

**Forensic Science & Criminal Law:
Cutting Edge DNA Strategies**

Pennsylvania Association of Criminal Defense Lawyers
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Cybergenetics

Cybergenetics © 2003-2015

DNA mixtures



eye of newt



toe of frog



Double, double toil and trouble

Inconclusive mixture

Crime laboratory DNA report
Crime lab user fee: \$5,000

Conclusions:

Item 1 – Swab of textured areas from a handgun

The data indicates that DNA from four (4) or more contributors was obtained from the swab of the handgun. Due to the complexity of the data, **no conclusions can be made** regarding persons A and B as possible contributors to this mixture.

Computer reanalysis

Cybergenetics TrueAllele® report
Match statistic provides information

Unmix the mixture

Contributor

1

2

3

4

400,000

↔

Person A
excluded

Person B
included

Mixture statistic shuts down labs

“National accreditation board suspends all
DNA testing at D.C. crime lab”
The Washington Post April 27, 2015
Did not comply with FBI standards

“New protocol leads to reviews of
'mixed DNA' evidence”
The Texas Tribune September 12, 2015
24,468 lab tests affected

Unreliable mixture statistics

NIST (Commerce Department) study in 2005
Two contributor mixture data, known victim

LabID	Kits Used	Caucasian	AfricanAmerican	Hispanic
90	ProPlus/Cofiler	1.10E+15	2.13E+14	3.09E+15
34	ProPlus/Cofiler	2.40E+11	7.00E+09	9.90E+10
33	ProPlus/Cofiler	2.94E+09	1.12E+08	1.74E+09
6	ProPlus/Cofiler	40,000,000	3,500,000	280,000,000
9	ProPlus/Cofiler	1.14E+07	1.97E+07	1.54E+08
79	ProPlus/Cofiler	900,000	44,000	1,260,000
16	ProPlus/Cofiler	434,600	31,710	399,100

When not
“inconclusive”:

213 trillion (14)

31 thousand (4)

Remember that these labs are interpreting the same MIX05 electropherograms

Forensic DNA labs put on notice ten years ago

Inclusion statistic (CPI) unreliable

Inclusion probability for DNA mixtures is a subjective one-sided match statistic unrelated to identification information

- subjective (human bias)
- one-sided statistic (cannot exclude)
- unrelated to identification information
- adds no probability weight to "inclusion"
- no scientific basis
- no validation studies
- can't separate mixtures
- susceptible to challenge

Computer reanalysis

The Washington Post

Virginia reevaluates DNA evidence in 375 cases

July 16, 2011

- extensively tested TrueAllele system
- error rates have been determined
- 7 peer-reviewed validation papers
- generally accepted science
- overcome challenges in 6 states
- Pennsylvania v Kevin Foley (precedent)
- 250 cases: 60 in PA, 35 in Pittsburgh

OPEN ACCESS Freely available online

PLOS ONE

TrueAllele Casework on Virginia DNA Mixture Evidence: Computer and Manual Interpretation in 72 Reported Criminal Cases

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March 25, 2014

... The computer could make genotype comparisons that were impossible or impractical using manual methods. TrueAllele computer interpretation of DNA mixture evidence is **sensitive, specific, precise, accurate and more informative** than manual interpretation alternatives. It can determine DNA match statistics when threshold-based methods cannot. Improved forensic science computation can **affect criminal cases by providing reliable scientific evidence.**

Relevance of CPI

Inclusion probability for DNA mixtures is a subjective one-sided match statistic unrelated to identification information

Pa.R.E. Rule 401
"evidence makes fact more or less probable"

Probativ value

none

Rule 403
"substantially outweighed by a danger of:"

Unfair prejudice
Confusing the issues
Misleading the jury
Cumulative evidence

Motion to exclude

Reliability of expert testimony

Inclusion probability for DNA mixtures is a subjective one-sided match statistic unrelated to identification information

Pa.R.E. Rule 702	(b) expert's knowledge helps trier of fact understand the evidence or determine a fact in issue?	NO
	(c) methodology generally accepted in the relevant field?	NO
Daubert	• has CPI been tested?	NO
	• established error rate?	NO
	• peer-review validation?	NO

Motion to exclude

Expert qualification

Lab analysts are experts in generating DNA data

But lack expertise in:

- math & probability
- modeling variation
- quantitative analysis
- validating analysis

Why overly simplistic mixture interpretation methods were developed and promoted:
a simple rule replaces solid science.

Cross examination

"Cross-examination is the greatest legal engine ever invented for the discovery of truth."
– *Dean John Henry Wigmore*

- Is the DNA a mixture of two or more people?
- How did you calculate the match statistic?
- What is the scientific basis of that calculation?
- Have you or others validated CPI?
- What is the statistics' false positive rate?
- How has its reliability been demonstrated?
- Are there peer-reviewed validation studies?
- What controversy surrounds the calculation?

Post-conviction relief

Title 42, Chapter 95, Subchapter B

§ 9543(a)(2). Eligibility for PCR

- (ii) Ineffective assistance of counsel
- (vi) The unavailability ... of exculpatory evidence that has subsequently become available and would have changed the outcome ...

§ 9543.1. Post-conviction DNA testing

TrueAllele reanalysis of "inconclusive" DNA or inaccurate DNA match statistics

Han Tak Lee v. Monroe County (PA Innocence)

US Court of Appeals for the Third Circuit (2012)
"fire expert testimony at trial fundamentally unreliable, so entitled to federal habeas relief on due process claim"

Conclusions

- much DNA mixture interpretation is unreliable
- "inconclusive" means "call Cybergenetics"
- crime lab match statistics often inaccurate
- challenge on relevance, reliability, expertise, and vigorous cross-examination
- pursue actual innocence via PCR
- good science leads to fair trials

More information

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



- Courses
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<http://www.youtube.com/user/TrueAllele>
TrueAllele YouTube channel



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