AT A GLANCE FILM GUIDE

DESCRIPTION

Human babies drink milk; it's the food especially produced for and given to them by their mothers. But when they grow into adults, most humans lose the ability to digest lactose, the sugar in milk, and become lactose intolerant. Why then do adults in some cultures think nothing of drinking a glass of cow's milk? In this film, human geneticist Dr. Spencer Wells tracks down the genetic changes associated with the ability to digest milk as an adult—a trait called lactase persistence—tracing the origin of the trait to pastoralist cultures that lived less than 10,000 years ago.

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.
- 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.
- Food has to be converted into simpler molecules that can be absorbed and used by cells in the body.

CURRICULUM AND TEXTBOOK CONNECTIONS

Text/Curriculum	Chapter Sections/Curriculum Topics
Miller & Levine Biology (2010 Ed.)	2.3, 13.3, 13.4,14.1, 16.3, 16.4, 17.1, 17.2, 17.4, 30.3
Campbell Biology (9th Ed.) ngss	5.2, 18.2,21.6, 22.2, 23.1, 23.3, 23.4, 25.6, 26.5, 41.1, 41.3
NGSS	MS-LS3.B, MS-LS4.B, MS-LS4.C HS-LS1.A, HS-LS3.A, HS-LS3.B, HS-LS4.B, HS-LS4.C
AP (2012-13 Standards)	1.A.1, 1.A.2, 1.C.3,2A2, 2D2, 2E1, 3B1, 3.C.1, 3.C.2, 4A1,4C3
IB (2009 Standards)	3.2, 3.6, 4.1, 5.4, 6.1, A.3.1, D.3.10,

SUGGESTED AUDIENCE

This film is appropriate for middle school, high school, and college-level biology, chemistry, and anthropology students. It presents multiple lines of evidence from different scientific disciplines for the co-evolution of the genetic trait lactase persistence and the cultural practice of dairying. The film also touches on the regulation of eukaryotic gene expression and the role of enzymes in food metabolism.

KEY REFERENCES

Callaway, E. Pottery shards put a date on Africa's dairying. *Nature*, 20 June 2012 (www.nature.com/news/pottery-shards-put-a-date-on-africa-s-dairying-1.10863).

Hollox, E. 2005. Evolutionary genetics: Genetics of lactase persistence –fresh lessons in the history of milk drinking. *European Journal of Human Genetics* **13**: 267-269.

Wells, S. *Pandora's Seed: The Unforeseen Cost of Civilization* (Random House: 1st ed., June 8, 2010).

Additional references can be found in the in-depth film guide.