## **Investigating Patterns of Lactase Persistence**

Name:	
Mairie	

Work as a group to explore patterns of lactase persistence in people from different parts of the world. Your group will explore three patterns: (1) geographic regions, (2) the role of gender, and (3) differences between adults and infants. After exploring these patterns, work as a group to summarize what you learned. To complete this activity, you will use materials on the Evolution and Medicine Web site:

http://science.education.nih.gov/supplements/evolution/student

Click on "Lesson 2: Investigating Lactose Intolerance and Evolution," then "Fill in samples from other researchers," "View map 2," and finally, "Add samples." After finishing a part, you can click on the "Continue" button to access the map.

### **Part A: Investigating Geographic Regions**

- 1. Access Map 2, which shows the simulated results from analyses of over 300 people in seven geographic regions.
- 2. Click on "Explore Lactase Persistence by Geographic Region." Then click on the seven geographic regions to see a summary graph for each region.
- 3. Estimate the percentage of people who are lactase persistent and lactase nonpersistent in each region. Write that information in Table 1 (below).

**Table 1. Investigating Geographic Patterns Summary** 

Region	Lactase persistent (%)	Lactase nonpersistent (%)
West Africa		
East Africa		
Middle East 1		
Middle East 2		
East Asia		
Northern Europe		
Southern Europe		

4. Make a claim about whether or not lactase persistence varies geographically. Make sure your claim is linked to the evidence in the data table (Table 1).

#### **Part B: Investigating the Role of Gender**

- 1. Access Map 2, which shows the simulated results from analyses of over 300 people in seven geographic regions.
- 2. Click on "Explore Lactase Persistence by Gender." Then click on the "Male" and then the "Female" buttons. Record your observations of the patterns you see.
- 3. Use information on the map to fill in Table 2.

**Table 2. Lactase Persistence and Gender Summary** 

Gender	Lactase persistence	Lactase nonpersistence
Male		
Female		

4. Use the data in the table to make a claim about whether or not lactase persistence is more common in males or females.

### Part C: Investigating the Differences between Adults and Infants

- 1. Access Map 2, which shows the simulated results from analyses of over 300 people in seven geographic regions.
- 2. The default map that you see shows lactase persistence or lactase nonpersistence for adults. Click on "Explore Lactase Persistence by Age," and then the "Infants" button to see a map of the results for infants sampled for lactase activity. Describe the patterns you see in the results.
- 3. Use information on the map to fill in Table 3.

**Table 3. Lactase Persistence and Age Summary** 

Age	Lactase activity (for infants) or persistence (for adults)	No lactase activity (for infants) or lactase nonpersistence (for adults)
Infants		
Adults		

4. Why do you think there is a difference between adults and infants for lactase activity?

# The Genetic Basis for Lactase Persistence

### **Questions**

1. Do you think you would find the gene that codes for lactase in both people who are lactase persistent and people who are lactase nonpersistent? Explain your answer.

2. Scientists recognize that two major types of changes in DNA sequences can affect the phenotype of organisms. One type changes the coding sequence of a gene. This can affect the amino acids that form the protein, which can affect the protein's shape and function. The second type of change affects when a gene gets "turned on" or "turned off." What type of change do you think causes the difference between lactase persistence and lactase nonpersistence?

### **Lactase and Human Evolution**

### **Questions**

1. Nonhuman primates and all other mammals are lactase nonpersistent. Do you think the common ancestor of humans was lactase persistent or lactase nonpersistent? Explain your answer.

2. Genetic studies show that different mutations cause lactase persistence in humans from different geographic regions. Does this evidence suggest that lactase persistence evolved once or more than once in humans? Explain your answer.

3. Did the mutation that causes lactase persistence first come about because people needed the mutation? Explain your answer.