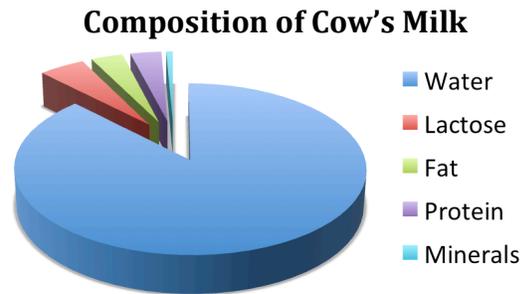


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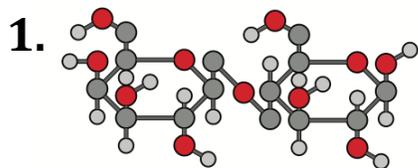
Lactose Lab Sheet

Introduction:

Milk is 87% water and contains fat, proteins, and carbohydrates. The primary carbohydrate in milk is the disaccharide *lactose*. Bonding two monosaccharides, *glucose* and *galactose* creates lactose. Another common disaccharide is *sucrose*. Bonding the monosaccharides *glucose* and *fructose* composes sucrose. Soy milk, a vegetable based milk made from soybeans, contains sucrose.

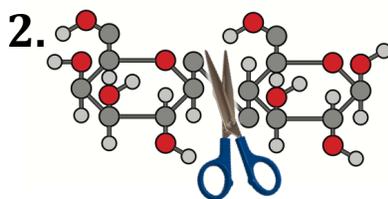


An *enzyme* is a substance that helps a specific chemical reaction to occur. The enzyme *lactase* breaks the bond that creates lactose. Therefore, when lactase is added to cow's or goat's milk, the disaccharide lactose is broken down into the monosaccharides glucose and galactose.

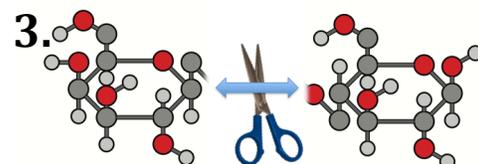


Glucose + Galactose = Lactose

(Lactose is a disaccharide)



Lactase= Enzyme that breaks down Lactose



Glucose
(monosaccharide)

Galactose
(monosaccharide)

Lactose intolerance is a problem for many individuals. Without lactase, drinking milk or eating cheese and other dairy products can cause a great deal of discomfort in the form of gas, bloating, and/or diarrhea. Without lactase the bacteria in the gut ferments lactose. The fermentation produces gas which leads to pain and discomfort in the digestive system. Most people and animals make lactase as infants. This allows them to process mother's milk. However, some people's bodies stop producing the enzyme leading to the condition of lactose intolerance. In rare cases infants can develop lactose intolerance, but usually it develops during the teen or adult years. People who are lactose intolerant tend to avoid dairy products and this can be troublesome since these foods are high in proteins and essential nutrients like vitamins A and D, magnesium, calcium, riboflavin, and potassium.

Purpose:

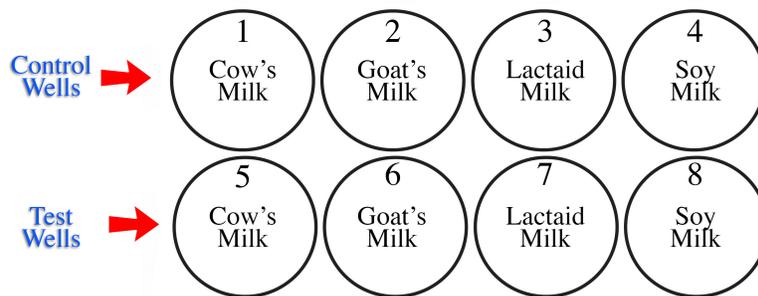
You are a scientist at a pharmacy company. Recently a new treatment for lactose intolerance was developed, *Fast Acting Lactase Tablets*. Your job is to determine what the tablets do to the composition of various milks. You need to determine if they will help those who are lactose intolerant to digest milk.

Lab Supplies:

- 1 ice cube tray
- Milk samples (cow's milk, goat milk, Lactaid milk, soy milk)
- 8 Glucose test strips
- 1 lactase tablet
- 100 mL of hot water

Procedure:

1. Make the enzyme solution by crushing 1 lactase tablet and stirring it into 100 mL of hot water. Let the solution sit for at least 5 minutes.
2. Label your glucose strips with the well numbers 1-8.
3. Add 20 mL of cow’s milk to wells 1 and 5.
4. Add 20 mL of goat’s milk to wells 2 and 6.
5. Add 20 mL of Lactaid milk to wells 3 and 7.
6. Add 20 mL of soy milk to wells 4 and 8
7. One at a time, dip your test strips into the control wells (1, 2, 3, & 4.) After 30 seconds record the amount (mg/dL) of glucose for each well on the chart below.
8. Add 5 mL of enzyme solution to the test wells (5, 6, 7, & 8.) Stir the liquid in each well. Let sit for at least 5 minutes.
9. One at a time, dip your test strips into the test wells (5, 6, 7, & 8.) After 30 seconds record the amount (mg/dL) of glucose for each well on the chart.
10. Calculate the difference between the glucose content of the control samples and the test samples. Record it in the table.
11. After all the data has been recorded, clean up your work area and materials.



Lab Results:

	COW'S MILK	GOAT'S MILK	LACTAID MILK	SOY MILK
	AMOUNT (mg/dL) GLUCOSE	AMOUNT (mg/dL) GLUCOSE	AMOUNT (mg/dL) GLUCOSE	AMOUNT (mg/dL) GLUCOSE
CONTROL	Well #1	Well #2	Well #3	Well #4
TEST	Well #5	Well #6	Well #7	Well #8
DIFFERENCE				

Follow-up Questions:

1. Why is it important to have a “control” in your experiment?
2. What are the independent and dependent variables in this experiment?
3. Which milk(s) contained glucose at the beginning of the experiment?
4. Which milks contained glucose at the end of the experiment?
5. Compare the test results of the cow’s and goat’s milk. Did one milk contain more lactose/glucose than the other?
6. In the cow’s milk and goat’s milk, was the lactase tablet effective in breaking the bond of the disaccharide lactose into two separate monosaccharides of glucose and galactose? How do you know?
7. In the soy milk, did lactase break the bond of the disaccharide sucrose into glucose and fructose? Why or why not?
8. Explain the results of the Lactaid milk. Did the added lactase have an effect on the milk? Explain why or why not.