Got Lactase? The Co-Evolution of Genes and Culture

In “Got Lactase? The Co-evolution of Genes and Culture,” geneticist Dr. Spencer Wells introduces us to one of the most compelling examples of gene-culture co-evolution: the evolution of lactase persistence in humans. Review the key concepts this film illustrates and take notes on the points detailed below.

**NOTE:** There will be questions on the exam from this video assignment.

**KEY CONCEPTS:**

- Humans, like all species, evolve and adapt to the environment through natural selection. Lactase persistence is an example of a human adaptation that arose within the last 10,000 years in response to a cultural change.

- Mutations occur at random; for evolution to occur there must be selection for or against the traits affected by those mutations.

- Both the physical and cultural environment can affect selective pressures. The practice of dairying provided an environment in which lactase persistence was advantageous.

- Different mutations can produce the same phenotype. Scientists have identified distinct mutations among northern Europeans and the Maasai people of eastern Africa that resulted in lactase persistence.

- Similar phenotypes can evolve independently under similar selective pressures. The lactase persistence trait arose independently among African and European pastoralist populations.

- Mutations occur not only in coding regions of genes but also in the regulatory regions that determine when and where a gene is turned on. All known mutations giving rise to lactase persistence are in a genetic “switch” that regulates expression of the lactase gene.

- Food has to be converted into simpler molecules that can be absorbed and used by cells in the body. The lactase enzyme breaks down the disaccharide lactose into glucose and galactose.
Instructions: Print this page. Take notes on the following as you watch the short film, “Got Lactase?” and be sure to write your statement that follows the questions.

1. What does lactase persistence mean?

2. Where is the highest concentration of lactase persistence found in human populations across the globe? (hint: review the cover sheet too).

3. What was the SINGLE mutation in the lactase gene found among Northern Europeans that led to lactase persistence in this population?

4. What was the selective pressure that allowed the lactase persistence mutation to evolve independently in both Africa and Europe?

After viewing the film, reading the covering sheet, and answering the above, explain in terms of natural selection how the lactase persistence trait has been shaped by the co-evolution of genes and culture. Your response should include: 1) a description of the mutation; 2) the cultural tradition/practice that made this mutation advantageous for certain groups of people; and 3) how this affected their reproductive fitness or success.