LEARNING UNDEFEATED

Enzyme Activity Lab

ANYWHERE LABS

STEM LEARNING FOR GRADES 6-12

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Enzymes, an example of a protein **catalyst**, speed up chemical reactions by lowering the reaction's activation energy. Every enzyme has an active site that binds to another molecule called the **substrate**. Once bound to the substrate, an enzyme can catalyze a reaction up to ten billion times faster than the non-catalyzed reaction. In other words, a reaction that only occurs once every ten billion seconds (316 years) will occur once every second if catalyzed by an enzyme. Enzymes are not consumed in the reaction and can bind to an infinite number of substrates.

Today you will use an enzyme to conduct an experiment to determine the types of sugars found in different types of milk. This experiment will test rice milk, soy milk, and cow milk. Below are the common sugars found in milks. Make your predictions as to which sugar will be found in each type of milk.

Common Sugars	Monosaccharide Components	Milk Prediction
Sucrose	Glucose & Fructose	
Lactose	Glucose & Galactose	
Glucose	n/a	

MATERIALS

From the Enzyme Activity Lab bag	From the Box	From Home
• Soy milk powder • Rice milk powder • Cow milk powder • Lactase powder • 5mL tubes • Transfer pipettes • Glucose test strips	• 4 large tubes (50mL) • Glucose test color card	• Cup of Water

PREPARING SOLUTIONS

1. Gather all supplies listed on the "Enzyme Activity Test" bag.
2. Label three of the large tubes (50mL): one "rice", one "cow", and one "soy".
3. Prepare the three milk samples by adding 30 mL of water to three of the large tubes (50mL tubes).
4. Add ¼ tablespoon of the milk powder to the appropriately labeled tube (rice milk powder to rice tube, cow milk powder to cow tube, etc.). Cap the tubes and shake to mix.
5. Prepare the lactase solution by adding 15 mL of water and ¼ tbsp lactase powder to the fourth large tube (50mL tube).
6. Cap the tube and shake to mix.

LABORATORY PROTOCOL

7. Label three 5mL tubes: one "rice", one "cow", and one "soy".
8. Using a transfer pipette, fill a 5mL tube with 2 mL with rice milk.
9. Rinse the transfer pipette in water, then repeat step 8 for the soy and cow milk.
10. Use the glucose test strips to test for the presence of glucose.

    a. Dip the blue square of the glucose test strip into the milk, take it out, then wait 10 seconds. Then compare the color on the strip to the glucose test color card.

11. Record the strip color and the associated amount of glucose from your test card below.

Test 1: No Lactase

	Test Strip Color	Relative Amount of Glucose (mg/dL)
Rice Milk		
Soy Milk		
Cow Milk		

12. Shake your lactase solution, then using a new transfer pipette add 1mL of lactase to all three milks.
13. Shake your test tubes to mix the lactase into the milks.
14. Use the glucose test strips to test for the presence of glucose and record your results below.

Test 2: With Lactase

	Test Strip Color	Relative Amount of Glucose (mg/dL)
Rice Milk		
Soy Milk		
Cow Milk		

EXTENSION ACTIVITY

Design an experiment to measure the effect of temperature on lactase function.