



# Lactose Lab



**Purpose:** Students will investigate milk by comparing different kinds, researching important nutrients, and brainstorming ways to add key nutrients to your diet.

**Background:** Milk can be transformed into other products because of its complex properties. A few of these products are evaporated milk, sweetened condensed milk, and dry milk. **Lactose** is the carbohydrate (sugar) in milk. **Lactose** is made of the two sugar molecules, **glucose**, and **galactose**. **Lactose** is a **disaccharide**. Once **lactose** is broken down into these single sugar molecules (monosaccharides); it cannot be broken down further in the body. **Lactase** is an enzyme produced in the small intestine, which is used to breakdown **lactose**. **Enzymes** are substances that help chemical digestion occur in our digestive system. Without **lactase**, **lactose** is broken down by microorganisms (bacteria) in the small intestine producing gas, cramping, and diarrhea. **Lactose** intolerant individuals do not produce enough lactase to digest **lactose** causing these problems to occur. You can find **disaccharides** in different types of milk. For example, **lactose** can be found in mammal's milk. This type of milk is produced by the mammary glands of mammals like cows and goats. Rice and soy milk, however, are produced from plant products. They are a beverage and not milk. They are considered milk because they have a similar macronutrient (carbohydrate, protein, fat) composition.

**Materials:** 12 glucose strips, 2-3 paper napkins, 1 ½ crushed lactase enzyme pills, Glucose Reference Color Chart, kitchen timer or stopwatch, labeled test tube containing Unknown Milk Sample A, labeled test tube containing Unknown Milk Sample B, labeled test tube containing Unknown Milk Sample C, test tube rack or beaker, safety goggles, aprons (optional)

## Activity:

1. Obtain three labeled unknown samples of milk from your teacher (Cow's Milk, Soy Milk, Rice Milk). Through observation of enzymatic reactions, you will determine the identity of each unknown sample.
2. Measure the glucose concentration of each milk type (before adding the enzyme) by dipping 1 glucose strip into 1 unknown milk sample. Dip the side of the glucose strip that has the colored pad into the milk. Be sure to keep track of which strip belongs to each milk type. After dipping, blot each side of the strip onto a paper napkin or towel to remove the excess fluid. Not removing the extra fluid from your strip can result in an incorrect measurement. Wait two minutes for the color of the strip to develop.
3. Compare the color of the strip to the provided color chart. Record your answers in Table A under the column "Before Adding Enzyme."
4. Repeat steps 2 and 3 for the other two milk samples.
5. Add ½ of a crushed lactase pill to each milk type and stir. Then, measure the glucose concentrations of each milk type at 2 minutes, 3 minutes, and 4 minutes using the glucose strips. Record your answers in Table A.
6. Based on your observations, identify each milk sample (Soy Milk, Rice Milk, or Cow's Milk) and provide a brief explanation supporting your answer. Record your answers in Table B.

Activity from NAITC Curriculum Matrix: <https://agclassroom.org/matrix/lesson/269/>