

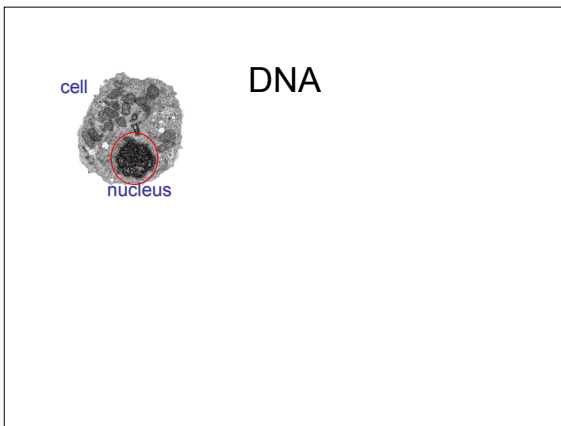
DNA Identification: Biology and Information

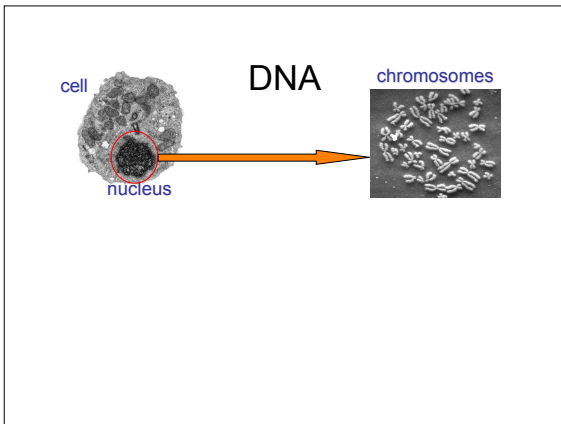
Mark W Perlin, PhD, MD, PhD
Cybergenetics, Pittsburgh, PA

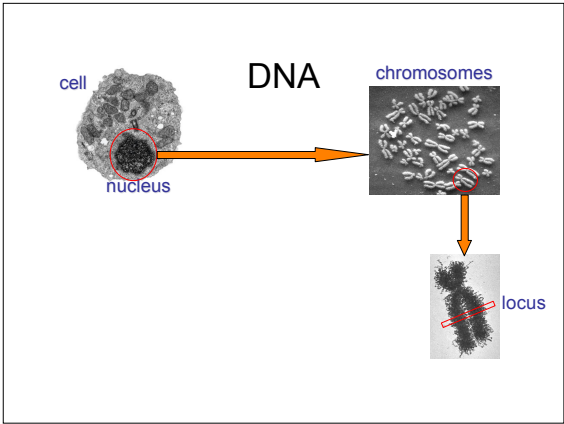
Continuing Legal Education
Allegheny County Courthouse
March, 2011

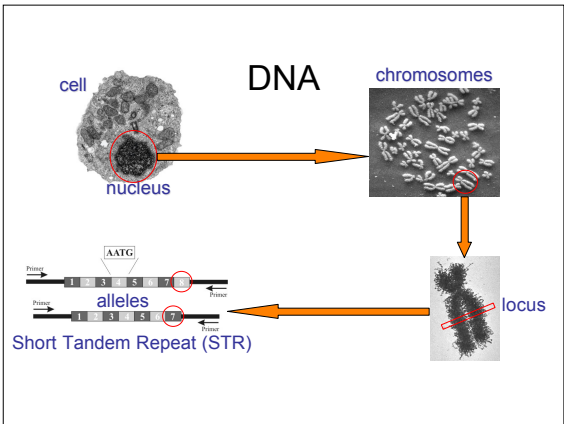


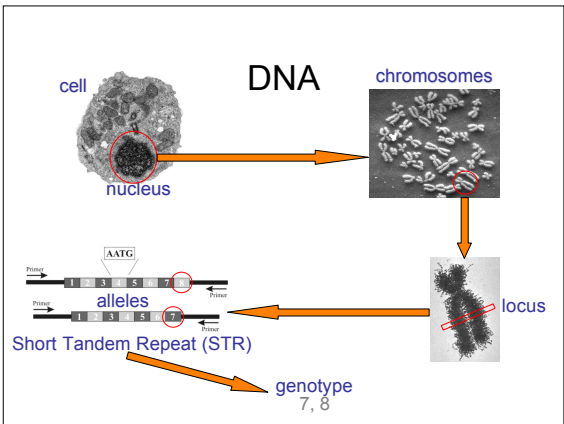
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Identification

Biological
evidence



Identification

Biological
evidence



Lab



Questioned
data



Identification

Biological
evidence



Lab



Questioned
data

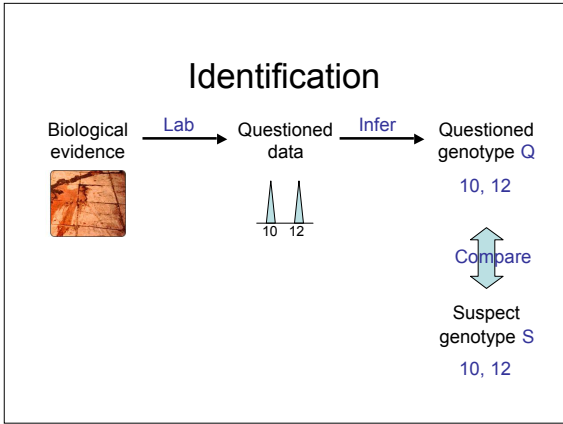


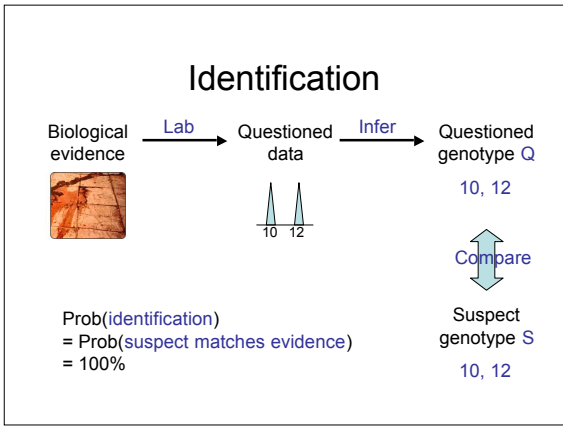
Infer

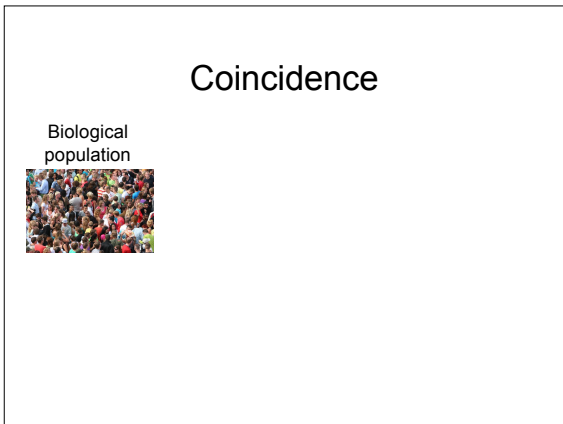


Questioned
genotype Q

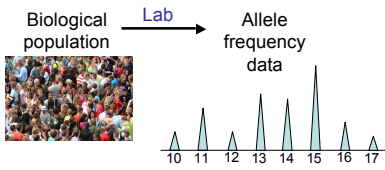
10, 12



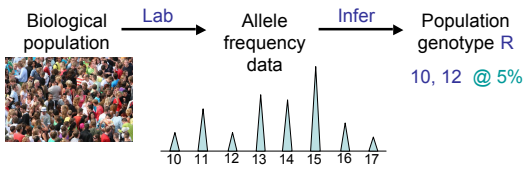




Coincidence

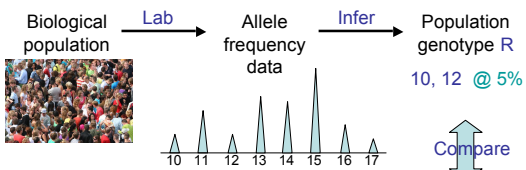


Coincidence

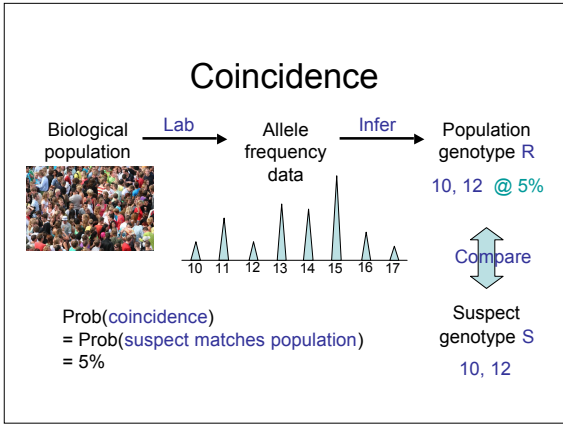


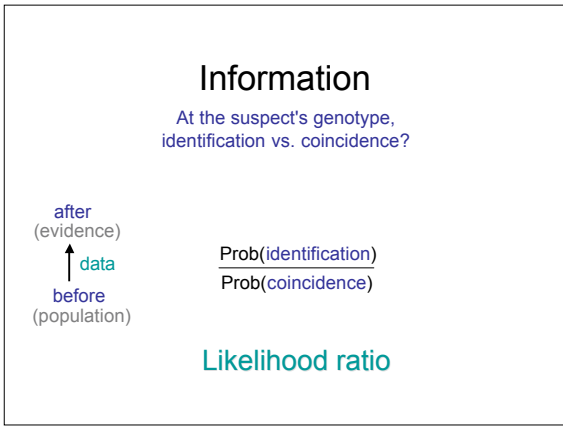
Genotype product rule, combines alleles
 $\text{Prob}(10, 12) = 2 \times p_{10} \times p_{12}$
 $\text{Prob}(10, 10) = p_{10} \times p_{10}$

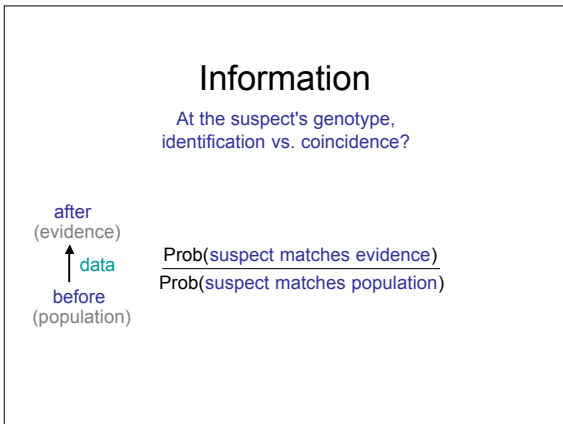
Coincidence



Suspect genotype S
 10, 12







Information

At the suspect's genotype,
identification vs. coincidence?

after
(evidence)

↑ data

before
(population)

$$\frac{\text{Prob}(\text{suspect matches evidence})}{\text{Prob}(\text{suspect matches population})} = \frac{100\%}{5\%} = 20$$

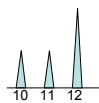
Uncertainty

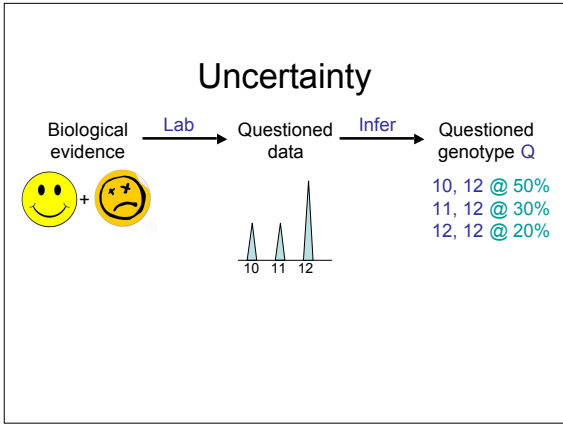
Biological
evidence

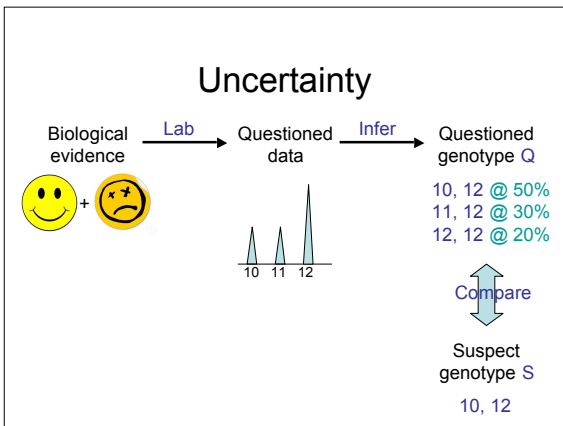


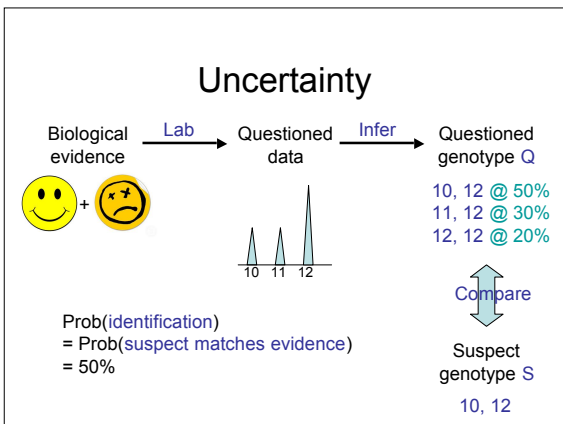
Uncertainty

Biological evidence → Lab → Questioned data









Information

At the suspect's genotype,
identification vs. coincidence?

after
(evidence)
↑ data
before
(population)

$$\frac{\text{Prob}(\text{identification})}{\text{Prob}(\text{coincidence})}$$

Likelihood ratio

Information

At the suspect's genotype,
identification vs. coincidence?

after
(evidence)
↑ data
before
(population)

$$\frac{\text{Prob}(\text{suspect matches evidence})}{\text{Prob}(\text{suspect matches population})} = \frac{50\%}{5\%} = 10$$
