



Got Lactase? The Co-evolution of Genes and Culture

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Abbreviated Film Guide
Educator Materials

OVERVIEW

Babies can easily digest milk, the food especially provided for them by their mothers. Later in life, most of us lose this ability because we stop producing lactase, the enzyme that helps us digest the sugar in milk. But about one-third of adults worldwide continue to produce the enzyme, a phenomenon known as lactase persistence.

This film explores the genetics behind lactase persistence and discusses research that traces the origin of this trait to less than 10,000 years ago. The origin of lactase persistence coincides with a cultural shift in human populations who began to use the milk of other mammals as food. Combining genetics, chemistry, and anthropology, this story provides a compelling example of the coevolution of human gene regulation and human culture.

KEY CONCEPTS

- During digestion, food is converted into simpler molecules that can be absorbed and used by the body. For example, milk is digested by the enzyme lactase, which breaks down lactose (a sugar in milk).
- Humans, like all species, evolve and adapt to their environment through natural selection. Lactase persistence is an example of a human adaptation.
- For evolution to occur, there must be selection for or against traits. Both the physical and cultural environment can affect selective pressures. The cultural practice of dairying provided an environment in which lactase persistence was advantageous.
- Different mutations can produce the same phenotype, and similar phenotypes can evolve independently under similar selective pressures. For example, lactase persistence arose independently in African and European populations due to different mutations.
- Mutations can occur in regulatory regions that determine when and where a gene is expressed. Mutations giving rise to lactase persistence are in a “switch” region that regulates expression of the lactase gene.

STUDENT LEARNING TARGETS

- Describe the genetic mechanisms of lactase persistence.
- Use evidence to explain why lactase persistence is an example of human evolution.

KEY REFERENCES

Callaway, Ewen. “Pottery shards put a date on Africa’s dairying.” *Nature*, 20 June 2012. <https://doi.org/10.1038/nature.2012.10863>.

Hollox, Edward. “Evolutionary genetics: Genetics of lactase persistence – fresh lessons in the history of milk drinking.” *European Journal of Human Genetics* 13, 3 (2005): 267–269. <https://doi.org/10.1038/sj.ejhg.5201297>.