

Exonerating the Innocent with Probabilistic Genotyping

Mid-Atlantic Association of Forensic Scientists
Annual Conference
May, 2019
Morgantown, WV



Cybergenetics

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DNA Evidence

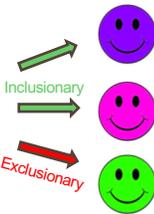
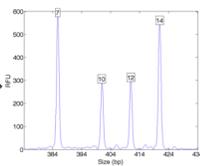
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DNA can link evidence or a place to a person

Evidence

DNA data

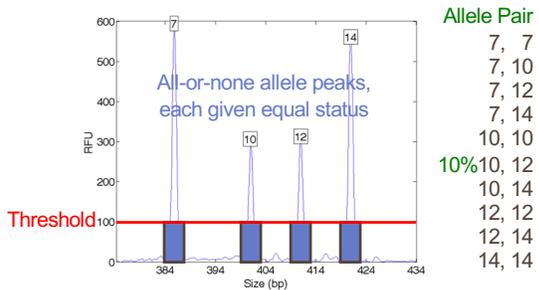
Match statistics



Human Interpretation

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Over **threshold**, peaks are labeled as allele events



Threshold Issues - Casework 7

False inclusions in casework with human review
Ten comparisons with no statistical support:

TrueAllele	Interpretation Method		Data Observations					
	CPI	mCPI	allele dropout	allele overlap	low peaks	peak imbalance	infeasible mixture	infeasible pattern
-10.64			3	4	1			1
-6.52			4	3	1			1
-5.05			4	3	1	1		1
-4.87			3			1	1	1
-4.86	3.48		4		1		1	
-3.22	6.04	6.34		2			1	1
-2.99	4.23		2		1		1	1
-2.18			2		1		1	
-1.41	4.08		1		1		1	
-0.67	2.95	0.60	1	2	1			

Non-valid Scientific Method 8

Threshold methods cannot work

J Pathol Inform Editor-in-Chief: Lisa Fitzpatrick, Pittsburgh, PA, USA
OPEN ACCESS HTML format

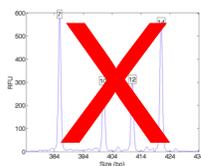
Research Article
Inclusion probability for DNA mixtures is a subjective one-sided match statistic unrelated to identification information
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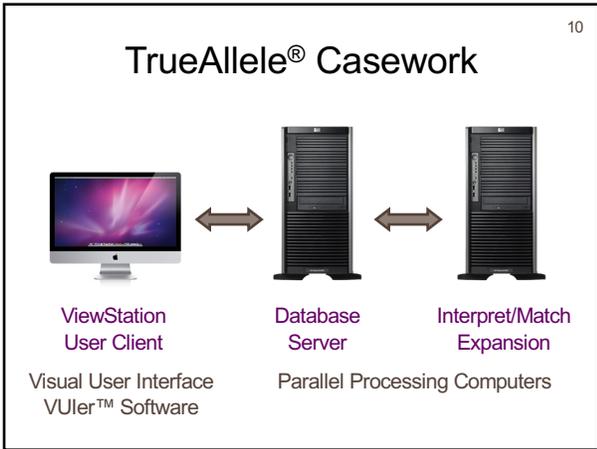
Received 18 July 2015 Accepted 21 September 2015 Published 28 October 2015

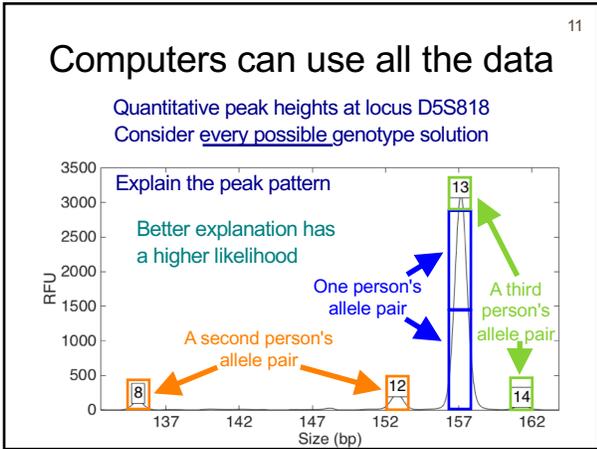
Abstract
Background: DNA mixtures of two or more people are a common type of forensic crime scene evidence. A match statistic that connects the evidence to a criminal defendant is usually needed for court; jurors rely on this strength of match to help decide guilt or innocence. However, the reliability of unsophisticated match statistics for DNA mixtures has been questioned. **Materials and Methods:** The most prevalent

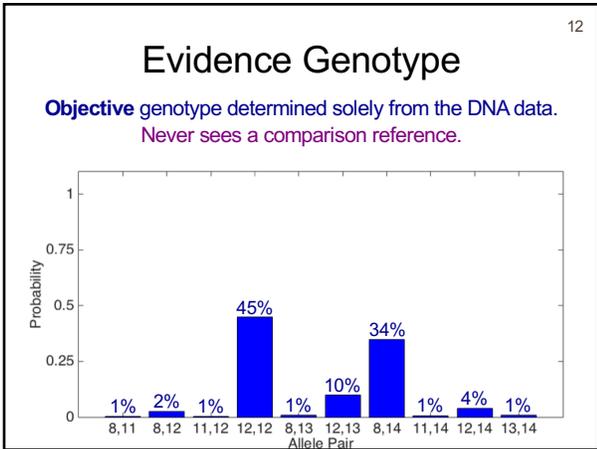
False convictions 9

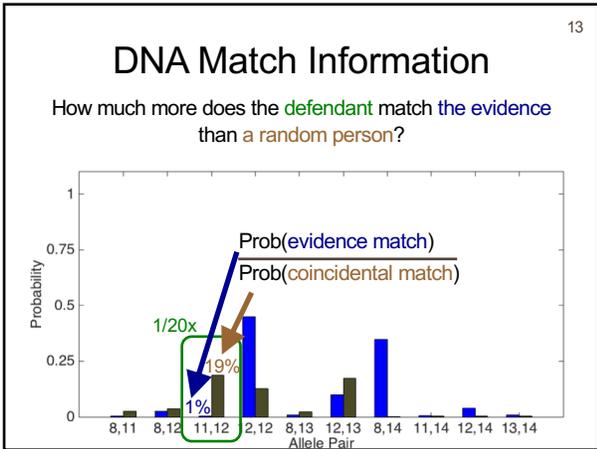
Good DNA data, failed interpretation
Result: People stayed in jail











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Is the reference in the evidence?

Calculated at all loci tested

A match between the **evidence** and **the reference** is:

1.1 million times **less** probable than a coincidental match to an unrelated African-American person

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TrueAllele Exclusions

Five exonerations

- Indiana v. Darryl Pinkins
- Indiana v. Roosevelt Glenn
- Montana v. Paul Jenkins
- Montana v. Fred Lawrence
- Georgia v. Johnny Lee Gates

Other cases

- Connecticut v. Michael Ciannella, Jr.
- Idaho v. Christopher Tapp
- Pennsylvania v. Joshua Huber

Indiana v. Darryl Pinkins and Roosevelt Glenn

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1989 – 5 men raped an Indiana woman
Darryl Pinkins and 2 others misidentified
1991 – wrongfully convicted, 65 year sentence

2001 – DNA mixture evidence 2 contributors found,
not the accused
but 5 were needed, post-conviction relief denied



Computer Analysis

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The TrueAllele computer:

1. compared *evidence with evidence*
2. calculated *exclusionary match statistics*
3. revealed 5% *minor mixture contributor*
4. *jointly analyzed DNA mixture data*
5. showed three perpetrators were *brothers*

found 5 unidentified genotypes,
defendants not linked to the crime

Pinkins exonerated

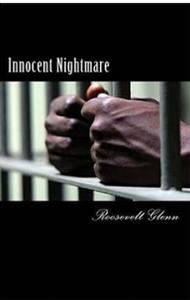
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Glenn exonerated

January 30, 2017

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Montana v. Fred Lawrence and Paul Jenkins

1994 – murder, 2 men accused
 Jailhouse “snitch” testifies against them
 At trial, no physical evidence presented connecting either man to the crime

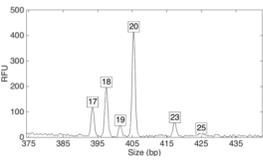
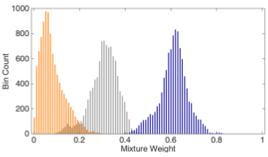
2015 – petitions for DNA testing submitted
 Ligatures from crime scene tested
 – minor component inconclusive




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Computer Analysis

TrueAllele used all of the data
 to separate the mixture in to 3 contributors

DNA Hit

Database hit to major component – David Nelson
Had confessed the homicide to his nephew shortly after crime



TrueAllele results

Jenkins and Lawrence excluded,
two unknown contributors found

Description	Fred Lawrence	Victim	Paul Jenkins
ligature	one in 722 billion	11.4 quadrillion	one in 157 thousand

Reported unknown major contributor matches David Nelson
Additional unknown 8% contributor found

Case Outcome

April 13, 2018 – Lawrence and Jenkins release from prison



Photo: Joe Lawrence, center, walking out of Montana State Prison with his lawyers, Toby Cook, left, and Larry Marshall of the Montana Innocence Project. Photo by Thomas Frank

Georgia v. Johnny Lee Gates

1976 – woman raped and murdered
 1977– Gates admits to murder after brought to crime scene
 Convicted and sentenced to death

2015 – two evidence items found not destroyed by state
 Bathrobe belt and necktie used to bind victim
 Degraded mixtures of 3 or 4 people – inconclusive results



Post-conviction Hearing

- May 2018 hearing:
- Dr. Mark Perlin testified about the TrueAllele results
 - Inconclusive results with human interpretation are now exclusionary match statistics
 - The crime laboratory supported the findings



TrueAllele Analysis

Gates excluded, 6 unknown contributors found

76C2573-004

Item	Description	Johnny Lee Gates
76C2573-032	robe belt side 1 swab	one in 1.5 million
76C2573-033	robe belt side 2 swab	one in 134 thousand
76C2573-034	front of black tie swab	one in 4.33 million
76C2573-035	back of black tie swab	one in 963 million
76C2573-042	robe belt M-vac filter	one in 902 trillion
76C2573-044	black tie M-vac filter	one in 825 billion
