

ASSESSMENT OF THE RapidHIT™ 200 HUMAN DNA IDENTIFICATION SYSTEM WITH SIMULATED CASEWORK SAMPLES

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The field of forensic biology over the last decade has advanced tremendously to the current state whereby DNA profiling is often (though inappropriately) regarded as a magic bullet in crime solving. The latest generation of megaplex PCR kits is able to simultaneously amplify 24 loci, giving unprecedented power of discrimination. The new capillary electrophoresis (CE) platforms are more sensitive and of higher throughput, supporting simultaneous detection of 24 samples. This powerful tool of DNA profiling and matching with convicted offender databases has to evolve in a new direction – speed. The value of our work cannot simply be determined by the amount of information we can get. Rather, it must also be in a timely fashion.

Current procedures in most forensic DNA laboratories still require over 8 hours for DNA extraction, quantification, amplification, CE detection. A new platform developed by IntegenX Inc. combines all these 4 processes into a single-use disposable cartridge with a total processing time of only 2 hours. This RapidHIT™ 200 Human Identification System is designed to simultaneously process up to 7 reference buccal swabs. The buccal swabs are placed into the cartridges and the entire process requires no human intervention from DNA extraction through to capillary electrophoresis and allele calling.

In our study, a variety of different samples (touch samples, blood mixtures, cigarette butts) were prepared in pairs and processed using both the RapidHIT™ 200 instrument and the laboratory validated method (Promega DNA-IQ technology on Maxwell-16 instrument). Admissibility of DNA profiles for Court use in US and European jurisdictions often requires the DNA profiling process to be performed by an accredited forensic laboratory. As the RapidHIT™ 200 instrument was designed for use by law enforcement officials in non-laboratory settings, this study also explored the possibility of recovering the samples from the disposable cartridges for re-processing within our laboratory using validated methods.

The DNA profiles obtained from the various methods were assessed for their quality (stutters, peak heights, morphology) and percentage recovery of alleles and loci. The results of this study showed that the RapidHIT™ 200 instrument could readily handle blood mixtures and cigarette butts, but the performance with touch samples was highly variable. Additional tests have also shown the RapidHIT™ 200 instrument to perform well with buccal swabs, FTA punch discs, and bone marrow samples.