

# Regulation of the Lactase Gene



## About This Worksheet

This worksheet complements the Click and Learn "Regulation of the Lactase Gene" developed in conjunction with the 2011 HHMI Holiday Lectures on Science "Bones, Stones, and Genes: The Origin of Modern Humans."

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## Key Concepts

- Eukaryotic gene expression is regulated at the levels of transcription, RNA processing, translation, and post-translation.
- Proteins called transcription factors bind to DNA and control transcription. Different types of transcription factors can increase or decrease transcription.
- Mutations in DNA regions that control gene expression can alter the way genes are expressed.
- Infants have high lactase levels so that they can digest their mothers' milk, but lactase gene expression is turned off after weaning.
- Lactase persistence is the trait that allows adults to continue to digest milk. It results from a mutation in an enhancer region of the lactase gene.

## Instructions

1. Go to [Biointeractive.org](http://Biointeractive.org).
2. In the menu bar under the masthead, mouse over Topics → Evolution → Interactive.
3. Scroll down the page and click on "Regulation of the Lactase Gene."
4. Proceed through the slides, watch the embedded video clips, and answer the following questions in the space provided.

## Questions

1. What is the difference between lactose tolerance and lactose intolerance? Be specific.

Lactose tolerance is being able to digest Lactose into Glucose + Galactose with an enzyme called Lactase. Lactose intolerance is not being able to digest Lactose because your body cannot produce Lactase.

2. Why is lactose tolerance also called lactase persistence?

Because it's the trait that allows adults to continue digesting milk after infancy.

3. In which cells or tissues is lactase produced and what is its role?

Lactase is expressed in the cells of the small intestine.

4. What normally happens to the levels of lactase produced throughout a person's lifetime?

After weaning, humans normally stop producing Lactase and become lactose intolerant.

5. In general, why is it important for a cell to regulate protein production?

The system needs to have enough protein to function, but not to the point where it wastes energy.

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**Edmond Henri Herman Maria Rings**



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