DIFFERENTIAL EXTRACTION OF MIXED STAINS USING THE QIACUBE PLATFORM AND EZ1 ADVANCED ROBOTIC WORKSTATION

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Manual organic DNA extraction is a lengthy component of the DNA analytical process currently utilized for sexual assault cases. Following incubation and washing steps, the time associated with manual organic extraction of 50+ samples can easily exceed four hours. Moreover, examiners are required to perform multiple sample transfer steps using hazardous organic solvents during this time period. The replacement of manual organic DNA extraction procedures with enhanced automated DNA extraction techniques can reduce this four hour process to ~30 minutes. In addition, implementation of enhanced automated DNA extraction techniques will reduce the risk for potential human error during the course of manual sample manipulation associated with manual organic DNA extraction.

The QIAcube platform is designed to perform fully automated purification of nucleic acids and proteins in molecular biology applications; however, we did not evaluate the nucleic acid/protein purification functionality of the platform. Instead, we evaluated the ability of the platform to conduct automated sperm pellet washes associated with the extraction of mixed stains. This process was done in conjunction with the use of a modified automated differential DNA extraction protocol on the EZ1 platform. Per contracted agreement, laboratory work was conducted by Qiagen personnel during the course of multiple site visits at the U.S. Army Criminal Investigation Laboratory (USACIL). Supplemental internal validation work was conducted by USACIL DNA Branch personnel. Sensitivity, precision and accuracy-reproducibility/repeatability, mock Samples/case-type samples, mixtures, NIST, matrix, Y-screening, comparison to existing procedures, and contamination assessment studies were conducted.

As a whole, data generated during the course of this validation study demonstrate the QIAcube/EZ1 Differential Extraction Procedure is capable of generating accurate and robust results comparable to or better than results associated with existing differential extraction procedures previously utilized by the USACIL DNA Branch.

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