Evolution Quiz

Standard 1.2a and 1.2b

In 2007 Sarah Tishkoff studied populations of humans from all over the world trying to determine if the ability to digest lactose was an adaptation that was selective in times of starvation. As environments changed and food was scarce, were humans with a mutation able to turn to their livestock they herded for nutrition and did those who did not have the mutation have a selective disadvantage?

Lactose is digested by the enzyme lactase, which is produced in the small intestine. The lactase gene codes for the enzyme lactase. In people that are lactose intolerant, the lactase gene gets “turned off” sometime after breastfeeding stops. People who are lactose tolerant have the lactase gene permanently “on.” Scientists have discovered that the gene remains “on” due to mutations that are not in the lactase gene but are near it. People who are lactose tolerant are also referred as being lactase persistent, because expression of the lactase gene *persists* beyond childhood. People who are lactose intolerant are lactase nonpersistent.

Table 1: Genotype data from world regions indicating frequency of people with lactose persistence

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Region | Population | No People Sampled (n) | Number of people with the lactose persistence allele | Lactase Frequency |
| Africa | Sudan | 162 | 73 | .45 |
| Asia | Japan | 62 | 0 | .00 |
| Asia | China | 82 | 8 | .10 |
| Europe | Finland | 1876 | 1538 | .82 |
| Middle East | Saudi Arabia (Bedouin) | 94 | 69 | .73 |
| Europe  | France | 58 | 39 | .67 |
| Indonesia | New Guinea | 34 | 0 | .00 |

Evolution Quiz Name: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Answer Sheet Period: \_\_\_\_\_\_\_\_\_\_

1. 1.2a: **CER**

Examine the data above. Make a **claim** to which populations were descendants of pastoral cultures which herded livestock.

Use **evidence** from the table above to **justify (this is the reasoning portion)** your claim.

1.2b - Use the following information (and the information on the previous page) to connect evolutionary changes in a population over time to a change in the environment.

 The lactose tolerance mutation is estimated to be around 20,000 years old. However, migration from the fertile crescent happened 8,000 years ago with crops from that region now being planted in Europe. One hypothesis is that in shorter growing seasons of Europe, most middle-eastern plants failed, leading to starvation. People then turned to their animals for nourishment. Complete the table below regarding lactose digestion in adults as a selective trait in times of starvation.

|  |  |
| --- | --- |
| Principle of Natural Selection | Description based on example  |
| Variation in the population |  |
| Inheritance Potential |  |
| Selection on the population |  |
| Adaptation Explanation |  |