A163 Increasing STR Analysis Success Rate and Potential Discrimination With Improved Multiplexes

Martin Ensenberger, PhD, Patricia M. Fulmer, PhD, Benjamin Krenke, MS, Robert McLaren, PhD, Dawn R. Rabbach, AS, Cynthia J. Sprecher, BS, Jonelle Thompson, MS, Douglas R. Storts, PhD, and Erin McCombs, BS, Promega, 2800 Woods Hollow Road, Madison, WI 53711*

After attending this presentation, attendees will understand potential strategies for handling challenged samples and increasing discrimination for difficult relationship testing using an increased number of loci.

This presentation will impact the forensic science community by demonstrating capabilities of new typing strategies.

Multiplex short tandem repeat (STR) analysis remains the primary technique for human identification. At the beginning of this decade, focus of STR multiplex design was on increasing the number of concurrently analyzed markers, largely to meet the demand of having the FBI CODIS core 13 loci in a single assay. Forensic analysts require STR systems that are compatible with ever more challenging samples, prompting the need for greater performance from assays. Additionally, the complexity of relationship testing for immigration and familial searches has prompted the need for increased marker availability. This combination of greater performance and increased marker availability has driven the design of the most recent generation of STR multiplexes.

Forensic samples routinely include impurities known to inhibit PCR and reduce genotyping success rates. Additionally, high heat and other environmental impacts can reduce the integrity of the DNA. Improved buffer systems and incorporation of shorter amplicon primer design (mini STR) have significantly increased the tolerance to common inhibitors and yield from degraded samples. Additionally, increased sensitivity can improve the likelihood of obtaining interpretable data from low concentration samples and challenging mixtures.

The recommendation to extend the current European Standard Set (ESS) for STR systems has prompted inclusion of several new markers in the latest STR multiplex designs. Coamplification of two multiplexes can provide full CODIS and ESS panels, plus Amelogenin, SE33, Penta E, and Penta D, for a total of 24 markers. Compared to the CODIS core panel, the additional markers add significantly to the power of discrimination that can be applied to statistically-challenging cases.

Comparison data of these systems will be presented with inhibitors and challenging samples along with developmental validation data. We will also present strategies for use of these newer STR systems in the forensic laboratory.

STR Analysis, Mini STR, Inhibition

 ** Presenting Author*