Forensic Genetics

Module 18 – Topic 6 Exercises

Exercise 1a: Formulating Propositions

An individual is discovered looking into a house one night. The police are called and find a single cigarette butt under the window where the incident occurred. No one in the family smokes. The police have a person of interest captured on a neighbor's CCTV.

A single-source profile is obtained from the cigarette butt and the reference profile of a person of interest (POI) matches.

Exercise 1b: Formulating Propositions

A complainant calls 911 to report a sexual assault in her home. She is taken to a hospital where an intimate swab is collected.

A POI is identified from the investigation and the obtained profile from the swab is fully explained by a mixture of the complainant (K) and the POI.

Exercise 1c: Formulating Propositions

A complainant is cut with a knife during an altercation. Based upon eyewitness testimony, a POI is identified.

A stain on the clothing of the POI is tested for blood, and a DNA profile is developed that is consisted with a mixture of the POI and the complainant.

Exercise 1d: Formulating Propositions

Molotov cocktails have been thrown at random cars. An unexploded container is found in the street, and a 2 person mixture is developed from the evidence.

Two persons of interest are arrested.

Exercise 1e: Formulating Propositions

A complainant walking through a city park is attacked from behind and is sexually assaulted on a blanket. She didn't get a good look at the perpetrator. The police recognize the blanket as possibly belonging to a vagrant known to live near the park.

A profile obtained from the blanket is fully explained by mixing of K and POI's DNA.

Discussion – LR Examples in Testimony

THE WITNESS: No, so LR is really different then random man odds. LR basically just compares, like -- here is the probability -- which is what I did say not very well at the beginning -- the other half of the deposition the last time -- the LR is this, it is essentially a fraction. On the top, it's the -- this is the proposition, given the evidence, versus this proposition or an opposing proposition, given the evidence. Everything is evidence driven.

Discussion – LR Examples in Testimony

Q And I'm trying to make it more clear here.
The -- when you're asked in a proposition of a person being that, it's not telling you a probability that DNA came from that person. Do you understand that?
A From the person that I've compared?
Q Right. It's not a probability. The number that --
A It's a likelihood ratio. The sample is more likely to occur in this individual versus someone else.
Q Do you see a difference between the likelihood ratio and saying probabilities?
A The likelihood is just the probability of the evidence given the information.
Q Do you consider the likelihood ratio to be the probability that DNA came from a particular person?
A Yes.

Discussion – LR Examples in Testimony

A The DNA results obtained indicate a mixture of three contributors. Again, [redacted] was assumed in the DNA profile. When run

against [redacted] the DNA results are at least is 7.46, excuse me 74.6 septillion times more likely that they originated from [redacted] and one unrelated unknown individual, than if they originated from [redacted] and two unrelated unknown individuals.

So, again these results provide very strong support that [redacted] is included as a contributor.

Discussion – LR Examples in Testimony

No Longer the Gold Standard: Probabilistic Genotyping is Changing the Nature of DNA Evidence in Criminal Trials

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A. What Are Likelihood Ratios?

A likelihood ratio (LR) compares the probabilities of two different hypotheses that seek to explain a given piece of evidence. In the context

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