

TrueAllele® interpretation of Allegheny County DNA mixtures

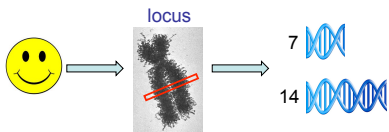
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Cybergenetics, Pittsburgh, PA

Continuing Legal Education
Allegheny County Courthouse
February, 2014



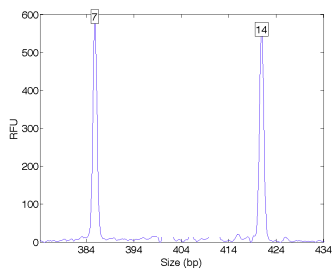
Cybergenetics © 2003-2014

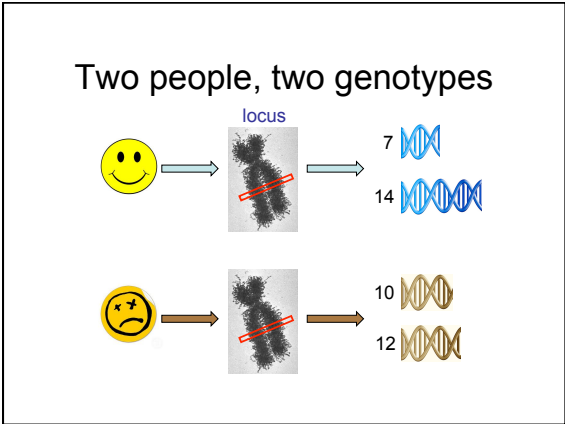
One person, one genotype

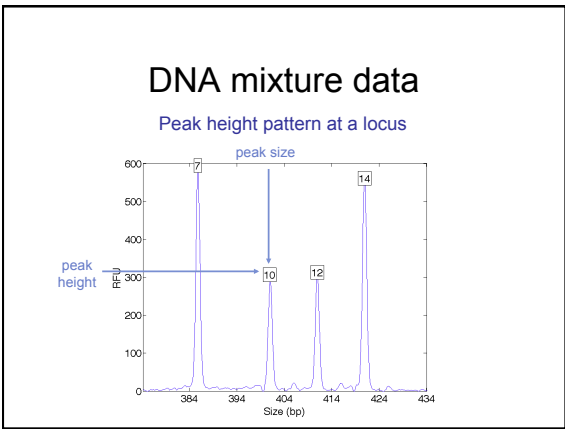


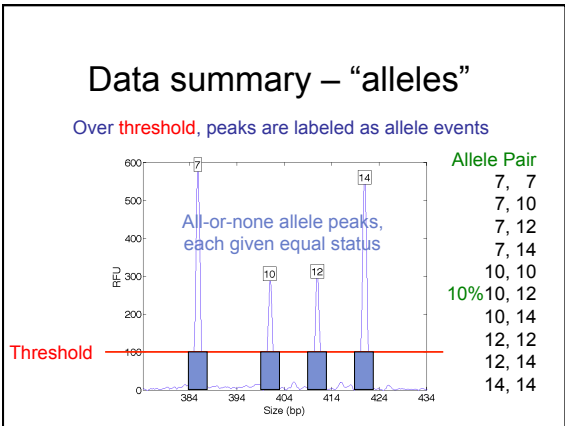
DNA data

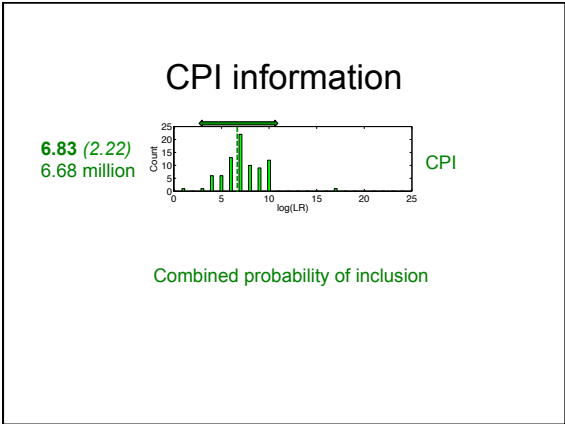
One or two allele peaks at a locus

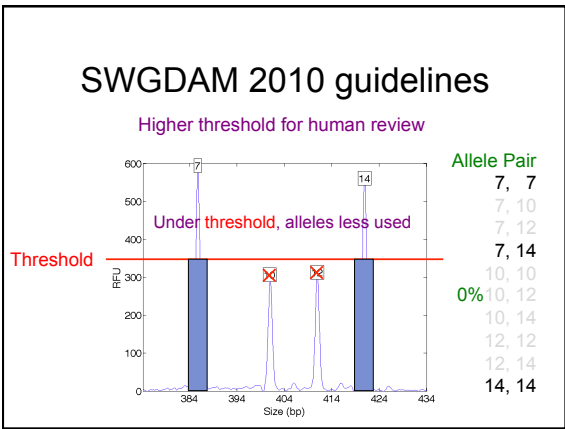


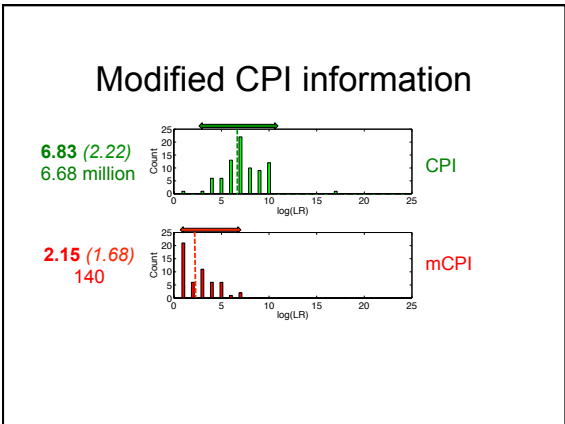










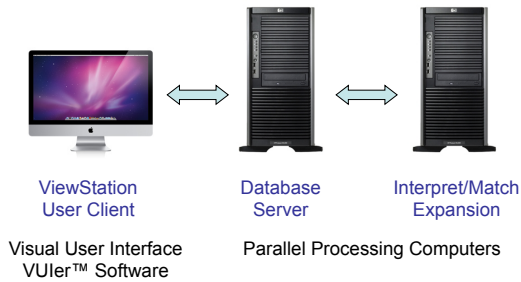


SWGDM 2010 guidelines

3.2.2. If a stochastic threshold based on peak height is not used in the evaluation of DNA typing results, the laboratory must establish alternative criteria (e.g., quantitation values or use of a probabilistic genotype approach) for addressing potential stochastic amplification. The criteria must be supported by empirical data and internal validation and must be documented in the standard operating procedures.

Use TrueAllele® Casework for DNA mixture statistics

TrueAllele Casework



Validated genotyping method

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.

Ballantyne J, Hanson EK, Perlin MW. DNA mixture genotyping by probabilistic computer interpretation of binomially-sampled laser captured cell populations: Combining quantitative data for greater identification information. *Science & Justice*. 2013;53(2):103-14.

Perlin MW, Belrose JL, Duceman BW. New York State TrueAllele® Casework validation study. *Journal of Forensic Sciences*. 2013;58(6):1458-66.

Perlin MW, Dormer K, Hornyak J, Schiermeier-Wood L, Greenspoon S. TrueAllele® Casework on Virginia DNA mixture evidence: computer and manual interpretation in 72 reported criminal cases. *PLOS ONE*. 2014;in press.

TrueAllele reinterpretation

The Washington Post

Virginia reevaluates DNA evidence in 375 cases

July 16, 2011

"Mixture cases are their own little nightmare," says William Vosburgh, director of the D.C. police's crime lab. "It gets really tricky in a hurry."

"If you show 10 colleagues a mixture, you will probably end up with 10 different answers"
Dr. Peter Gill, Human Identification E-Symposium, 2005

Report mixture statistics

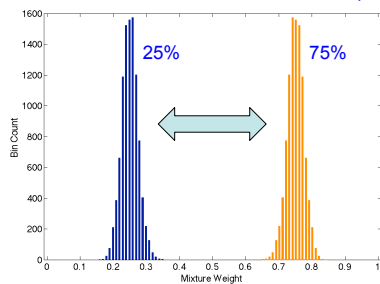
- 72 criminal cases
- 92 evidence items
- 111 genotype comparisons

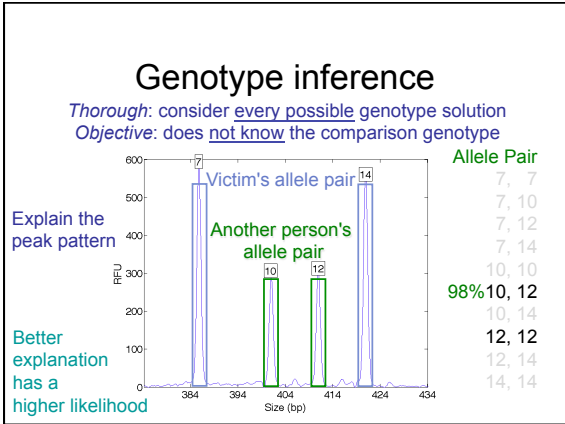
Criminal offense

- 18 homicide
- 12 robbery
- 6 sexual assault
- 20 weapon

Mixture weight

Separate mixture data into two contributor components



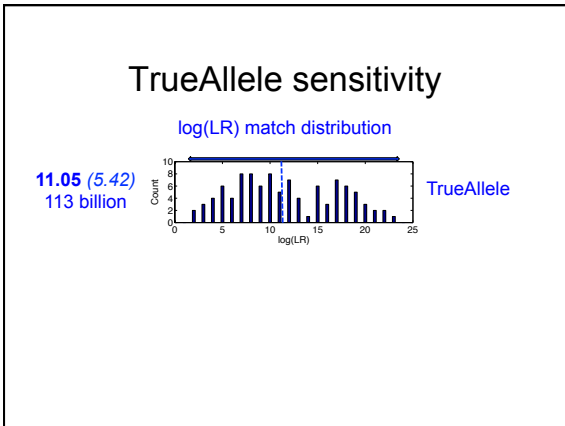


Sensitivity

The extent to which interpretation identifies the correct person

True DNA mixture inclusions

101 reported genotype matches
82 with DNA statistic over a million



Specificity

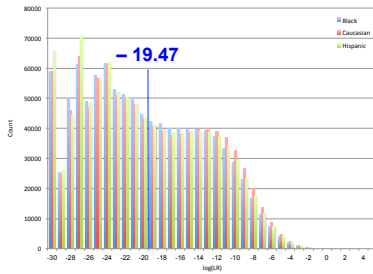
The extent to which interpretation does not misidentify the wrong person

True exclusions, without false inclusions

101 matching genotypes x 10,000 random references
x 3 ethnic populations,
for over 1,000,000 nonmatching comparisons

TrueAllele specificity

log(LR) mismatch distribution

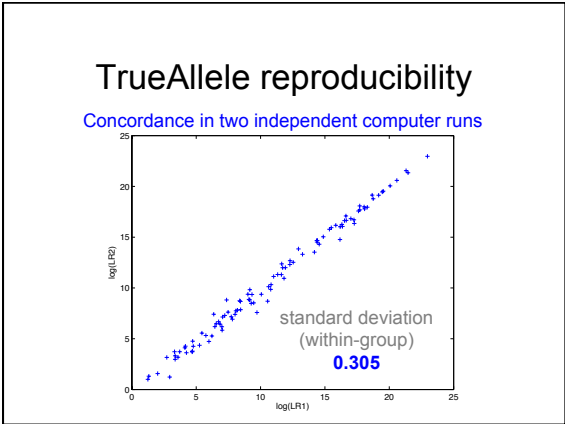


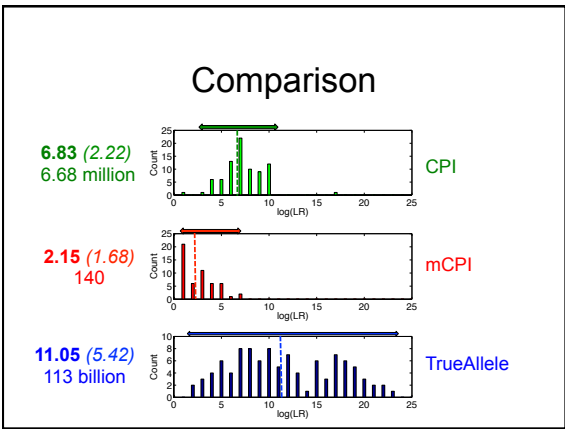
Reproducibility

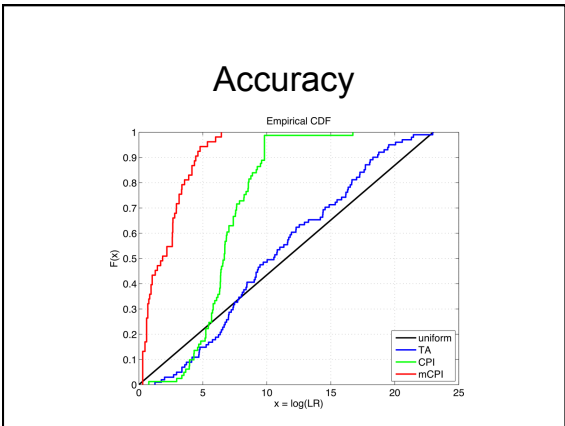
The extent to which interpretation gives the same answer to the same question

MCMC computing has sampling variation

duplicate computer runs
on 101 matching genotypes
measure log(LR) variation







TrueAllele Virginia outcomes

144 cases analyzed
72 case reports – 10 trials

City	Court	Charge	Sentence
Richmond	Federal	Weapon	50 years
Alexandria	Federal	Bank robbery	90 years
Quantico	Military	Rape	3 years
Chesapeake	State	Robbery	26 years
Arlington	State	Molestation	22 years
Richmond	State	Homicide	35 years
Fairfax	State	Abduction	33 years
Norfolk	State	Homicide	8 years
Charlottesville	State	Homicide	15 years
Hampton	State	Home invasion	5 years

TrueAllele today

Invented math & algorithms	20 years
Developed computer systems	15 years
Support users and workflow	10 laboratories
Used routinely in casework	3 labs
Validate system reliability	20 studies
Educate the community	50 talks
Train & certify analysts	200 students
Go to court for admissibility	5 hearings
Testify about LR results	20 trials
Educate lawyers and laymen	1,000 people
Make the ideas understandable	150 reports

Pennsylvania Cases

Allegheny
Beaver
Berks
Butler
Cambria
Columbia
Delaware
Indiana
Luzerne
Mercer
York

Allegheny County

16 cases, 12 reports
3 trials, 1 exoneration

Crime	Evidence	Defendant	Outcome	Sentence
rape	clothing	Ralph Skundrich	guilty	awaiting
murder	gun, hat	Leland Davis	guilty	23 years
rape	clothing	Akaninyene Akan	guilty	32 years
murder	shotgun shells	James Yeckel, Jr.	guilty plea	25 years
murder	finger nail	Anthony Morgan	stipulation	life
weapons	gun	Thomas Doswell	guilty plea	1 year
drugs	gun	Derek McKissick & Steve Morgan	guilty pleas	2 1/2 years
