B54 Advances in Automation - Incorporation of the Biomek NXP Liquid Handler Into a Small Forensic Biology Laboratory

Valerie K. Bostwick, BS*, Marshall University, Forensic Science Center, 1401 Forensic Science Drive, Huntington, WV 25701; and Amy McGuckian, MSFS, Julie Conover Sikorsky, MS, and Cecelia A. Crouse, PhD, Palm Beach Sheriff's Crime Lab, 3228 Gun Club Road, West Palm Beach, FL 33406

The goal of this presentation is to discuss the advantages of the integration of the Biomek NXP into a small forensic biology laboratory, as well as to address the trials of being the first forensic laboratory to validate the instrument.

This presentation will impact the forensic community by demonstrating that the validation and implementation of the Biomek NXP increases the efficiency and throughput of a small forensic laboratory by decreasing the amount of time a forensic analyst spends processing a single sample.

The Palm Beach County Sheriff's Office (PBSO) Forensic Biology Unit has been using the Beckman Coulter BioMek® 2000 liquid handling robot on casework evidence for over four years. As a result, there has been nearly a 50% increase in the number of samples processed in the laboratory. In order to further enhance the sample handling capabilities of the laboratory to include automated extraction, qPCR preparation, normalization of sample DNA concentrations and amplification preparation, the PBSO has acquired the Biomek® NX^P. Similar to the BioMek®2000, the NX^P also uses the Promega Corporation's DNA IQ™ Extraction Kit for the extraction process. However, since this instrument has not been implemented into a forensic laboratory, the PBSO has been responsible for writing all of the software methods necessary to operate the robot. Training on the Biomek® NX^P was initiated at Beckman Coulter where beginning and intermediate courses were attended in order to acclimate to the system's software package. This knowledge was transferred to the PBSO's Biomek® NX^P but not without many challenges, especially as it related to the custom parts and protocols used within the laboratory. After extensive manipulation of the software, two all encompassing methods were written. The first method incorporated DNA extraction, using Promega's DNA IQ™ Kit, integrated with quantification using the Applied Biosystems' Quantifiler™ Human DNA Quantification Kit. This method allows the user to indicate how many samples will be extracted, as well as which extraction protocol will be used. An adjunct method combines the normalization of DNA extracts followed by PCR set-up for the Eppendorf Mastercycler. A user simply indicates which samples are concentrated and, using the data from the ABI Prism® 7000, the method will normalize all samples on the plate to the desired concentration, 1.21 ng/µL. Once the samples are extracted, quantified, normalized, and amplified using Promega's PowerPlex® 16 Bio, amplified products are electrophoresed on a 6% polyacrylamide gel followed by allele detection using the Hitachi FMBIO II Scanner. To test the reliability and reproducibility of these methods, the following validation studies have been conducted: first, a checkerboard test using 10mm blood punches was conducted on the Slicprep™ 96 Device plate and the Beckman Deep Well Plate to ensure there was no contamination. Data showed there was no cross contamination of samples from one well to another. Experiments were also run to look at sensitivity, mixture, and non-probative sample analysis, as well as to assess the improvement in efficiency and workflow in a small forensic biology laboratory. It is anticipated that the incorporation of the versatile Biomek® NX^P into a forensic caseworking laboratory will dramatically decrease the amount of time a forensic analyst spends with a single sample, thereby increasing the number of samples that can be handled which will reduce the backlog of cases.

This research was funded in part through an NIJ grant (2005-DN-BX-K099).

Biomek NX, Automation, Validation