions, of which Marshall University is one, that provide services, research and training to the Forensic Community. As a component of the services provided by the FRN, Marshall University Forensic Science Center (MUFSC) initiated a collaboration with the Alabama Department of Forensic Sciences (ADFS) to validate a high throughput system for short tandem repeat (STR) analysis.

During the last several years, high throughput systems have evolved which increased the capacity for both processing and analyzing convicted offender samples. Previously, laboratories employed a conventional slab gel electrophoresis approach or a single capillary electrophoresis testing system. While the introduction of single capillary electrophoresis platforms required less analyst laboratory time for electrophoresis setup, the introduction of multicapillary testing platforms provided even greater throughput. Furthermore, laboratories are now using multiplexed single amplification chemistry which is able to co-amplify all of the required core CODIS loci in a single amplification, rather than the previous two (2) amplification approach which was required to obtain results of all 13 loci.

Once again, this advancement in forensic molecular biology techniques provides for even greater throughput.

Polymerase chain reaction (PCR) multiplex amplification using commercially available kits, subsequent separation of the DNA fragments by either slab gel or capillary electrophoresis, and data analysis using specific software provides an efficient, accurate method for the compilation of DNA databases worldwide. Many laboratories have validated commercial STR kits for forensic casework, databasing applications, and parentage testing using ABI PRISM® Genetic Analyzers and/or the FMBIO® II Fluorescent Imaging Device. In order to upload data into CODIS, internal validation demonstrating reproducibility, precision, and accuracy shall be performed and documented according to the FBI Director's, "Quality Assurance Standards for Convicted Offender DNA Databasing Laboratories" [Forensic Science Communications 2000: 2 (3): online].

Known human DNA was extracted from blood and buccal swabs. Select samples were quantitated using yield gel and/or QuantiBlot® Human DNA Quantification Kit. Extracted human cell line DNA (9947A) was included as an amplification control. Amplifications were performed in 25 1L reaction volumes in MicroAmp® reaction tubes in the GeneAmp® PCR System 9700 thermal cycler (Applied Biosystems, Foster City, CA) using the Identifiler™ PCR Amplification Kit, a 5-dye multiplex kit with the necessary reagents to amplify 15 tetranucleotide short tandem repeat loci and the gender identification locus Amelogenin. The collaboration between the two agencies expedited the design, validation and implementation of the high throughput system adopted by the ADFS to increase the number of convicted offender samples analyzed in house that qualify for import into the national database. In this paper, the results of the internal validation studies performed as a result of the collaboration between the Alabama Department of Forensic Sciences and Marshall University Forensic Science Center will be presented.

Supported under Award Number 2001-RC-CX-K002 from the Office of Justice Programs, National Institute of Justice, Department of Justice. Points of view in this document are those of the authors and do not necessarily represent the official position of the U.S. Department of Justice.

CODIS, High Throughput, Validation

 ** Presenting Author*