

AUTOMATED DNA EXTRACTION FROM BLOOD, CIGARETTE BUTTS AND TISSUES USING DNA IQ™ CASEWORK SAMPLE KIT ON MAXWELL® 16 INSTRUMENT

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In forensic laboratories, automation in sample processing increases throughput, reduces contamination and hence enhances workflow. Large automated liquid handlers are often ubiquitous in high-throughput and databasing laboratories. However, in forensic laboratories that handle crime-scene evidence, smaller automated instruments are preferred. In this study, we sought to validate the use of the Promega DNA IQ™ Casework Sample Kit on the Maxwell® 16 instrument for automated DNA extraction. Comparison was made to the conventional organic DNA extraction. Cross-contamination studies were also performed to ensure no detectable level was observed with the automated method.

Commonly encountered forensic exhibits with an expected high DNA yield were identified to be ideal for automated extraction. These included blood samples, cigarette butts and tissue samples. To demonstrate sensitivity, DNA was extracted from blood samples of various concentrations on cotton swab and blood stain on cotton cloth of different sizes. Organic extraction generally yielded more DNA. Complete short tandem repeat (STR) profiles were obtained for most of these DNA samples when genotyped except when the DNA yield was too low. For the Maxwell® 16 system, since DNA yield is dependent on the binding capacity of the DNA IQ™ paramagnetic beads, samples of the appropriate size or volume should be used for DNA extraction to avoid over-saturation of the beads.

DNA was also extracted from bloodstains on different substrates, cigarette butts and tissue samples. No DNA was extracted from blood stains on soil using either method. Correspondingly, no profile was obtained for either method. Only a minute quantity was extracted from blood stains on denim substrate using both methods. This translated to 20% success rate of obtaining a DNA profile from blood-stained denim using organic extraction, and 0% with automated extraction. The Maxwell® 16 method also seemed less suited for DNA extraction from blood stains on leather as mostly partial STR profiles were obtained. The results are attributed to inhibitors present in the respective substrates. For tissues, the optimal size for automated DNA extraction was found to be approximately 20 mg and complete STR profiles were obtained from 82% of the tissue samples. The DNA profiles obtained were in concordance with those obtained previously by organic extraction.