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VALIDATION AND IMPLEMENTATION OF A HIGH THROUGHPUT AUTOMATED FORENSIC STR SETUP PROTOCOL USING THE POWERPLEX® 16 SYSTEM FROM PROMEGA

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The Pennsylvania State Police DNA Laboratory is tasked with processing DNA from convicted offender blood and buccal-stained samples for CODIS database entry. The number of samples that must be analyzed is not proportionate to the number of available staff and resources. In order to process samples more efficiently, while ensuring sample integrity, we have chosen to automate a variety of our DNA procedures using liquid handling platforms from PerkinElmer that are specifically targeted for forensic sample handling. The flexibility of these workstations have allowed this laboratory to more than adequately handle the influx of samples automating protocols that include DNA extraction, purification, quantification, and STR PCR setup. We have processed over 25,000 samples in nine months with the capacity to handle even more.

The PowerPlex® 16 System allows single-tube coamplification and three-color detection of sixteen loci (fifteen STR loci and Amelogenin) for typing both database and forensic casework samples. The system is accepted by several worldwide forensic standardization bodies such as INTERPOL, the European police network, the European Network of Forensic Science Institutes (ENFSI), GITAD (Grupo Iberoamericano de Trabajo en Análisis de DNA) and the United States FBI (CODIS). Another reason for choosing the PowerPlex® 16 System is that it contains two low-stutter, pentanucleotide repeat loci, Penta E and Penta D with improved discrimination resolution to better evaluate DNA mixtures encountered in our casework groups samples.

We report here the validation and implementation of a high throughput automated multiplex STR DNA typing protocol using the PowerPlex® 16 System from Promega and PerkinElmer's liquid handling robot with Varispan™ option. Purified unknown DNA samples were prepared using Promega's DNA IQ™ System on the same liquid handling robot, normalized and used as template. PowerPlex 16 Master Mix, diluted with water according to the kit recipe, was aliquoted into an ABI 7000 PCR plate. Two Amp-positive DNA control DNA samples were then transferred into the PCR plate, followed by the diluted unknown DNA and finally with two Amp-negative control samples. Sample plates were sealed and carried into the Amplification Room for further processing and analysis using an ABI 3130xl Genetic Analyzer. We will present data from our validation studies and describe the robotic setup used to process large batches of samples.