The Way Forward in the UK

TrueAllele® Workshop
April, 2013
Leicestershire, United Kingdom

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Cybergenetics, Pittsburgh, PA

Cybergenetics

TrueAllele mixture validation: Virginia case study

Establish the reliability of TrueAllele mixture interpretation

Mark W Perlin, PhD, MD, PhD
Kiersten Dormer, MS and Jennifer Hornyak, MS
Cybergenetics, Pittsburgh, PA

Lisa Schiermeier-Wood, MS and Susan Greenspoon, PhD
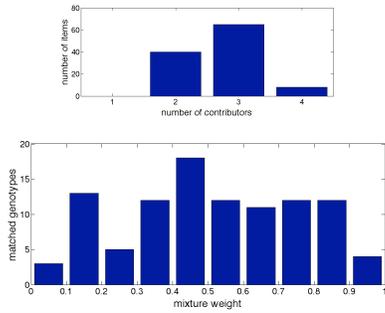Department of Forensic Science, Richmond, VA

Case composition

- 72 criminal cases
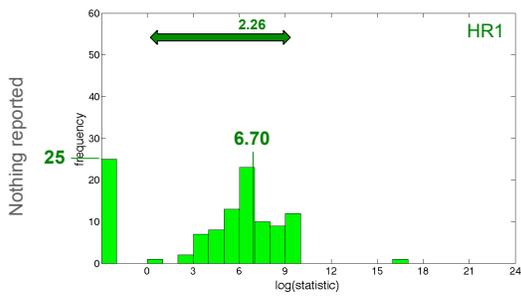- 92 evidence items
- 111 genotype comparisons

Criminal offense
- 18 homicide
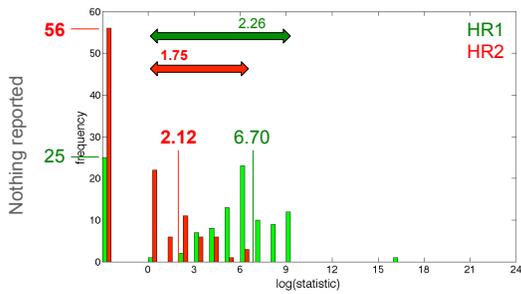- 12 robbery
- 6 sexual assault
- 20 weapon

DNA mixture distribution

Human review information

2010 guidelines: modified human review information

TrueAllele reinterpretation

The Washington Post

Virginia reevaluates DNA evidence in 375 cases
July 16, 2011

"Mixture cases are their own little nightmare," says
William Vosburgh, director of the D.C. police's crime
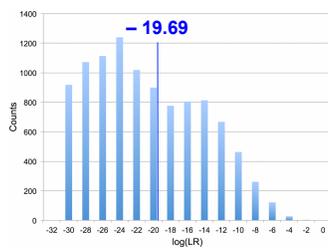lab. "It gets really tricky in a hurry."

"If you show 10 colleagues a mixture,
you will probably end up with 10 different answers"
Dr. Peter Gill, Human Identification E-Symposium, 2005
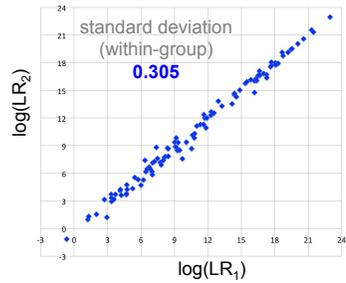

TrueAllele sensitivity
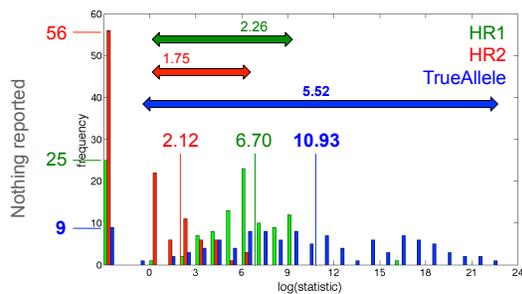
TrueAllele specificity

True exclusions, without false inclusions

TrueAllele reproducibility

Concordance in two independent computer runs

standard deviation
(within-group)
0.305

$\log(LR_2)$ vs $\log(LR_1)$

Validation results

TrueAllele® Casework DNA mixture interpretation is:

A reliable method
- sensitive
- specific
- reproducible

TrueAllele computer genotyping is
more effective than human review

TrueAllele Virginia outcomes

144 cases analyzed
72 case reports – 10 trials

City	Court	Charge	Sentence
Richmond	Federal	Weapon	50 years
Alexandria	Federal	Bank robbery	90 years
Quantico	Military	Rape	3 years
Chesapeake	State	Robbery	26 years
Arlington	State	Molestation	22 years
Richmond	State	Homicide	35 years
Fairfax	State	Abduction	33 years
Norfolk	State	Homicide	8 years
Charlottesville	State	Homicide	15 years
Hampton	State	Home invasion	5 years

TrueAllele in Virginia

- Department of Forensic Science has their own TrueAllele system
- Training, validation, approvals
- Services centralized in Richmond
- DFS will provide DNA mixture statistics and court testimony

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Perlin MW, Belrose JL, Duceman BW. New York State TrueAllele® Casework validation study. *Journal of Forensic Sciences*. 2013;58(6):in press.

TrueAllele in New York
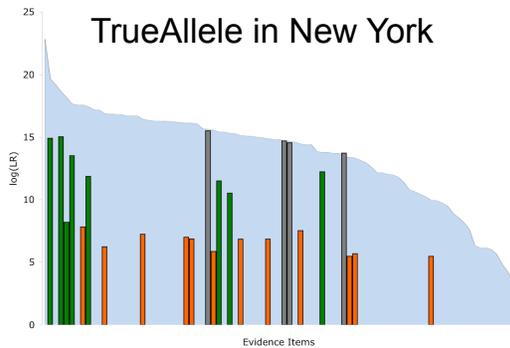
TrueAllele in the United States

Casework system
Interpretation services
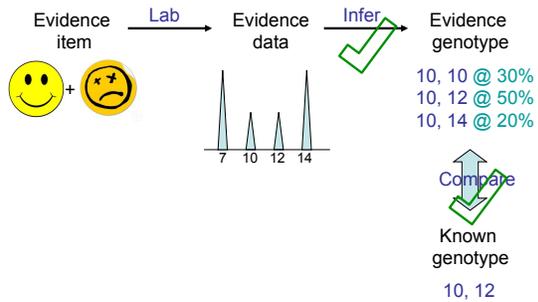
TrueAllele in the United Kingdom

2000: FSS & TrueAllele Databank

• first fully automated DNA expert system
• for reference samples only
• *faster*: eliminated 350,000 item backlog
• *better*: eliminated human error of 0.05%
• *cheaper*: eliminated 100 jobs

2010: PSNI & TrueAllele Casework
• match stats for complex DNA evidence
• 3-4 person DNA mixtures
• low-template & degraded DNA

DNA Pathway Restored

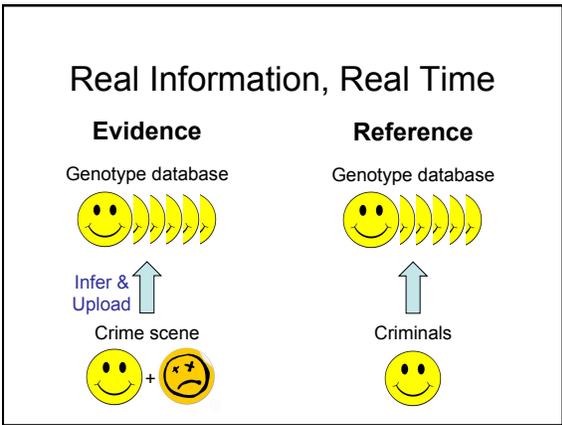Evidence item → Lab → Evidence data → Infer → Evidence genotype

10, 10 @ 30%
10, 12 @ 50%
10, 14 @ 20%

7 10 12 14

Compare

Known genotype

10, 12

TrueAllele Applications

• murder
• rape
• gangs
• terror
• IEDs

• cold cases
• DVI
• property crime
• prevention

Real Information, Real Time

Evidence

Genotype database

Infer & Upload

Crime scene

Real Information, Real Time

Evidence   Reference

Genotype database   Genotype database

Infer & Upload

Crime scene   Criminals

Real Information, Real Time

Evidence   Reference

Genotype database   Genotype database

Match & Report

Infer & Upload

Crime scene   Criminals
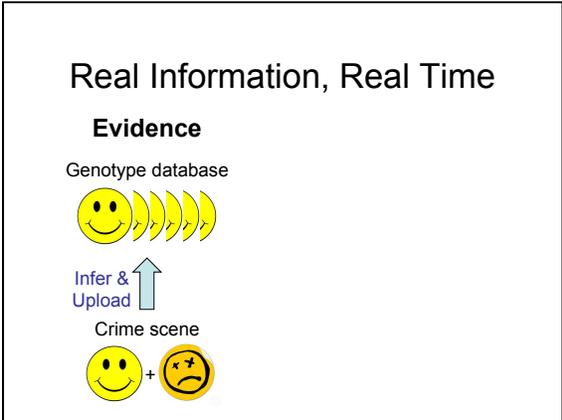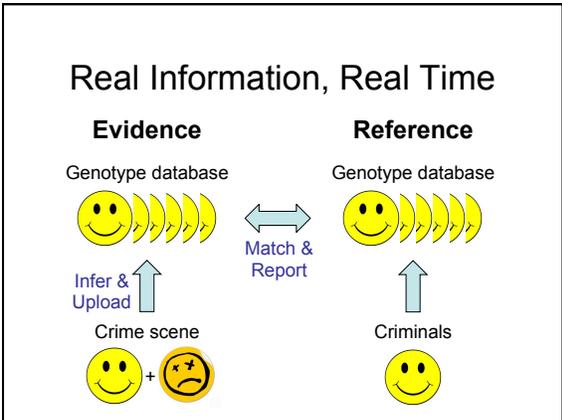
Continuous Crime Scene Mapping

Suspects: S1, S2, S3, S4, S5

Food mart
• gun
• hat

Market
• hat 1
• hat 2
• overalls
• shirt

Jewelry
• counter
• safe

Hardware
• safe
• phone

Convenience
• keys
• tape
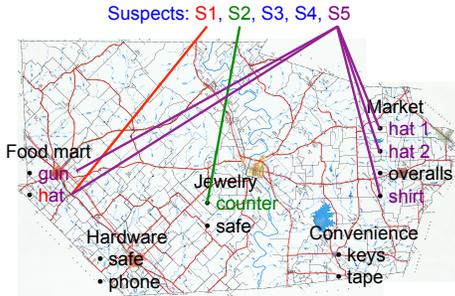
TrueAllele Deployment

• in the cloud
   (Cybergenetics service)

• in your station or laboratory
   (Cybergenetics product)

Police Empowerment

• TrueAllele-led DNA investigation
• solve challenging DNA evidence
• train TrueAllele police personnel

• accurate DNA interpretation
• faster turnaround
• less human effort
• consistent answers

• preserve identification information
• DNA evidence within cases
• automated investigative database

Getting Started

http://www.cybgen.com/support

Sending Data

Cybergenetics uses the following information when processing your laboratory case data.

1. DNA process. Please give us some background information about your laboratory process, including DNA sequencer, STR kit, allelic ladder, size standards, positive and negative controls.

2. Evidence items. For each case, please list the case name, DNA items, and their amplifications. Please specify which data are of most interest to you.

3. References. Please provide known crime scene related DNA reference genotypes (e.g., victim, elimination). Such scene-related references can help infer informative genotypes from the evidence data. You can send either data or tables.

4. Suspects. Please provide suspect genotypes for comparison purposes. To ensure complete objectivity, we only use a suspect *after* genotype inference, solely to compute a likelihood ratio (LR) DNA match statistic. You can send either data or tables.

5. Populations. What population databases do you use for reference? If

Moving Forward

• Send one case (no cost)
• Discuss match results
• Assess TrueAllele value
• Identify additional cases
• Determine business case
• Rent or buy technology
• Training and support

Cybergenetics

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