ACCELERATING THE STR ANALYSIS WORKFLOW THROUGH AUTOMATION AND DIRECT AMPLIFICATION METHODS

David Yoder, PhD[1], Laurence Delauriere, PhD[2], Ann MacPhetridge, BS[1], Benjamin E. Krenke, MS[1], Robert Ray, BS[1]
[1]Promega Corporation, Madison, WI, USA
[2]Promega France, Lyon, France

After attending this presentation, attendees will understand potential strategies for simplification and automation of the STR workflow of database and reference samples. This presentation will impact the forensic community by highlighting the positive effects of more efficient workflows on laboratory throughput.

Analysis of amplified short tandem repeat (STR) multiplexes remains the primary technique for human identification. Several developments in STR analysis can improve the efficiency of this workflow, including direct amplification of unpurified samples, automated amplification plate setup and fast thermal cycling.

To evaluate and illustrate these workflows, the authors tested different sample types, STR multiplexes and robotic platforms. Swabs, punches from FTA® and nonFTA cards and traditionally-extracted samples were analyzed with Promega's PowerPlex® Fusion and Y23 Systems. Amplifications from swabs and punches were performed without purification or wash steps and were compared to amplifications from traditionally-extracted samples. Testing utilized the Hamilton STARlet and easyPunch STARlet liquid handling workstations to automate STR amplification reaction setup.

The Hamilton STARlet PowerPlex STR setup method utilizes a barcoded sample worklist to prepare the reaction mix from kit component tubes, and can use both single and multi-dispense modes to dispense the reaction mix, accommodating workflows built for speed or maximum cost effectiveness. The easyPunch STARlet method utilizes manually prepared reaction mix, and dispensed the reaction mix prior to FTA® sample addition. The barcoded FTA® samples were punched into the amplification plate containing reaction mix, according to a sample worklist. A secondary option to punch samples in the order they are loaded in the FTA® sample carriers also exists.

The authors will discuss the best practices for automating the latest generation of rapid cycling protocols for direct amplification and traditional STR analysis, as well as present data showing the performance of the automated methods across a variety of parameters. The data will show amplification success rate, as well as the absence of detectable cross-contamination. With reliable amplification providing a high success rate for obtaining full STR profiles with no detectable cross contamination, the automated setup of direct amplification and traditionally-extracted samples can help improve the forensic workflow. The automated methods can prevent setup errors, help ensure samples are tracked through amplification properly, as well as provide a time and/or resource cost savings.

Keywords: Automation, STR, direct amplification