Forensic Genetics

Module 15 – Section 7 & 8 Answers

Section 7 Group Work

Y-STR

Y-STR Exercise

Go to https://yhrd.org/search and manually enter the following 12-locus profile with the Y-filer option, building it up one locus at a time:

DYS456: 15; DYS389I: 12; DYS390: 25; DYS389II: 28;
DYS458: 28; DYS393: 13; DYS391: 10; DYS635: 22;
DYS392: 11; YGATAH4: 11; DYS438: 11; DYS448

i.e. find 12 separate counts in the Worldwide database. Any comments on your results?

Y-STR Exercise

DYS456	15	141,485
DYS38I	12	45,631
DYS390	25	5,086
DYS389II	28	3,029
DYS458	16	312
DYS393	13	107
DYS391	10	68
DYS635	22	10
DYS392	11	1
YGATAH4	11	1
DYS438	11	1
DYS448	19	1

Section 8 Group Work

Relatives

Exercise 1a: LR – Relatives

Consider a simple single-source crime scene sample with genotype $G_C = AA$, and a suspect that matches at that locus. Calculate the LR, using $p_A = 4\%$, and alternative hypotheses:

- The DNA in the sample came from a brother of the suspect;

Exercise 1a: LR – Relatives

Consider a simple single-source crime scene sample with genotype $G_C = AA$, and a suspect that matches at that locus. Calculate the LR, using $p_A = 4\%$:

- LR $= \frac{1}{0.25p_A^2 + 0.5p_A + 0.25} \approx 3.7$;

Exercise 1b: LR – Relatives

Consider a simple single-source crime scene sample with genotype $G_C = AA$, and a suspect that matches at that locus. Calculate the LR, using $p_A = 4\%$, and alternative hypotheses:

- The DNA in the sample came from a brother of the suspect;
- The DNA in the sample came from an identical twin of the suspect.

Exercise 1b: LR – Relatives

Consider a simple single-source crime scene sample with genotype $G_C = AA$, and a suspect that matches at that locus. Calculate the LR, using $p_A = 4\%$:

- LR $= \frac{1}{0.25p_A^2 + 0.5p_A + 0.25} \approx 3.7$;
- LR $= 1$.

Exercise 2a: Paternity Index

Suppose a child has genotype $G_C = AB$. What are the LR values when:

- $G_M = AA$ and $G_{AF} = BB$;

Exercise 2a: Paternity Index

Suppose a child has genotype $G_C = AB$. The LR values are:

- $\text{LR} = \frac{\Pr(G_C{=}AB|G_M{=}AA,G_{AF}{=}BB,H_p)}{\Pr(G_C{=}AB|G_M{=}AA,H_d)} = \frac{1}{p_B}$;

Exercise 2a: Paternity Index

Suppose a child has genotype $G_C = AB$. What are the LR values when:

- $G_M = AA$ and $G_{AF} = BB$;
- $G_M = AA$ and $G_{AF} = CD$;

Exercise 2a: Paternity Index

Suppose a child has genotype $G_C = AB$. The LR values are:

- LR $= \frac{\Pr(G_C{=}AB|G_M{=}AA,G_{AF}{=}BB,H_p)}{\Pr(G_C{=}AB|G_M{=}AA,H_d)} = \frac{1}{p_B}$;
- LR $= \frac{\Pr(G_C{=}AB|G_M{=}AA,G_{AF}{=}CD,H_p)}{\Pr(G_C{=}AB|G_M{=}AA,H_d)} = 0$;

Exercise 2b: Paternity Index

Calculate the weight of the evidence for the following data:

Locus	G_C	G_M	G_{AF}
TPOX	(6,9)	(6,12)	(8,9)
vWA	(17,17)	(17,16)	(17,17)
TH01	(7,9)	(9,10)	(7,9)

Locus	**Allele**	**Frequency**
TPOX	6	0.006
	8	0.506
	9	0.094
	12	0.038
vWA	16	0.276
	17	0.300
TH01	7	0.147
	9	0.232
	10	0.116

Source: Introduction to Statistics for Forensic Scientist (Lucy, 2005).

Exercise 2b: Paternity Index

Calculate the weight of the evidence for the following data:

Locus	G_C	G_M	G_{AF}
TPOX	(6,9)	(6,12)	(8,9)
vWA	(17,17)	(17,16)	(17,17)
TH01	(7,9)	(9,10)	(7,9)

We calculate single-locus LRs and combine these results through multiplication:

- TPOX: LR $= \frac{0.25}{0.5p_9} = \frac{1}{2\times 0.094} = 5.32$;
- vWA: LR $= \frac{1}{p_{17}} = \frac{1}{0.3} = 3.33$;
- TH01: LR $= \frac{0.25}{0.5p_7} = \frac{1}{2\times 0.147} = 3.40$.

Our overall LR is in this case 60.23, yielding evidence in favor of H_p.