

The DNA Information Pathway

TrueAllele® Workshop
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Leicestershire, United Kingdom

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Cybergenetics

Cybergenetics © 2003-2013

Identification

Evidence
item



Known
reference

DNA Identification

Evidence
item



Lab

Evidence
data



Infer

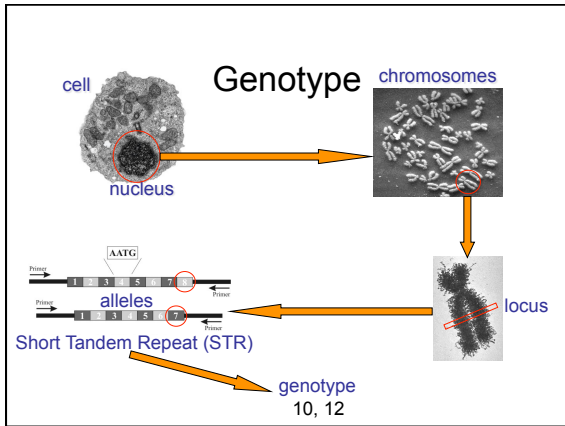
Evidence
genotype

10, 12



Known
genotype

10, 12

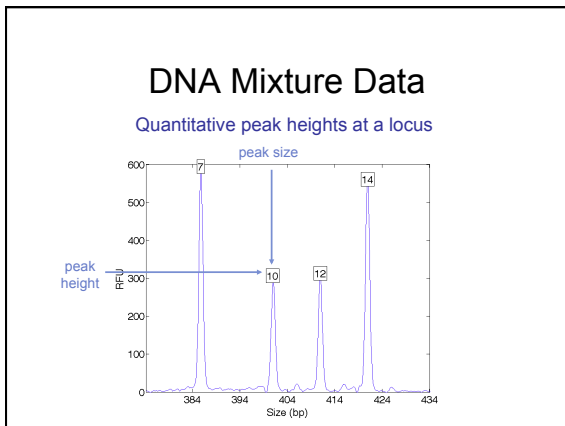


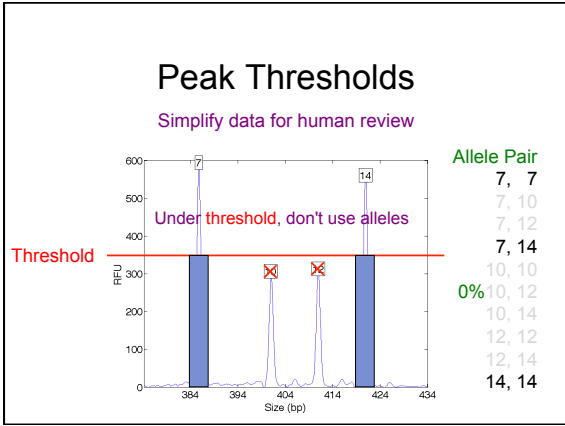
Match Information

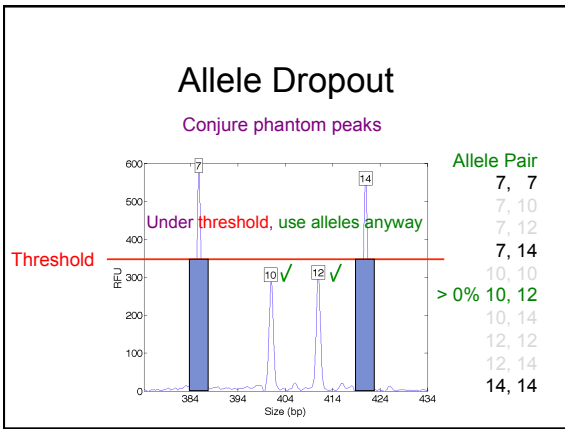
At the suspect's genotype, identification vs. coincidence?

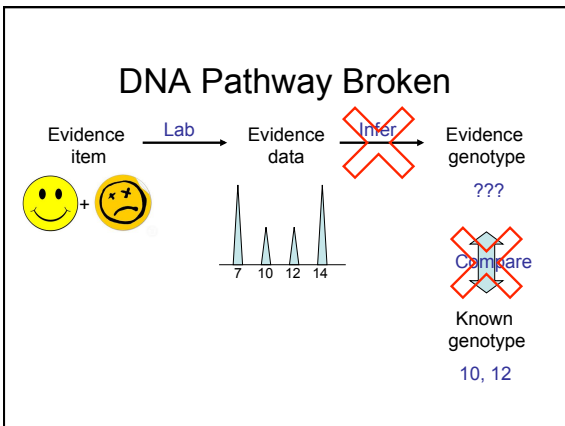
after (evidence) data before (population)

$$\frac{\text{Prob}(\text{evidence matches suspect})}{\text{Prob}(\text{coincidental match})} = \frac{100\%}{5\%} = 20$$









Human Interpretation Issues

Evidence

- call good data inconclusive
- peaks are too low for them
- too many contributors to handle
- potential examination bias

Database

- hit by association, not by match
- comparison: make false hits
- restrict upload: lose true hits

TrueAllele® Casework

Evidence

- preserve data information
- use all peaks, high or low
- any number of contributors
- entirely objective, no bias

Database

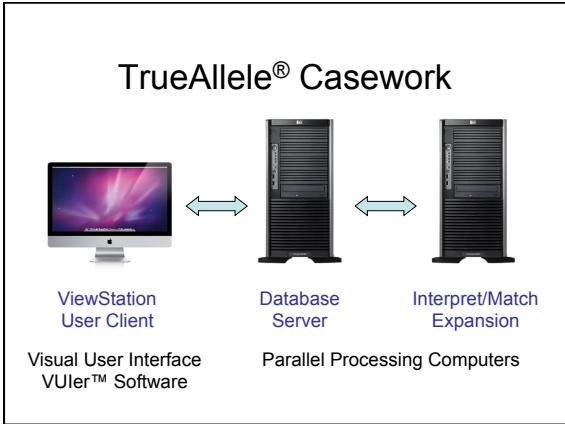
- hit based on LR match statistic
- sensitive: find true hits
- specific: only true hits

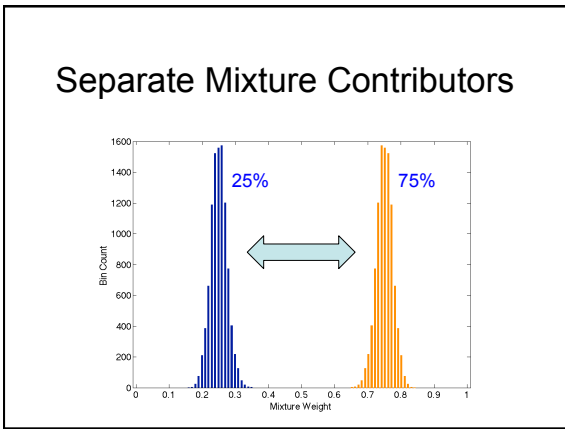
Validation Studies

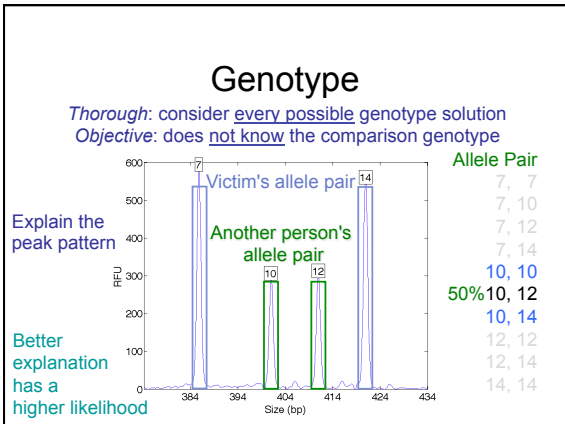
Perlin MW, Sineelnikov A. [An information gap in DNA evidence interpretation](#). *PLoS ONE*. 2009;4(12):e8327.

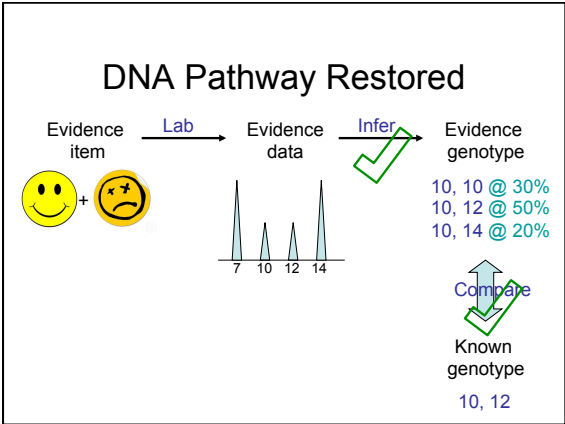
Perlin MW, Legler MM, Spencer CE, Smith JL, Allan WP, Belrose JL, Duceman BW. [Validating TrueAllele® DNA mixture interpretation](#). *Journal of Forensic Sciences*. 2011;56(6):1430-47.

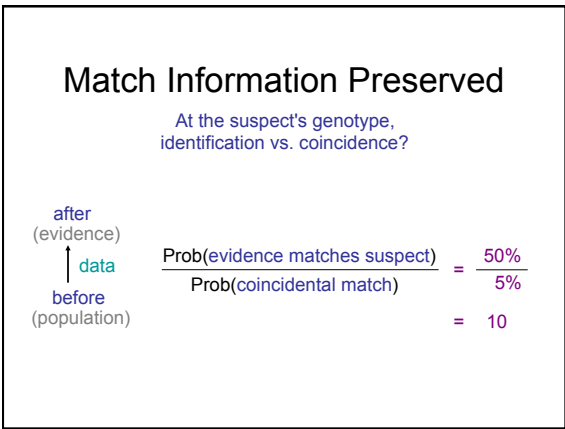
Perlin MW, Belrose JL, Duceman BW. [New York State TrueAllele® Casework validation study](#). *Journal of Forensic Sciences*. 2013;58(6):in press.











Massereene Barracks Attack

March 7, 2009 in Antrim, Northern Ireland

Homicide victims

Patrick Azimkar Mark Quinsey

Real Irish Republican Army claimed responsibility

Abandoned Burned Car



Touch DNA Evidence



passenger side
safety belt buckle

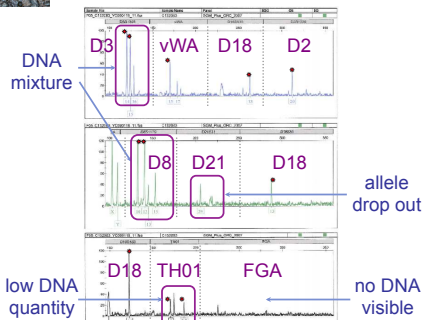


cell phone in
center console



match stick
at side of road

Data Ambiguity



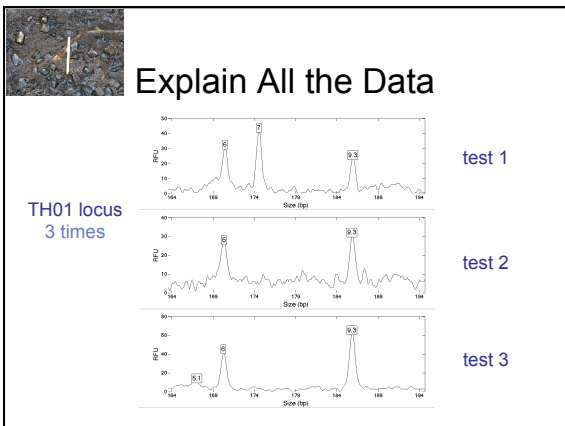
Much Data, Little Consensus No Match Statistic

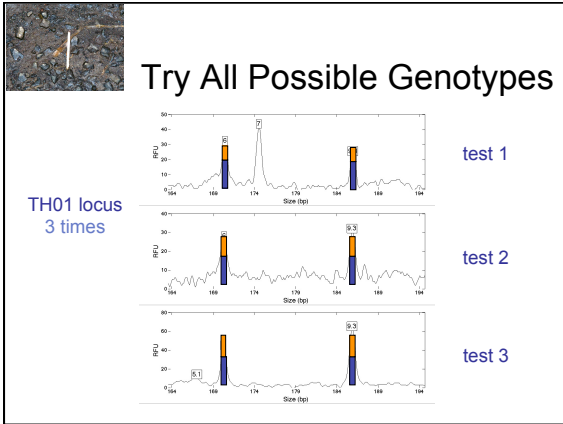
Brian Shivers *

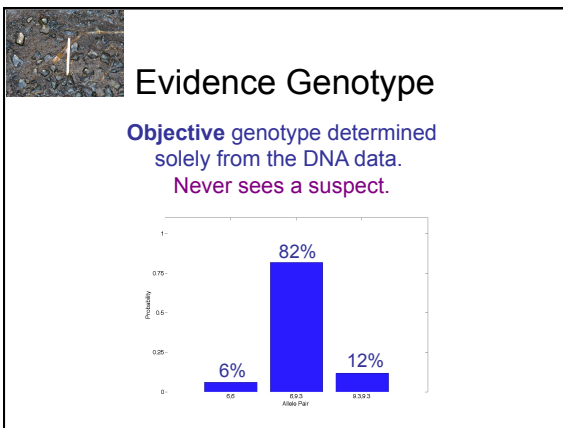
a b c

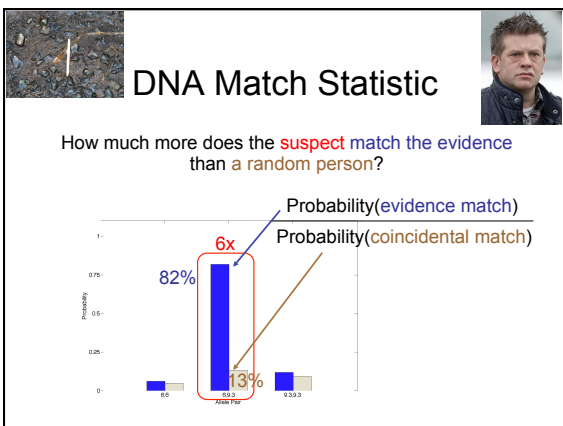
Combine DNA Evidence

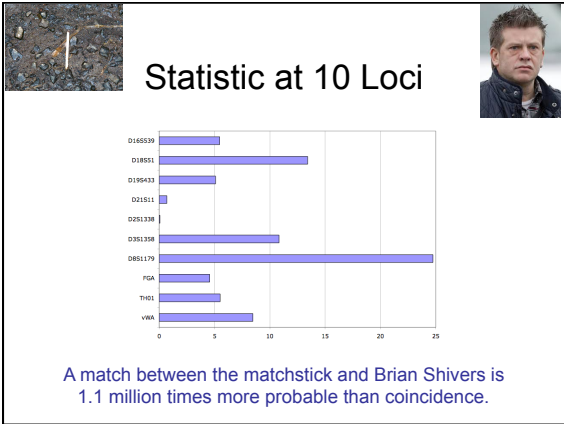
data	singles	pairs	all three
a	1.40 a 25	2.75 a b 560	
b	1.43 b 27	4.60 a c 40,000	6.04 a b c 1.1 million
c	0.75 c 6	4.42 b c 26,000	
STR tests	10	20	30

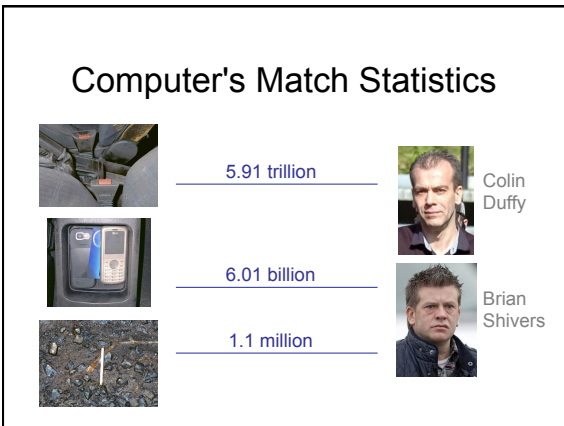












Admissibility Ruling

December 1, 2011
The Honorable Mr. Justice Hart

18 page ruling on TrueAllele, concluding:

I am satisfied that the stage has now been reached in the case of this system where it can be regarded as being reliable and accepted, and I am satisfied that Dr Perlin has given his evidence in a credible and reliable fashion. In the light of these conclusions I can see **no basis on which I could properly exercise my discretion ... to exclude this evidence**, and I therefore **admit it in evidence**.

THE HUFFINGTON POST

UNITED KINGDOM 

DNA Techniques Used In Massereene Conviction Could Pave Way For Future Trials



A pioneering method of genetic analysis could have major implications in future UK trials after helping to deliver a conviction in the Massereene Baracks murder case.

The high-profile case in Antrim saw a pioneering method of analysing genetic samples recovered from a crime scene accepted in a British courtroom for the very first time, opening the way for its use in future trials.

The computer-based statistical technique has emerged as an alternative to the long-established human review process in the last decade.

The True Allele casework system, developed by American scientist Dr Mark Perlin, has been used to examine samples containing mixed DNA traces when traditional lab analysis failed to identify a clear genetic profile of an individual.

After interpreting the sample, Dr Perlin's computer programme derives a likelihood ratio on whether the profile obtained matches a suspect or victim.

Photo: Paul Gilford/PA Wire. Updated 2011. PUBLISHED 2011. HUFFINGTON POST

World Trade Center Attack

September 11, 2001 in New York City, USA



Over 2,700 victims



al-Qaeda claimed responsibility

Identify Victim Remains

biological material



Identify Missing People

biological material

personal effects



family references



Match Biological Material

victim remains

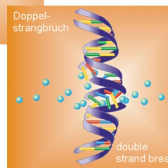
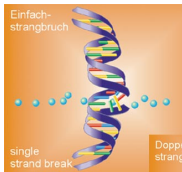
missing people



match



Damaged Victim Remains



TrueAllele in Criminal Trials

Over 100 case reports filed on DNA evidence

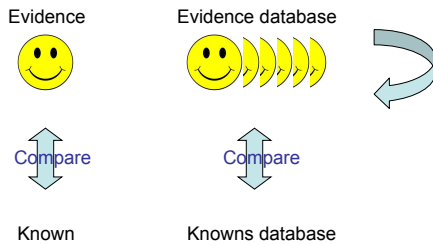
Court testimony:

- state
- federal
- military
- foreign

Crimes:

- armed robbery
- child abduction
- child molestation
- murder
- rape
- terrorism
- weapons

TrueAllele Information Pathway





Magazine Reading

Perlin MW. [Forensic science in the information age](#). *Forensic Magazine*. 2012;9(2):17-21.

Perlin MW, Galloway J. [Computer DNA evidence interpretation in the Real IRA Massereene terrorist attack](#). *Evidence Technology Magazine*. 2012;10(3):20-23.

Perlin MW. [Easy reporting of hard DNA: computer comfort in the courtroom](#). *Forensic Magazine*. 2012;9(4):32-37.



Book Chapters

Perlin MW, [DNA identification science](#), in *Forensic Sciences*, Wecht CH, editor. Albany, NY: LexisNexis® Matthew Bender®; 2012; Chapter 37C.

Perlin MW, [The Blairsville slaying and the dawn of DNA computing](#), in *Death Needs Answers: The Cold-Blooded Murder of Dr. John Yelenic*, Niapas A, New Kensington, PA: Grelin Press, 2012.

Human-Computer Partnership

Objective, reliable truth-seeking computer

- solves the DNA mixture problem
- handles low-copy and degraded DNA
- provides accurate DNA match statistics
- automates DNA evidence interpretation

Current TrueAllele applications

- eliminate DNA backlogs
- reduce forensic costs
- solve crimes
- find criminals
- convict the guilty
- free the innocent
- create a safer society

More Information

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

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- Newsletters
- Newsroom
- Presentations
- Publications



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