Three Match Statistics, One Verdict

Mark W Perlin, PhD, MD, PhD
Cybergenetics, Pittsburgh, PA

Robin W Cotton, PhD
Boston University Medical School, MA

American Academy of Forensic Sciences
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Cybergenetics

Commonwealth vs. Foley

Apr 2006: Blairsville Dentist John Yelenic murdered

Nov 2007: Trooper Kevin Foley charged with crime

Feb 2008: Defense questions 13,000 DNA match score

DNA Evidence

- DNA from under victim's fingernails (Q83)
- two contributors to DNA mixture
- 93.3% victim & 6.7% unknown
- 1,000 pg DNA in 25 ul
- STR analysis with ProfilerPlus®, Cofiler®
- know victim contributor genotype (K53)
- TrueAllele® computer interpretation
  (using genotype addition method)
    infer unknown contributor genotype
- only after having inferred unknown,
    compare with suspect genotype (K2)

Three DNA Match Statistics

Score	Method
13 thousand	inclusion
23 million	subtraction
189 billion	addition

• Why are there different match results?
• How do mixture interpretation methods differ?
• What should we present in court?

Different Interpretation Methods

Data Used	inclusion	subtraction	addition
victim profile	NO	YES	YES
quantitative data	NO	NO	YES

Frye: General Acceptance in the Relevant Community

• Quantitative STR Peak Information
• Genotype Probability Distributions
• Computer Interpretation of STR Data
• Statistical Modeling and Computation
• Likelihood Ratio Literature
• Mixture Interpretation Admissibility
• Computer Systems for Quantitative
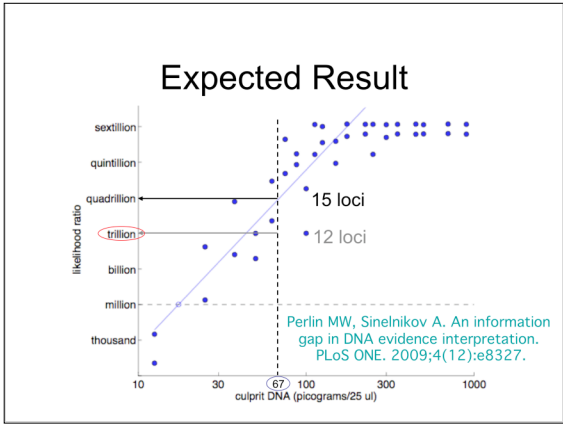   DNA Mixture Deconvolution
• TrueAllele Casework Publications

Expected Result

15 loci

12 loci

Perlin MW, Sinelnikov A. An information gap in DNA evidence interpretation. PLoS ONE. 2009;4(12):e8327.

Expert Testimony

Dr. Perlin explained to the jury why these apparently different results were expected by DNA science. "The less informative methods ignored some of the data," said Dr. Perlin, "while the TrueAllele computation considered all of the available DNA data."

"A scientist may look at the same slide using the naked eye, a magnifying glass, or a microscope," analogized Dr. Perlin. "A computer that considers all the data is a more powerful DNA microscope."
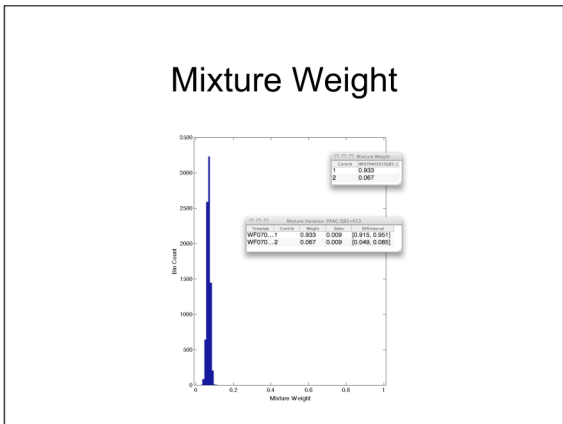

Mixture Weight

Inferred Genotype
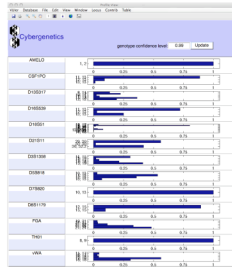
log(LR) Match Information
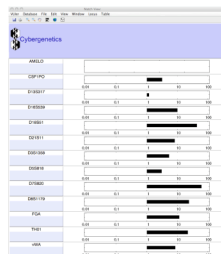
Locus D8S1179 Data
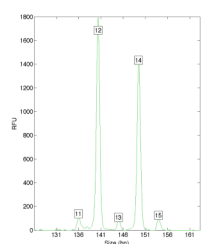
Explain D8S1179 Genotype

Likelihood Comparison

better fit's more likely it

every pair gets equal share
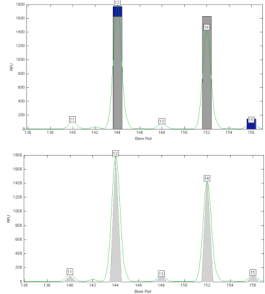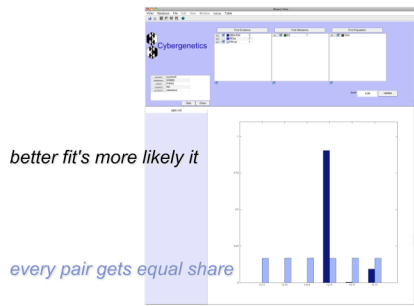
Generate Report

Q83+K53 contributor 2 vs. K2 (CAU)

File Signature Statement Summary Calculation

The LR calculation assumes one unknown contributor in the evidence with one known contributor reference relative to a Caucasian human population having a coancestry coefficient of 0.01.

The joint LR is approximately 22.1 billion.
The log(LR) information is 10.34.

locus	allele pair	Q	R	S	LR	log(LR)
CSF1PO	12, 13	0.091	0.0518	1	1.755	0.244
D13S317	8, 11	0.136	0.0683	1	1.990	0.299
D16S539	11, 13	0.722	0.0928	1	7.775	0.891
D18S51	12, 13	0.803	0.0354	1	22.683	1.356
D21S11	29, 30	0.561	0.0877	1	6.388	0.805
D3S1358	15, 18	0.213	0.0839	1	2.538	0.405
D5S818	12, 13	0.358	0.1077	1	3.324	0.522
D7S820	10, 13	1	0.0226	1	44.188	1.645
D8S1179	12, 15	0.895	0.0365	1	24.525	1.390
FGA	21, 24	0.483	0.0514	1	9.388	0.973
TH01	8, 9	1	0.0450	1	22.201	1.346
vWA	17, 18	0.562	0.1199	1	4.689	0.671

Locus information gain is genotype probability ratio:
LR = after/before
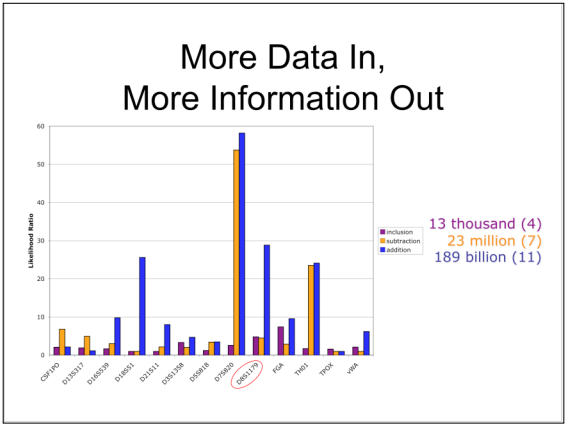
Joint information is the sum of the locus information

More Data In, More Information Out

| | 13 thousand (4) |
| 23 million (7) |
| 189 billion (11) |

Case Observations

- objective review never saw suspect
- easy to testify about in court
- understandable to judge and jury
- have precedent: admitted, testified
- preserve match information in data
- rapid response to attorney
- multiple match scores presented
  all information to the triers of fact –
  nothing was withheld from the jury
  this should be standard practice

One Verdict

Jury convicts trooper of dentist slaying

Published: Thursday, March 19, 2009 12:46 AM EDT

An Indiana County Court jury this evening convicted state trooper Kevin Foley of first degree murder in the April 13, 2006, slashing death of Blairsville dentist John Yelenic.

"John Yelenic provided the most eloquent and poignant evidence in this case," said the prosecutor, senior deputy attorney general Anthony Krastek. "He managed to reach out and scratch his assailant," capturing the murderer's DNA under his fingernails.

The DNA Investigator Newsletter. Same Data, More Information - Murder, Match and DNA, Cybergenetics, 2009. www.cybgen.com/information/newsletters/CybgenNews1.pdf