COST EFFECTIVE AND VERSATILE DNA PROCESS AUTOMATION FOR LOW-MEDIUM THROUGHPUT FORENSIC LABORATORIES USING HAMILTON NIMBUS 4 ROBOTIC PLATFORM

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Robotic or automated processing of samples to be analyzed in the forensic laboratory offers many advantages over existing manual procedures including greater sample throughput, labor cost savings, and reduced risk of manual error. However, for many low-medium throughput labs, the cost for a large robotic platform capable of a variety of liquid-handling processes cannot be justified. The Hamilton NIMBUS 4 is a liquid handling robot with a much smaller footprint and cost, but it is still capable of transferring accurate and reproducible liquid volumes between a wide variety of source and destination “labware” including microfuge tubes, 96- and 384-well plates, and reservoirs. The software interface allows the user to create unique programs for liquid transfers which are then executed with absolute fidelity by the robot. In this instance, an amplification setup program was developed and validated by Sorenson Forensics Biotechnical Solutions which directs the Hamilton NIMBUS liquid handling platform to execute several distinct steps: 1) Scan samples and reagents and ensure everything correlates with the run worklist, 2) Prepare PCR master mix of amplification kit(s) specified by worklist, 3) Add the required volume of master mix to the appropriate wells of a 96-well amplification plate, 4) Add samples and standards to amplification plate as specified by run worklist, and 5) Prompt user to unload samples and reagents to clear robot deck for next run. The automated process can accommodate samples in 1.5mL microfuge tubes or 96-well plates. It is also able to setup all commonly used STR amplification kits (e.g. Identifiler®, Identifiler® Plus, PowerPlex® 16, PowerPlex® 16 HS, etc.) and quantitative PCR (qPCR) kits such as Quantifiler® DUO and Plexor® HY. The validation for this process was done following SWGDAM guidelines and the results for this study show that the NIMBUS robot is capable of accurately transferring volumes as low as 1µL or as high as 1000µL to the appropriate labware with great precision and repeatability. All tested samples were processed with no instance of cross-contamination seen throughout the liquid handling operation, and transferred volumes were found to be homogenous and reproducible. It was found that the Hamilton NIMBUS 4 robot is a highly versatile and capable liquid handling platform to be used for automated processing of forensic samples, and could be an ideal candidate for low-medium throughput laboratories.