

Testifying about probabilistic genotyping results

Mid-Atlantic Association of Forensic Scientists
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Morgantown, WV

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Cybergenetics

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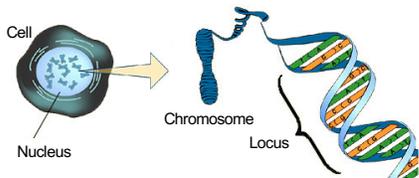
2

First case example



3

DNA biology



Short tandem repeat

DNA locus paragraph

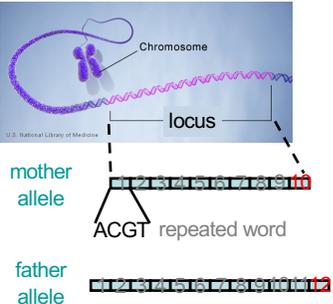


23 volumes in cell's DNA encyclopedia

Take me out to the ball game
 take me out with the crowd
 buy me some peanuts and Cracker Jack
 I don't care if I never get back
 let me
 root root root root root root root root root
 for the home team,
 if they don't win, it's a shame for it's one, two,
 three strikes, you're out
 at the old ball game

"root" repeated 10 times, so allele length is 10 repeats

DNA genotype



Chromosome

locus

mother allele

father allele

ACGT repeated word

A genetic locus has two DNA sentences, one from each parent.

An allele is the number of repeated words.

A genotype at a locus is a pair of alleles.

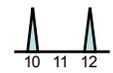
10, 12

Many alleles allow for many many allele pairs. A person's genotype is relatively unique.

DNA evidence interpretation

Evidence item → Lab → Evidence data → Infer → Evidence genotype

DNA from one person

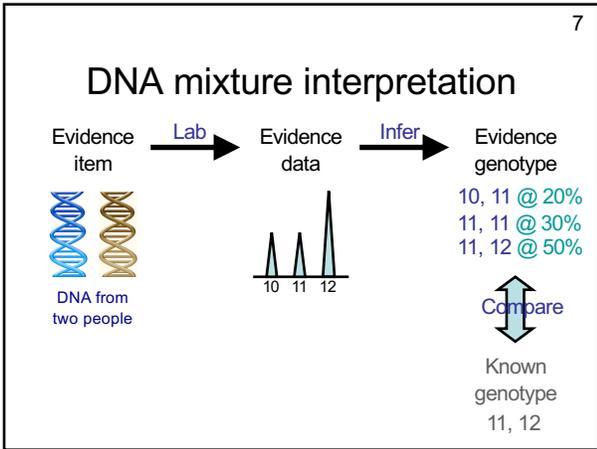


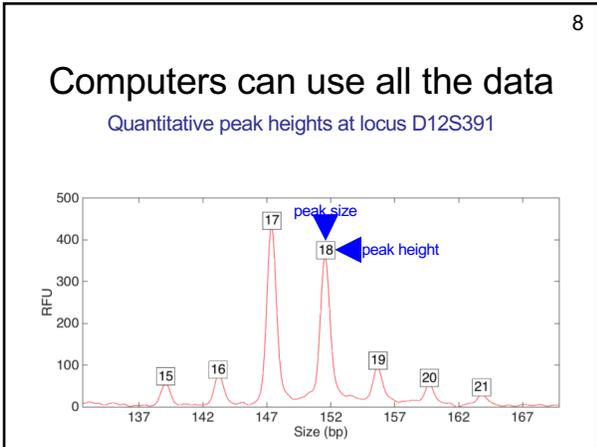
10 11 12

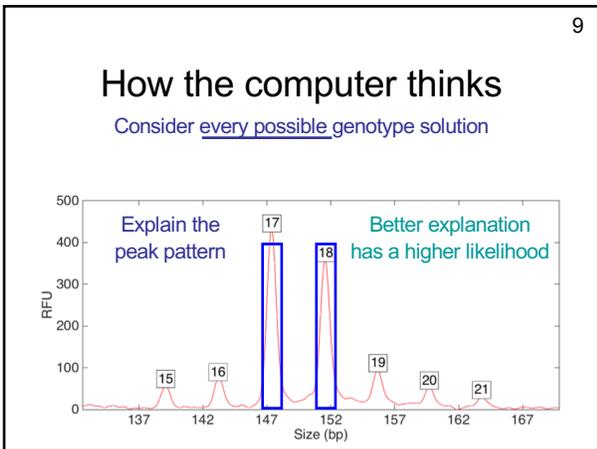
Compare

Known genotype

10, 12



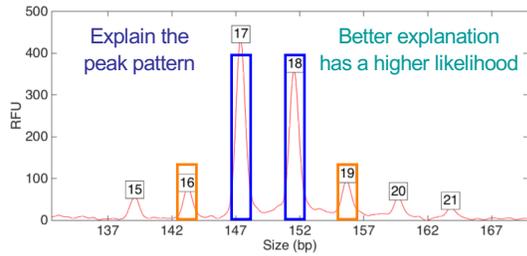




10

How the computer thinks

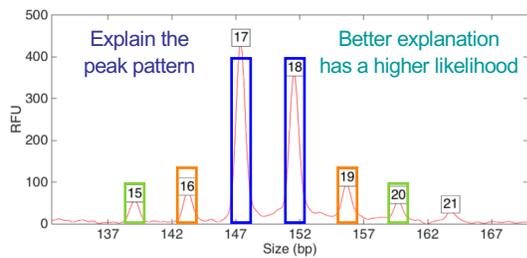
Consider every possible genotype solution



11

How the computer thinks

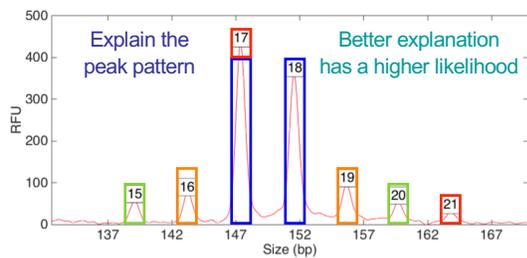
Consider every possible genotype solution



12

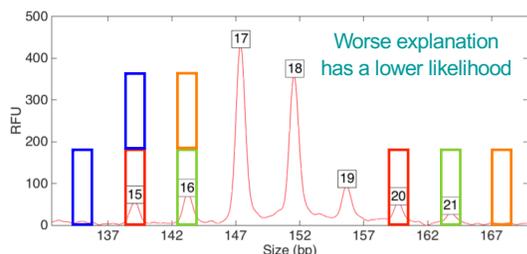
How the computer thinks

Consider every possible genotype solution



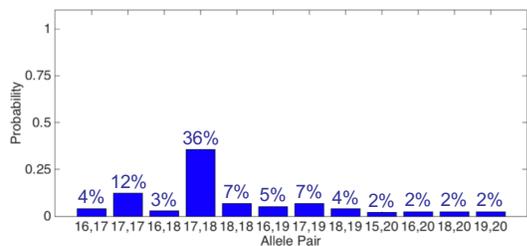
How the computer thinks

Consider every possible genotype solution



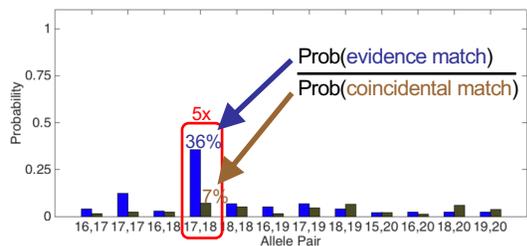
Evidence genotype

Objective genotype determined solely from the DNA data.
Never sees a comparison reference.

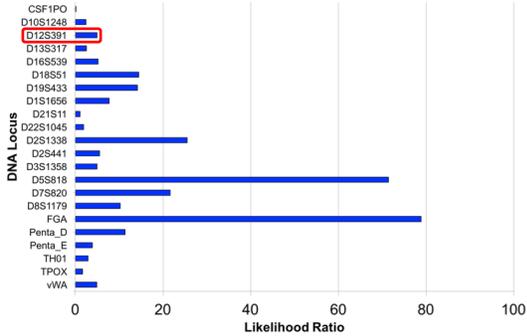


DNA match information

How much more does the suspect match the evidence than a random person?



Match information at 22 loci



Is the suspect in the evidence?

A match between the gun and the suspect is:

59.2 quadrillion times more probable than a coincidental match to an unrelated African-American person

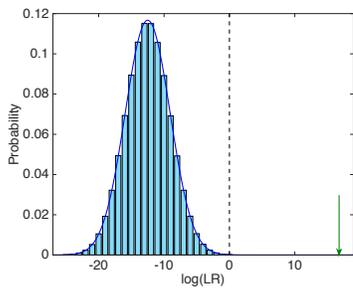
2.69 quintillion times more probable than a coincidental match to an unrelated Caucasian person

4.11 quintillion times more probable than a coincidental match to an unrelated Southeast Hispanic person

1.25 quintillion times more probable than a coincidental match to an unrelated Southwest Hispanic person

Noncontributor Analysis for the suspect

Only 1 in 22.2 quintillion people would match as strongly

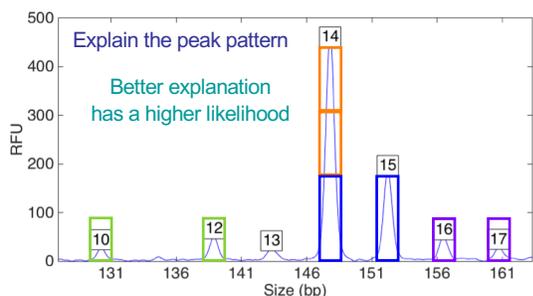


Second case example



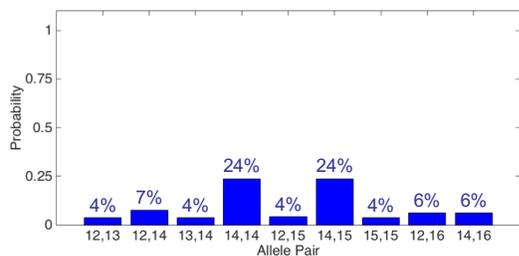
How the computer thinks

Consider every possible genotype solution



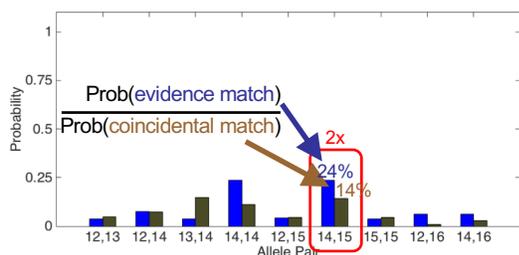
Evidence genotype

Objective genotype determined solely from the DNA data.
Never sees a comparison reference.

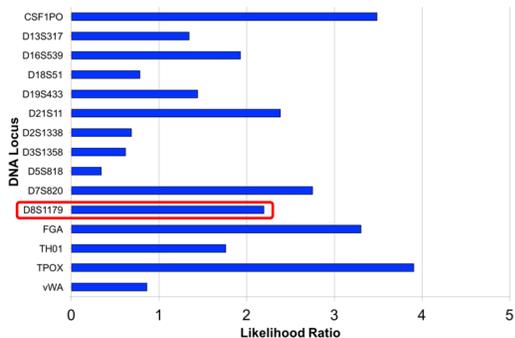


DNA match information

How much more does the suspect match the evidence than a random person?



Match information at 15 loci



Is the suspect in the evidence?

A match between the steering wheel and the suspect is:

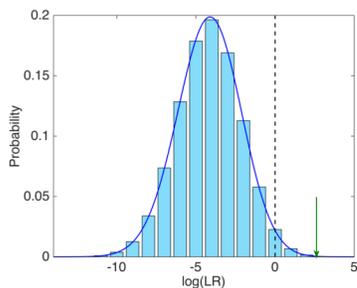
414 times more probable than a coincidental match to an unrelated African-American person

47.6 thousand times more probable than a coincidental match to an unrelated Caucasian person

21.3 thousand times more probable than a coincidental match to an unrelated Hispanic person

Noncontributor Analysis for the suspect

Only 1 in 4.45 thousand people would match as strongly

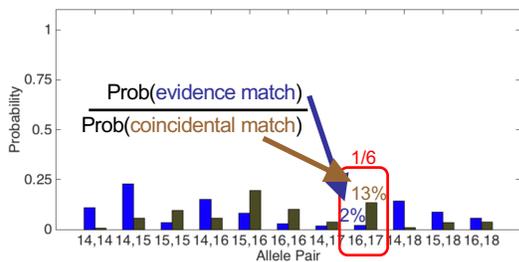


Third case example

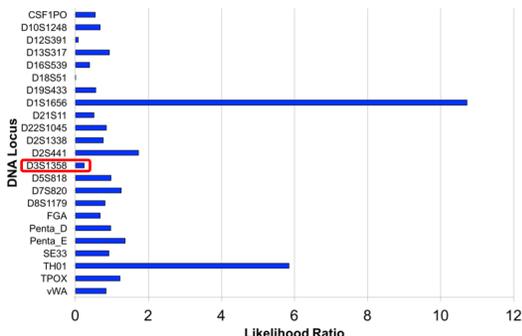


DNA match information

How much more does the defendant match the evidence than a random person?



Match information at 23 loci



Is the defendant in the evidence?

A match between the revolver and the defendant is:

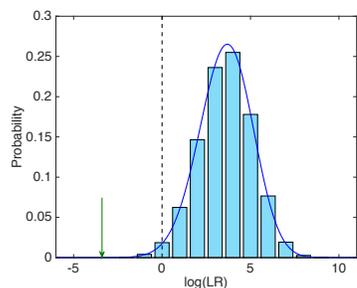
2.54 thousand times *less* probable than a coincidental match to an unrelated African-American person

41.6 thousand times *less* probable than a coincidental match to an unrelated Caucasian person

22.2 thousand times *less* probable than a coincidental match to an unrelated Hispanic person

Contributor Analysis for the defendant

Only 1 in 101 thousand people would be excluded as strongly



More information

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



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



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