

DEVELOPMENT OF AN IN-HOUSE ELECTRONIC SAMPLE TRACKING SYSTEM FOR USE IN AUTOMATED HIGH THROUGHPUT FORENSIC DNA ANALYSIS

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Recently the Centre of Forensic Sciences (CFS) in Toronto has validated an automated system for the processing of forensic casework samples using a 96-well format [1]. A MultiPROBE® II PLUS HT EX Automatic Liquid Handling System (ALH) is used for DNA isolation using the Promega DNA IQ® System [2]. A second ALH is dedicated to the setup of samples for DNA quantification, STR PCR normalization and amplification. DNA quantification is performed using an in-house CFS-HumRT Quantitative PCR assay which utilizes a custom designed TaqMan®-MGB sequence specific probe and the ABD 7900HT Sequence Detection System [3]. Samples are amplified in AmpFISTR® Profiler Plus™ and/or Cofiler™ using an ABI 9700 thermal cycler and following amplification samples are run on an ABI 3100 Genetic Analyzer. In order to track barcoded samples through the automated process we have designed an electronic information system (DNA QuEST) capable of cross-platform communication between the various instruments required for DNA analysis. DNA QuEST also provides a real time summary of the automated process; tracks batch files and monitors continuity. The program functions by dividing the automated process into eight distinct steps. These eight steps include sample screening and batch creation, extraction, quantification, STR setup, capillary electrophoresis, review, releasing of results and archiving of plates. Utilizing these steps, DNA QuEST can monitor the progress of each batch file and corresponding 96-well sample plate through a series of user-specified milestones. An operator can consult a user-interface window to evaluate batch progress and assess the results at each stage. The link between batch files and samples contained within 96-well plates are established at the beginning. The batch file is created within DNA QuEST and contains a sample well map, plate barcode, technologist details, and instrumentation data. Once this link is established, the plate and batch file begin their journey through each step in the automated process. At each step, regardless of instrumentation, the batch file uploads required information and downloads the final results. The batch file also evaluates sample and plate continuity at each step of the DNA analysis. Furthermore, DNA QuEST output simplifies and increases the efficiency of the technical review of each 96-well plate.

[1] Suzanne Lima, Al Marignani, Lee Hulse-Smith, Diane Komonski, Lois Tack, Peng Li, Roger Frappier, and Jonathan Newman. Validation And Optimization Of A Robotic System Used To Fully Automate Forensic DNA Extraction, Quantification, DNA Normalization and STR Amplification Analysis. Presented at the 15th Annual Promega Conference, Phoenix, Arizona, October 2004. [2] Komonski D, Marignani A, Richard ML, Frappier RH, Newman JC. Validation of the DNA IQ™ System for Use in the DNA Extraction of High Volume Forensic Casework. Canadian Society of Forensic Science Journal 2004 [3] Richard ML, Frappier RH, Newman JC. Developmental Validation of a Real-Time Quantitative PCR Assay for Automated Quantification of Human DNA. Journal of Forensic Science 2003; 48 (5):1041-6.