



Tracing Human Ancestry with DNA Microarrays

Worksheet Answers

- a) How many of the bases are the same across all four strands? 23
- b) How many of the bases are different? 17
- c) For the DNA on the microarray, which end points up, the 3' end or the 5' end? 3'

Fill in the blank with the letter of the base that hybridizes with the bases listed below:

- d) Adenine (A) : T
- e) Thymine (T) : A
- f) Guanine (G) : C
- g) Cytosine (C) : G
- h) How many of your fragments hybridized with the DNA microarray? 5
- i) Are there any DNA fragments from your sample that did not hybridize to the Microarray Grid Master? YES (5)

What is the most likely explanation for the non-hybridization of fragments?

- j) The DNA markers are common to two or more haplogroups so they aren't included in the section of the microarray for unique markers. It could be a gene that codes for a protein that is found in all human beings, perhaps the Cytochrome C protein.

Determine which haplogroup (and location) each sample belongs to:

- k) Sample #1 Haplogroup: U Location: Eastern Europe
- l) Sample #2 Haplogroup: A Location: South America
- m) Sample #3 Haplogroup: L₁ Location: Eastern Africa
- n) Sample #4 Haplogroup: V Location: Scandinavia

Note: Haplogroup Q (Indonesia) does not match with any sample.

What conclusions can you make about the composition of the human population of this ancient city based on your analysis of the four different humans whose remains you analyzed?

- o) Certainly, the population was diverse with individuals having come there as travelers from various parts of the world.



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Homework Answers

1. All body cells contain the same DNA. The difference is in which genes are 'expressed' or turned on in the particular cells. For instance, the genes that code for actin and myosin, expressed in muscle cells, would not be expressed in skin cells.
2. Gene expression relates to the function of the gene. If the gene is 'expressed' in a cell, then it is producing a protein. If the gene is not expressed, then that protein is not being made in that cell.
3. It takes many steps, many different pieces of equipment, and thousands of DNA samples to make a microarray. Because of the time and energy a lab would need to manufacture its own microarrays, a lab generally chooses to spend money on a pre-manufactured microarray.
4. Each spot corresponds to one gene, and contains many probes, or the sequence for that one gene.
5. G – T – A – A – C
6. Microarrays can be used to detect SNPs, which are single nucleotide polymorphisms, usually harmless genetic mutations which accumulate over generations in the genomes of living organisms.
7. A scientist can analyze a lot of DNA at one time. And he/she can compare the DNA from two sources at the same time by computer analyzing the pattern of colors caused by the fluorescent tags on the DNA.
8. Restriction enzymes come from bacteria. They are thought to be defense mechanisms to aid the bacteria in destroying their enemies by cutting the enemy DNA into fragments.