

Mix & match: Getting comfortable with DNA reporting

What's in a Match?
How to read a forensic DNA report

Duquesne University
October, 2015
Pittsburgh, PA

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Cybergenetics



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Elmira, New York

On June 15, 2011, a man broke into a woman's apartment. Wielding a knife and wearing a bandana, he raped her. The victim recognized Casey Wilson by his voice and height.

On September 29, 2013, a man broke into another woman's apartment. With a knife, he raped and robbed her, and then tried to eliminate evidence of the sex crimes. Wilson was again recognized by his voice and height.

Surveillance video showed a masked man wearing **gloves** leaving the second victim's apartment. Later surveillance placed him in the same clothes near Wilson's Mt. Zoar home.

People of New York v Casey Wilson

Gloves from Elmira serial rapist



- Due to **insufficient genetic information**, no comparisons were made to the minor contributors of this profile.
- Due to the **complexity of the genetic information**, no comparisons were made to this profile.

December 11, 2013: crime lab emails data late afternoon
TrueAllele solves in the evening
preliminary report issued that night

December 19, 2013: Cybergenetics testifies at Grand Jury
September 11, 2014: Cybergenetics testifies at trial

Computer Interpretation of Quantitative DNA Evidence

People v Casey Wilson
September, 2014
Elmira, New York

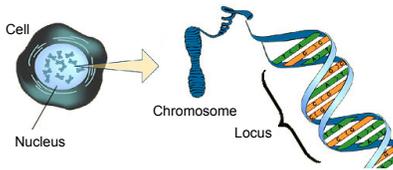
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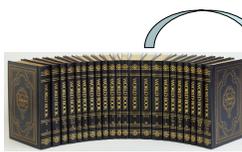
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DNA biology



Short tandem repeat



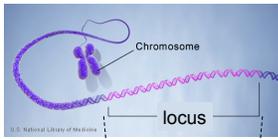
23 volumes in cell's
DNA encyclopedia

DNA locus paragraph

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



mother allele

1 2 3 4 5 6 7 8 9 10

ACGT repeated word

father allele

1 2 3 4 5 6 7 8 9 10 11 12

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

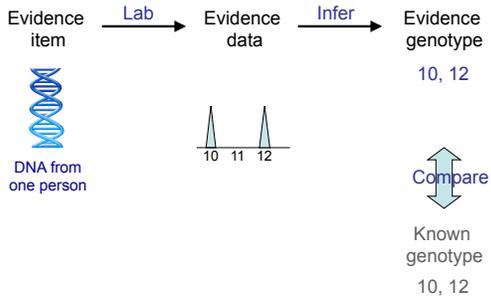
An **allele** is the number of repeated words.

A **genotype** at a locus is a pair of alleles.

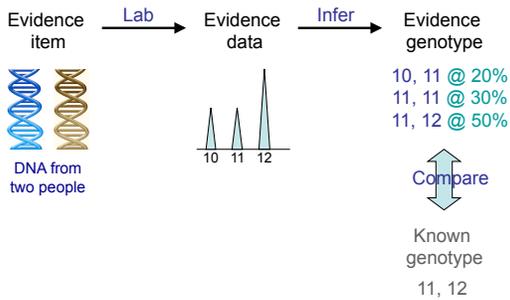
10, 12

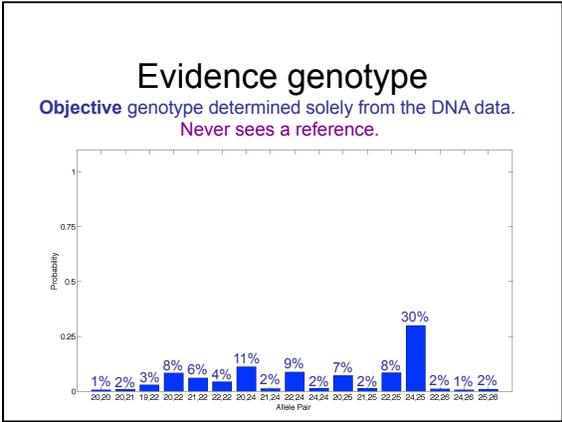
Many alleles allow for many many allele pairs. A person's genotype is relatively unique.

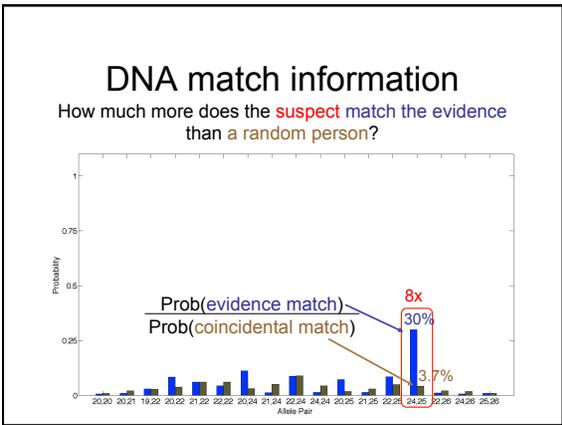
DNA evidence interpretation

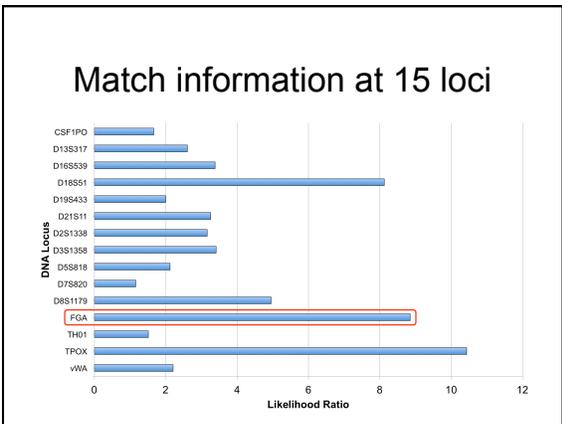


DNA mixture interpretation









Is the suspect in the evidence?

A match between the glove
and Casey Wilson is:

31.3 million times more probable than
a coincidental match to an unrelated Black person

66.3 million times more probable than
a coincidental match to an unrelated Caucasian person

98.1 million times more probable than
a coincidental match to an unrelated Hispanic person

Match statistics

Item	Description	15B	24A	20A
		Victim	Elimination	Casey Wilson
17D-E	Purple knit glove	930 quadrillion	1/2.72	817 thousand
18D-E	Purple knit glove	520 trillion	14.6 thousand	31.3 million

Match statistics

Item	Description	15B	24A	20A
		Victim	Elimination	Casey Wilson
17D-E	Purple knit glove	17.97	-0.43	5.91
18D-E	Purple knit glove	14.72	4.16	7.50

Table of Contents

Case Notes

Data Table EPG Lab EPG

Request Listing Timing

Genotype Evidence Reference Population

Match Table Locus Table Specificity

Horizontal lines for notes or data entry.

17D-E

- Data. Peaks mostly between 100 and 800 rfu, with some above and below.
- Mixture. At least 3 (D16, D21), maybe 4 (D6, FGA) contributors.
- Degradation. Not apparent.
- Separation. Clear separation between ~78% major and minor components.
- Convergence. Excellent convergence with GR < 1.04.

Match to victim

- Genotype inference. Genotype is essentially single source with average KL of 19.5.
- Genotype separation. Clearly distinct from the minor contributors.
- Genotype concordance. Excellent agreement across 4 independent computer runs.
- Genotype match. Victim-matching genotype mixture weight = 0.7598 (stdev = 0.0598) & KL = 19.5671.
- Reported match. Representative genotype match to victim with log(LR) value 17.9676.

Chemung 13HL-05428 evidence Chemung 17D-E_ncon3_100K 16 1

Match to elimination

- Genotype inference. Distinct from population with average KL ~4.2
- Genotype separation. Distinct from known references.
- Genotype concordance. Good agreement across 8 independent computer runs.
- Genotype match. Elimination-matching genotype mixture weight = 0.1037 (stdev = 0.0651) & KL = 4.8005.
- Reported match. Representative genotype match to elimination with log(LR) value -1.4626.

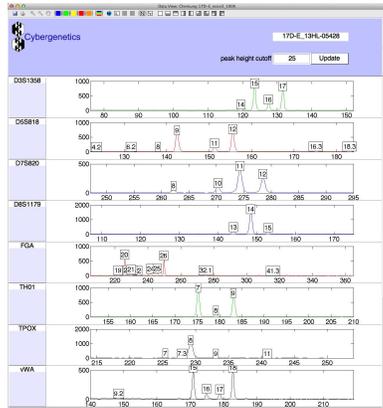
Chemung 13HL-05428 evidence Chemung 17D-E+15B_ncon3_100K 18 3

Match to suspect

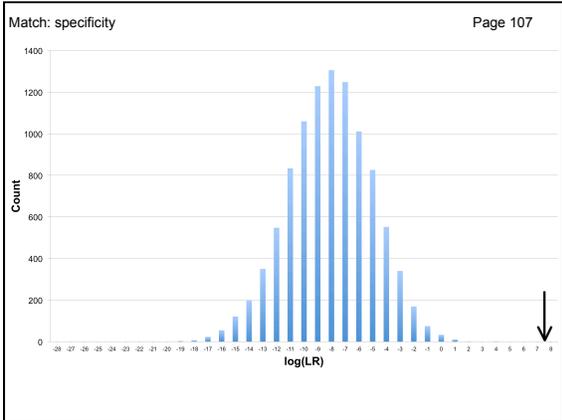
- Genotype inference. Genotype clearly distinct from population with average KL 5.6.
- Genotype separation. Distinct from known references.
- Genotype concordance. Good agreement across 12 computer runs; better with same contributor number.
- Genotype match. Suspect-matching genotype mixture weight = 0.1387 (stdev = 0.0442) & KL = 6.7101.
- Reported match. Representative genotype match to suspect with log(LR) value 5.4629.

Chemung 13HL-05428 evidence Chemung 17D-E+15B+24A_ncon3_100K_rep1 26 3

Horizontal lines for notes or data entry.



Horizontal lines for notes or data entry.



Case outcome



Elmira man sentenced in 2 city rapes

Lois Wilson, lwilson@stargazette.com | @SGLoisWilson 4:42 p.m. EST November 3, 2014



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An Elmira man who was found guilty of rape, burglary and other charges will spend at least 20 years in prison.

Casey J. Wilson, 25, of Mt. Zoar Street, was sentenced on Monday in Chemung County Court.

He was convicted on Sept. 12 of two counts each of first-degree rape, first-degree burglary, first-degree sexual abuse and third-degree aggravated sexual abuse, as well as one count of first-degree robbery.

CASEY WILSON
(PHOTO: PROVIDED PHOTO)

General YouTube talks

[M.W. Perlin, "Challenging DNA Evidence", Allegheny County Courthouse - Continuing Legal Education, Pittsburgh, PA, 27-Feb-2015.](#)

[M.W. Perlin, "Objective DNA Mixture Information in the Courtroom: Relevance, Reliability and Acceptance", National Institute of Standards and Technology, Arlington, VA, 22-July-2015.](#)

[M.W. Perlin, "Forensic Science and Criminal Law: Cutting Edge DNA Strategies", Pennsylvania Association of Criminal Defense Lawyers, Pittsburgh, PA, 25-Sep-2015.](#)

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