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Computer Interpretation of RapidHIT Mixtures for DNA Match Information

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Criminalistics Section

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Disclosure

The views and opinions expressed in this presentation are those of the presenters & authors and do not represent any official views or opinions of the American Academy of Forensic Sciences.

Some authors are employed by Cybergenetics.

We show the TrueAllele® evidence interpretation technology developed by Cybergenetics.

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RapidHIT™ ID (Applied Biosystems™)

- Produces a DNA profile in as little 90 minutes
- Swab in, profile out workflow (Lab in a box)
- Originally intended for offender reference samples in booking stations



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RapidINTEL Plus Cartridge

- Designed for forensic purposes
- GlobalFiler™ Express Chemistry
- Contains internal quality control and quantification markers

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Louisiana State Police Crime Lab- Investigative Leads Rapid Program

<p>March 2024</p> <p>Purchase and installation of RapidHIT ID Instruments</p>	<p>August 2024</p> <p>RapidINTEL Plus Cartridge Validation</p>	<p>July 2025</p> <p>Achieved Scope Extension from ANAB</p>
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Protocols

15µl of each saliva mixture were spotted on two different substrates in triplicate and were processed with the **General Protocol** and the **Specialized Protocol**:

Cotton Swabs

Flocked Swabs

NDIS Submission

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- Partnered with other partner laboratories to seek FBI approval for the RapidINTEL Plus cartridge
- A mixture study was performed by LSP in which saliva samples were collected from donors and combined to simulate mixtures with various proportions.

Mixture	Minor Donor (male)	Major Donor (female)
1:1	75µl	75µl
1:4	30µl	120µl
1:9	15µl	135µl

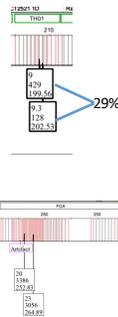
Data Interpretation

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During the process of validation and data interpretation, what did we learn?

- Heterozygous imbalance >40%
- Stochastic effects are common
- Can exhibit high rates of random PCR artifacts

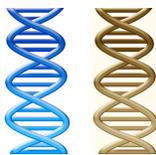
LSP decided not to pursue mixture interpretation at that time.



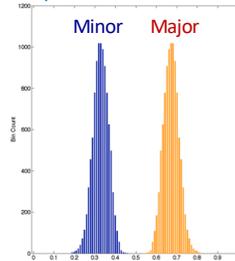
DNA Mixtures

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DNA mixed together from multiple people



Contributor genotypes separated from DNA data



Perlin MW, Szabady B. Linear mixture analysis: a mathematical approach to resolving mixed DNA samples. *Journal of Forensic Sciences*. 2001;46(6):1372-7.

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TrueAllele® Technology

Visual User Interface
VUI™ Software



Parallel Processing
Server Computer



Separates data into genotypes
all data, no thresholds,
solves 10 contributors

Probability represents uncertainty
accurate and unbiased

Likelihood ratio match statistic
measures identification information

Automated computer workflow
no calibration, learns from data

Perlin MW, Legler MM, Spencer CE, Smith JL,
Allan WP, Belrose JL, Duceman BW.
Validating TrueAllele® DNA mixture interpretation.
Journal of Forensic Sciences. 2011;56(6):1430-47.

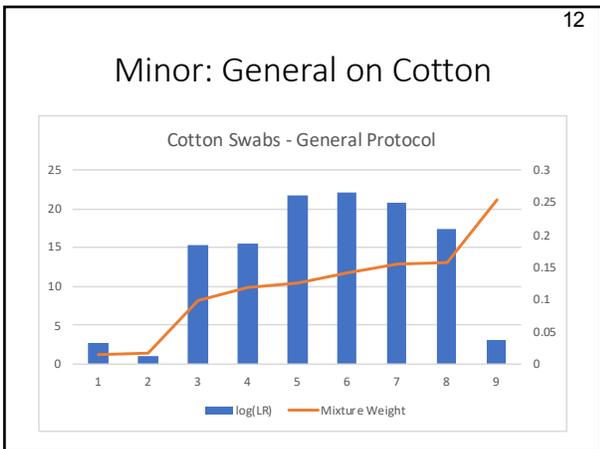
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TrueAllele on Rapid Mixtures

Cybergenetics ran TrueAllele on LSP Rapid mixture data

Time: 30 minutes (short triplicate computer runs)

Information:
Major contributors easily identified (24 ban)
Minor contributors
10% to 20% minor components (15 ban)
1% to 5% minor components (6 ban)
better with specialized-flocked protocol



Minor: Specialized on Flocked



Conclusions

On RapidHIT two-person saliva mixtures:

1. TrueAllele is fast and informative
2. Handles small minor contributors
3. No instrument calibration needed
4. Users can get started right away

More information

<http://www.cybgen.com/information>



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<http://www.youtube.com/user/TrueAllele>
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