

Investigating Milk

Introduction

When a chemist analyzes fresh milk, the composition is typically 87% water, 4.8% carbohydrate, 4.0% fat, 3.5% protein and 0.7% minerals, although these values can vary. Some of the minerals in milk are calcium and phosphorus, and one of the more important vitamins is vitamin D, which is added to the mixture at the dairy.



When heated, milk reacts with acidic substances to coagulate the milk protein, such as in sour milk. In this lab, you will examine some of the properties of milk, and you will compare the differences between fresh and sour milk. You will also compare the differences between nonfat (skim) milk and 4% fat (whole) milk.

Materials

fresh skim milk
fresh whole milk
pH paper

sour skim milk
sour whole milk
vinegar (5% acetic acid)

Equipment

large test tubes (4)
marbles

stirring rod
test tube rack

Safety Considerations

- Vinegar can be irritating to the eyes and skin.
- Wash your hands thoroughly after completing this lab.

Procedure

1. Obtain approximately $\frac{3}{4}$ test tube of each of the four kinds of milk.
2. Note the odor of each type of milk. Record your observations in the Data Table.
3. Note the color of each type of milk. You may wish to compare it to the color of this lab worksheet. Record your observations in the Data Table.
4. Using pH paper, determine and record the pH of each kind of milk. Record your observations in the Data Table.
5. Obtain two marbles. To test the thickness of the milk, drop the marbles in the fresh skim and fresh whole milk test tubes at the same time. Record your observations in the Data Table.
6. Repeat Step #5 for the sour milk; record your observations in the Data Table. Remove, rinse and return the marbles when you're done.
7. Pour out some of the milk out of each "fresh" test tubes so that about $\frac{1}{3}$ remains. Add about the same amount of vinegar to each of the "fresh" test tubes and either cover and shake or stir vigorously.
8. Allow this curdled milk to settle for about five minutes. Note the appearance, odor and color and record your observations in the Data Table.
9. Repeat Step #8 with both "sour" test tubes; record your observations in the Data Table.

Clean-up

1. Dispose of the milk in the sink.
2. Clean the test tubes thoroughly with soap, water and a test tube brush.

- Return all equipment to its proper location.
- Wipe down your lab area and wash your hands before leaving the lab.

Data Table

Procedure	fresh skim	fresh whole	sour skim	sour whole
odor				
color				
pH				
thickness				
curdling				

Questions

- Why do you think the skim milk behaved differently from the whole milk?

- Why does the milk look different after its treatment with vinegar?

- What are two other physical properties of milk that we could easily determine?

- What are two food products that are based upon the souring of milk?

- List one way you could change this lab and describe how your results might be different.
