

HHMI: Got Lactase? The Coevolution of Genes and Culture

1. What two monosaccharides (simpler sugars) are formed when the lactase enzyme hydrolyzes lactose?
 - a. glucose and fructose
 - b. galactose and maltose
 - c. glucose and galactose
 - d. glucose and maltose
2. Geneticists studying the gene for lactase did not find any differences in the coding region DNA (the section of DNA with instructions to make the protein) between people who could digest lactose and people who could not digest lactose. After they investigated further, they discovered that the difference between lactose tolerant and intolerant individuals was due to a mutation located in
 - a. The genetic switch for the lactase gene
 - b. An intron of the lactase gene
 - c. The gene for glucose production
 - d. Different genes for different individuals
3. Which statement accurately describes human evolution?
 - a. Human evolution ended 200,000 years ago when humans (*Homo sapiens*) became a distinct species.
 - b. Humans continued to evolve until the species adapted to a pastoralist way of life and then stopped evolving.
 - c. Humans are still evolving and will continue to evolve through natural selection.
 - d. Human evolution through natural selection ended with the advent of modern medicine.
4. Which discovery supports the hypothesis that evolution of the lactase persistence trait was driven by the use of milk in pastoralist cultures?
 - a. The lactase gene is present both in humans and in domesticated animals.
 - b. Ancient pots used to hold milk are about the same age as the lactase persistence mutations.
 - c. Most human cultures today drink milk and most people worldwide are lactase persistent.
 - d. Scientists have identified different mutations that cause lactase persistence.
5. Why would measuring blood glucose levels in an individual, 20 to 30 minutes after they drink a liter of milk, indicate whether they are able to digest lactose?
 - a. When lactose is digested by lactase in the small intestine, different cells in the body start releasing glucose into the bloodstream.
 - b. When lactose is digested by lactase, the glucose that is produced enters the bloodstream from the small intestine.
 - c. When lactose enters the large intestine, glucose is digested by bacteria and then enters the bloodstream.
 - d. The fats and proteins in milk are digested by the body, causing glucose levels in the blood to increase.
6. Why could milk have provided strong favorable selection for lactase persistence?
7. In humans, the *AMY1* gene produces the enzyme amylase in cells of the salivary glands. Amylase breaks down starch (a polysaccharide) into the sugar maltose (a disaccharide). People from cultures with diets high in starch produce more amylase than people from cultures with diets low in starch because of a mutation in the *AMY1* gene. Explain why the frequency of this *AMY1* mutation would have increased in frequency in populations with a high starch diet.