How to Defend Yourself Against DNA Mixtures

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Cybergenetics

Cybergenetics © 2003-2016

Pinkins confined

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

Pinkins guilty in bump-rape
NWI Times, May 4, 1991

Pinkins DNA evidence

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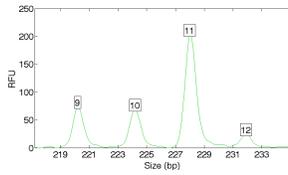but 5 were needed, post-conviction relief denied
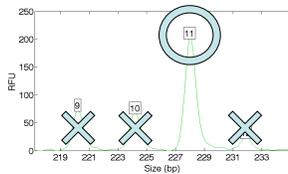
Jacket   Sweater

Good DNA mixture data

- two or more people
- small amounts of DNA
- degraded molecules

Bad DNA data interpretation

- biased exam
- wrong answer
- confusing result

Probabilistic genotyping

Options	Probability
A	A 20%
B	B 30%
C	C 50%

People choose their data

(1) Simplify data   **(2)** Peek at answer   **(3)** Calculate statistic

- Put people in the process
- To overcome software failure
- And introduce human bias

Adjust data for bad software

Methods of misinterpretation

- threshold – method discards data
- drop out – method conjures data
- wrong data – relies on calibration
- incomplete – model missing variables
- overconfident – misses own uncertainty
- human control – introduces bias
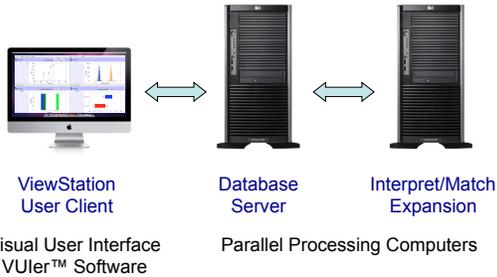- not validated – insufficient testing
- undervalidated – not fit for purpose

DNA injustice

Bad science leads to bad justice

- inclusion, biased wrong statistic
- exclusion, biased without statistic
- inconclusive, discard exculpatory evidence

TrueAllele® Casework

ViewStation
User Client

Database
Server

Interpret/Match
Expansion

Visual User Interface
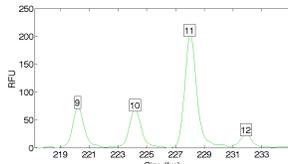VUIer™ Software

Parallel Processing Computers

TrueAllele Pinkins findings

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*

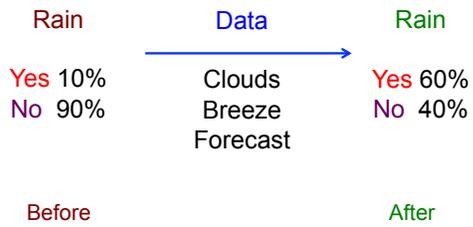found 5 unidentified genotypes,
defendants not linked to the crime

Good data interpretation

- objective
- accurate
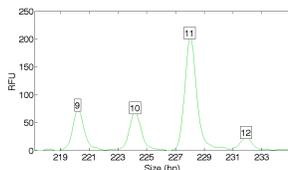- understandable

Bayes update

Assessing data changes our belief

Rain	Data	Rain
Yes 10%	Clouds	Yes 60%
No 90%	Breeze	No 40%
	Forecast	
Before		After

All the data, all the time

Bayes: consider all data for valid answer

- all locus tests
- all data peaks
- no thresholds
- no dropout

Accurate unbiased method

Bayes: consider all variables for right answer

- all variables
- all possibilities
- no choices
- thorough testing

31 validation studies, 7 published

TrueAllele® Genotype Identification on DNA Mixtures Containing up to Five Unknown Contributors*

TrueAllele justice

- inclusion, objective & accurate statistic
- exclusion, based on math, not opinion
- inconclusive, truly uninformative data

found 5 unidentified genotypes,
defendants not linked to the crime

Pinkins released

April 25, 2016

Crime labs on notice

MIX05 (2) – inconclusive, 4-14 zeros
MIX13 (3) – 70 of 100 labs falsely include
CPI statistic – random number, shutters labs

6 o'clock
or
nothing at all

Mixture interpretation failure

Given lab result, what is real answer?

Mark W. Perlin,[1] M.D., Ph.D.; Matthew M. Legler,[1] B.S.; Cara E. Spencer,[1] M.S.; Jessica L. Smith,[1] M.S.; William P. Allan,[1] M.S.; Jamie L. Belrose,[2] M.S.; and Barry W. Duceman,[3] Ph.D.

Validating TrueAllele® DNA Mixture Interpretation*,†

Given real answer, what is lab result?

Mark W. Perlin,[1] M.D., Ph.D.; Jamie L. Belrose,[2] M.S.; and Barry W. Duceman,[3] Ph.D.

New York State TrueAllele® Casework Validation Study*

Reliability of interpretation

Rule 702. Testimony by Expert Witnesses

A witness who is qualified as an expert by knowledge, skill, experience, training, or education may testify in the form of an opinion or otherwise if:
(a) the expert's scientific, technical, or other specialized knowledge will help the trier of fact to understand the evidence or to determine a fact in issue;
(b) the testimony is based on sufficient facts or **data**;
(c) the testimony is the product of reliable principles and **methods**; and
(d) the expert has **reliably applied** the principles and methods to the facts of the case.

Unreliable data

- *choosing* introduces bias
- *discarding* violates Bayes
- *adding* more makes no sense
- wrong answers guaranteed

Unreliable method

- invalid use of DNA data
- calibrations are extraneous
- model leaves out variables
- unrealistic validation testing

Unreliable result

- testing on limited samples
- not validated for actual use
- not applicable to case data
- report language confusing

Relevance of interpretation

Rule 403. Excluding Relevant Evidence for Prejudice, Confusion, Waste of Time, or Other Reasons

"substantially outweighed by a danger of:"

Probative value
questionable

Unfair prejudice (DNA)
Confusing the issues
Misleading the jury
Cumulative evidence

Software summary

Majority	TrueAllele
Wrong	Accurate
Biased	Objective
Confusing	Understandable
Limited	Universal

Defense vigilance required

Contain use within valid limits

Expose use outside limitations

✗ ✗ ✗

Recommendations

Most DNA mixture statistics
past, present and future
are wrong, biased and confusing

- educate defenders on DNA
- verify results (automation)
- cross exam to elicit truth
- expose the sins of the past

Resources

http://www.cybgen.com/information

- Courses
- Newsletters
- Newsroom
- Presentations
- Publications
- Webinars

http://www.youtube.com/user/TrueAllele
TrueAllele YouTube channel

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