

AUTOMATED DNA EXTRACTION FROM FORENSICS SAMPLES USING CHARGESWITCH® TECHNOLOGY AND THE NEW INVITROGEN IPREP INSTRUMENT

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Isolation of DNA from a crime scene or reference sample is the starting point for many forensics identification methods, including the commonly used short tandem repeat (STR) analysis. High quality DNA is required for analysis, often from very small amounts of starting material that may have deteriorated due to environmental exposure. Furthermore, the increased use of STR analysis for identification means that forensics laboratories are receiving rapidly increasing numbers of samples for which time consuming DNA extractions must be carried out. ChargeSwitch® Technology (CST) is a new, simple nucleic acid purification method that provides maximal DNA recovery, even when working with very small quantities of starting material. The technology is based on the concept of chemical pKa. DNA is bound to magnetic beads at low pH (pH 4) using optimized buffers, impurities are washed away and highly pure DNA is eluted in standard Tris-EDTA at pH 8.5. ChargeSwitch® purification uses 100% aqueous-based buffers that do not introduce PCR inhibitors or hazardous chemicals such as chaotropic salts and ethanol to the purification process. The iPrep™ purification instrument now combines the advantages of the ChargeSwitch technology with the reliability of automation. The iPrep™ instrument is a small benchtop instrument that uses pre-filled reagent cartridges and a standardized protocol to extract DNA from forensics samples. The instrument allows genomic DNA extraction of up to 12 samples, plus a positive control, in approximately 20 minutes. Tube transfers can be tracked using a barcode reader that records the position of both sample and elution tubes. The performance of the iPrep™ purification instrument, iPrep ChargeSwitch Forensic kit and iPrep™ ChargeSwitch Buccal kit was evaluated for a wide range of case work samples including blood spots, saliva, buccal swab, hair and various sweat and touch samples. STR analysis was performed on the extracted DNA and the success rate compared to DNA extractions performed using a silica bead based DNA extractor, silica spin columns and organic extraction. The success rate for DNA purified using the iPrep™ purification instrument were comparable to or better than the above mentioned comparison techniques. DNA extraction was highly reproducible with a coefficient of variation (CV) of between 2% - 5% for pooled samples. The iPrep™ purification instrument was examined for evidence of cross-contamination and none was detected. Use of the iPrep™ purification instrument, together with iPrep ChargeSwitch Forensic kit and iPrep™ ChargeSwitch Buccal kit, has been shown to increase the STR success rate of several types of low quantity starting material, increase standardization and eliminates labor intensive steps of the DNA purification process.