

WHEN MILK MAKES YOU SICK

FREE Lactaid
Test and Sample Kit

*Is your gas, bloating
or diarrhea
from
dairy foods?*

Works naturally
Lactaid
Enjoy dairy foods without gas,
bloating or diarrhea.

Lactaid
Caplets

*Time to enjoy
dairy foods again...
Naturally!*

Lactaid
1-800-HELP KIT
to find out.

BACKGROUND INFORMATION: What is the topic of this ad? Who would use such a product? Why would they need it?

According to statistics approximately one-third of all Americans feel ill after consuming milk and other dairy products. We are taught that we should "drink our milk" by our parents. "It is good for you, will help you have strong bones and teeth, and grow healthy and tall." The nutritional value of milk is a fact. However, most animals stop drinking milk after they are weaned and their body chemistry changes so that they can no longer digest the sugar in milk. Worldwide this is also true for the human population. That is what is normal. It is actually unusual for adults to be able to digest milk easily.

In this lab activity you will learn more about lactose intolerance. You will understand the chemical structure of lactose, why a person may have difficulty digesting milk, how lactose tolerance may have started, why so many Americans can digest it, and how lactose-reduced products can help people.

MATERIALS: 3 test tubes and rack Benedict's solution
 distilled water boiling water bath
 milk 3 10-ml pipettes
 100% lactose-reduced milk

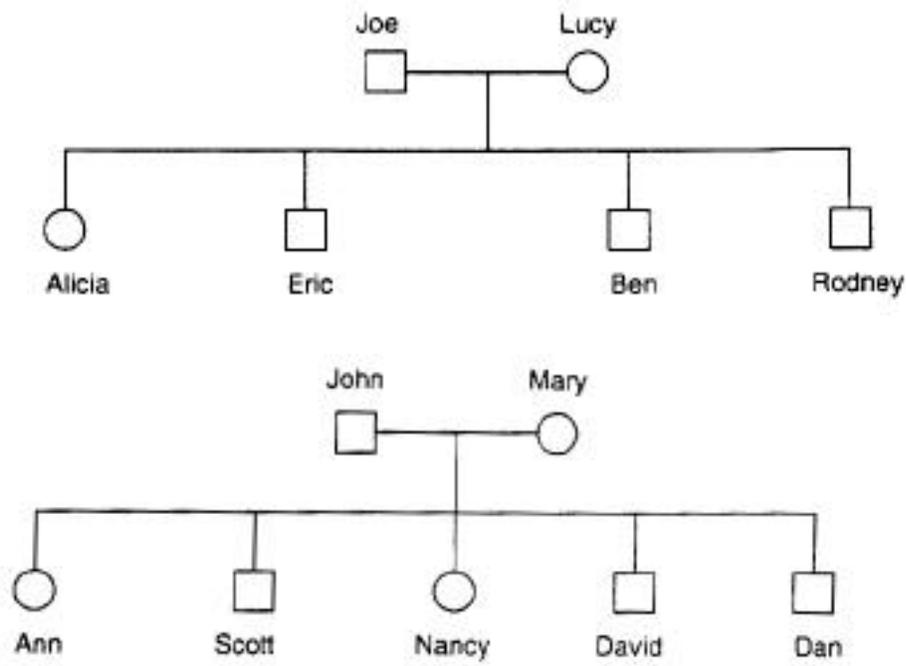
PROCEDURE: Part A. Test for lactose

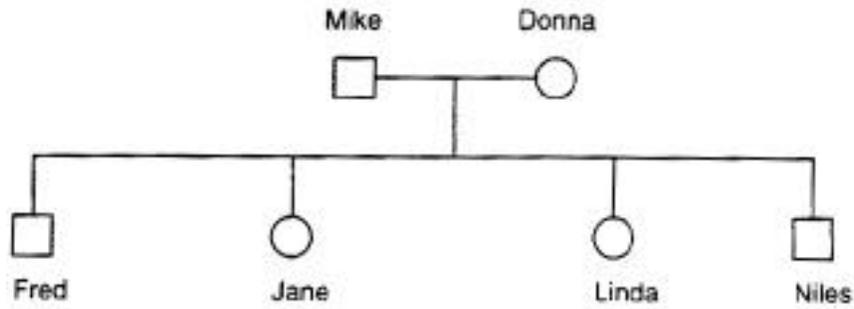
1. Place 10 ml of distilled water in test tube A
 Place 10 ml of milk in test tube B
 Place 10 ml of 100% lactose-reduced milk in test tube C
 WAIT 10 MINUTES
2. Add 5 ml of Benedict's solution to each test tube
 Heat the tubes for 3 minutes in the boiling water bath
3. Compare the tubes and record the results in the table:

Test Tube:	A	B	C
Color:			

PROCEDURE: Part B. Lactose Intolerance in Families

1. Fill in the pedigree charts for three families.
 Parents Joe and Lucy Anderson are both lactose intolerant.
 The four children: Alicia, Eric, Ben, and Rodney are all lactose intolerant.
 * Remember that we shade in persons with the phenotype being studied.
2. Parent Mary Wallace is lactose intolerant and her husband, John is lactose tolerant.
 They had five children. Ann, David, and Dan are lactose intolerant.
 Nancy and Scott are lactose tolerant.
3. Parents Mike and Donna Miller are both lactose tolerant.
 Their children Fred, Niles, and Linda are lactose tolerant.
 The other child, Jane is lactose intolerant.





PROCEDURE: Part C. Study the map of the world. The numbers indicate the percentage of the population in each area that is lactose intolerant.



USE THE MAP DATA TO MAKE A GRAPH



QUESTIONS TO ANSWER:

1. Which type of sugar is lactose?
2. What did the results of the Benedict's test for sugar mean?
3. Define hydrolysis.
4. What reaction is catalyzed by the enzyme lactase?
5. What are the products of lactose digestion?
6. What is the effect of adding lactase enzyme to milk?
7. Does it appear that lactose intolerance (or tolerance) is an inherited characteristic? Explain your answer.
8. Where did lactose tolerance probably first originate?
9. Which parts of the world were the original home of the early American settlers?
10. How can migration and gene flow affect a population?

ANALYSIS

1. When the body does not secrete lactase enzyme in the intestine, the lactose sugar is not digested. Bacteria that are a normal part of the colon use the lactose for food and produce gas. How does this contribute to the symptoms of lactose intolerance?

2. How can two parents who both tolerate lactose (digest it) produce children who do not?

What is the most probable mode of this inheritance?

Show your reasoning with a Punnett square or pedigree chart.

3. During the past 10,000 years agriculture has been important to human populations. In some isolated areas crops did not perform as well or the climate did not permit relying on them year round. In these places animals and their milk were the main food supply. Use your knowledge of evolution and natural selection to explain how some populations may have become lactose tolerant.

4. What would explain the statistics that approximately 30% of all Americans are lactose intolerant compared to other parts of the world where that number is more than 80%?