



Rapid Human Identification: The RapidHIT 200

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INTRODUCTION

The forensic science community has been effectively analyzing targets in the human genome for identification purposes for more than twenty years using traditional methods of PCR amplification and array-based capillary electrophoresis Short tandem repeats (STR) along with a gender-determining marker serve as the target. Emerging technologies offer the ability to advance the speed and mobility of the STR analysis process. One such platform is the RapidHIT 200 system from IntegenX., which combines the tasks of cell lysis, DNA extraction, purification, quantification, amplification, and capillary electrophoresis into one bench-top unit that generates a profile in less than 90 minutes. Samples taken from people or crime scenes can be processed with minimal hands-on involvement. In the long-term, the instrument is targeted for use in police stations where initial testing could be compared to local, state, and federal databases. We evaluated the RapidHIT 200 in our laboratory to form an initial determination of instrument suitability for validation and use by the forensic science community.



DNA:SI LABS™
FORENSIC DNA SERVICES

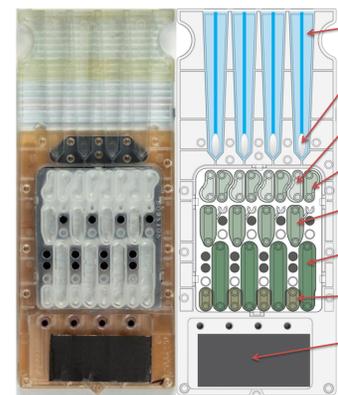
EXPERIMENTAL DESIGN

Twenty fresh buccal swabs with known DNA profiles having ten or more heterozygote loci were used to assess potential contamination from chamber-to-chamber within each run and contamination between consecutive runs. This was done by alternating the arrangement of swabs and blanks in the cartridges. The five best profiles from the contamination study were run eight more times to assess the reproducibility of profiles generated under optimal conditions. The known profiles were then compared to the Rapid-generated profiles for assessment of concordance. The data was used to evaluate system performance and establish an initial estimate of an appropriate analytical threshold for use during interpretation of the STR profiles.

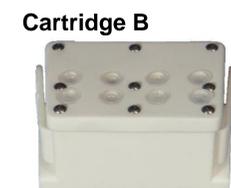
THE INSTRUMENT



The RapidHIT 200 is a desk-top instrument that takes up roughly the same amount of space as a printer.



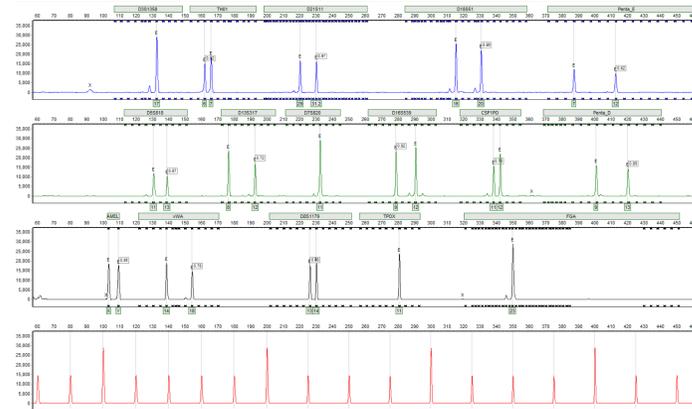
- Swab Chamber
 - Cell Lysis
 - Wash Solution
 - Elution Solution
 - Magnetic Beads
 - Lysis Buffer/Waste
 - Size Standard (ILS600)
 - STR PCR Reaction
- Sample and control cartridges contain Promega DNA IQ Extraction and Purification reagents
- Promega PowerPlex 16HS Multiplex



Reagent Cartridges	
Cartridge A	Cartridge B
Polymer	Supplies CE buffer
Buffer	Water
EEPROM	EEPROM
Capillary Port	Final destination of PCR product
Anode	

DATA ANALYSIS AND RESULTS

RapidHIT 200 Electropherograms Using GeneMarker 2.4



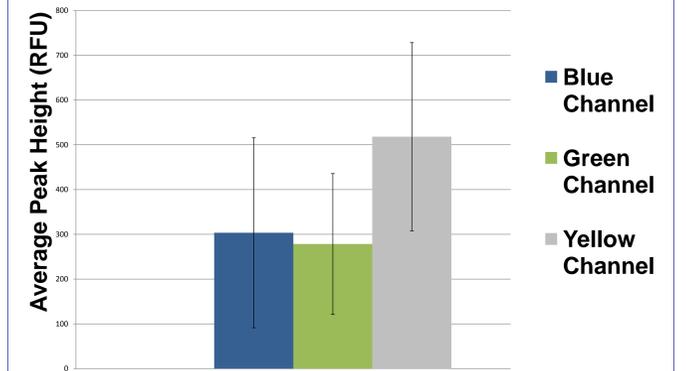
Suggested Analytical Thresholds
(Twice the Upper Bound of the Variance)

Blue Channel	1000
Green Channel	900
Yellow Channel	1500

Summary of All Sample Data

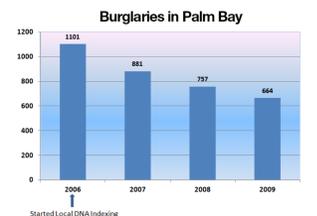
Average Height	Average Height Ratio
14099	0.81
Average Area	Average Area Ratio
128034	0.84

Maximum Peak Height of Negative Control Dye Channels



Bottom Line

- No signs of chamber-to-chamber or run-to-run contamination.
- Preliminary concordance information shows 100% matches between samples and known profiles.
- System is able to correctly call micro-variant alleles.
- Positive control gave correct profile 100% of the time with no observed contamination.
- Peak height ratios of 80% or better are comparable to other STR analysis technologies.
- Upon manual analysis with GeneMarker 2.4, 98.6% of all samples ran successfully (2239/2240 alleles, or 99.96%).
- Analytical threshold can be applied on a channel-by-channel basis.
- Currently being used in Palm Bay Police Department on casework samples and has successfully reduced their property crime rate.



CONCLUSION

The RapidHIT 200 HID System performs comparably to other STR analysis technologies. The data is able to be uploaded to local CODIS-like databases.

Negative controls do not show signs of contamination and the positive control was reproduced over 16 runs. A total of 69/70 samples (2239/2240 alleles) produced 100% concordant profiles with known profiles.