FORENSIC SAMPLE PROCESSING USING A ROBOTIC WORKSTATION: AUTOMATED PAPER-BASED SPOTTING OF WHOLE BLOOD CONVICTED OFFENDER SAMPLES AND HIGH THROUGHPUT DNA ISOLATION FOR STR ANALYSIS

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The need to process a greater number of convicted offender samples for DNA analysis due to new legislation is an increasing dilemma for the forensic community. Many states rely on outsourcing of their samples to private contractors to keep up with the workload. With the availability of a new class of versatile robotic workstation, the ability to automate a variety of testing procedures supercedes the need for outside contracted processing.

The Pennsylvania State Police DNA Laboratory was tasked with processing whole blood convicted offender samples for CODIS database entry. The MultiPROBE® II Forensic Workstation was chosen to automate sample processing and DNA isolation procedures. The MultiPROBE II HT EX system with Integrated Gripper™, Bar Code Reader, DPC Shaker, Automated Heater, and PlateStak options provided the flexibility to perform protocols including blood spotting, DNA purification, quantification and PCR setup.

The first automated protocol to be validated and put into daily use was paper-based archiving. This consisted of replicate spotting of convicted offender blood onto FTA® and S & S cards for preservation, storage, and subsequent DNA typing analysis. Blood tube samples were assigned bar codes and spotted by the MultiPROBE onto cards with corresponding bar codes. This procedure utilized the workstation's "hit picking" and liquid level sensing features, along with bar code scanning and plate stacking functions. Validation involved evaluating pipetting performance, sample tracking, reproducibility, and cross-contamination.

The robotic workstation was also used to automate the Promega DNA IQ™ DNA System using whole blood samples for analysis. The goal in using this DNA isolation protocol was to purify a consistent quantity of DNA from each sample. Elimination of a quantification procedure is paramount in achieving the desired throughput for processing these forensic database samples. Blood tube samples were dispensed into 96-well plates and processed using a walk-away 60-minute protocol that required automated shaking, gripper and heater functions. Downstream analysis of the purified samples included STR-based amplification with the PowerPlex® 16 system.

The MultiPROBE II workstation has proven to be a versatile, high throughput platform. In less than six months, over 12,000 whole blood samples have been processed for long-term storage using FTA® and S & S paper. Simultaneously, we have carried out validation of the Promega DNA IQ™ extraction procedure for DNA typing. The use of versatile automated platforms presents a viable, in-house alternative to outsourcing. Varied procedures, ranging from sample archiving to DNA extractions for typing, can be automated allowing analysts to concentrate on data analysis and interpretative activities.