Effects of different substrates on the specificity of an enzyme.

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Introduction:

Lactose, which is the sugar found in milk, is a disaccharide composed of glucose and galactose (both six-sided sugars). Sucrose is also a disaccharide but is composed of fructose (5-sided sugar) and glucose (6-sided sugar). Lactase is an enzyme that breaks lactose down into galactose and glucose. Although lactose is similar to sucrose, lactase will break down only lactose because of the shape of the sugar.

This lab will examine the specificity of an enzyme to specific substrates. The enzyme solution will be placed in different substrates including a milk substrate as well as a sucrose solution. Once they are mixed, two minutes will be timed and at the end of those two minutes the glucose level will be calculated and recorded in a chart, depending on whether or not it is present in the solution. In total there will be three different trials in order to get a hold of accurate information. The information gathered will be used to compare and see which solution has the highest glucose level after two minutes.

Hypothesis:

The more dense the solution, the more glucose that it will contain, meaning that the skim milk and the enzyme solution with have the greatest amount of glucose due to its denseness from the milk as well as the enzyme solution.

Variables:

Controlled Variable:

- Amount of skim milk
- Amount of enzyme solution
- Amount of water
- Time

Independent Variable:

- Enzyme solution

Dependant variable:

- Glucose levels

Materials/Resources:

- Lactase solution
- Ten milliliters of skimmed milk
- Water
- 5 grams of Sucrose
- Cylinder
- Beakers

- Five test tubes
- Test tube rack
- Pencil
- Paper
- Clock
- Glucose test strips
- Stirring rod

Lab procedures:

1. Gather the materials.
2. Label the test tubes with the following labels:
    1. Test tube with skim milk and enzyme solution.
    2. Test tube with skim milk and water.
    3. Test tube with sucrose solution and enzyme solution.
    4. Test tube with sucrose solution and water.
3. In test tube A add two milliliters of skim milk and one milliliter of enzyme solution.
4. Time for two minutes and test for glucose with the glucose test tape. Record this data in table 1. If there was glucose present mark a '+' in the table. If glucose was absent, mark a '-' in the table.
5. In test tube B add two milliliters of skim milk and one milliliter of water.
6. Repeat step 4.
7. In test tube C add two milliliters of the sucrose solution and one milliliter of enzyme solution.
8. Repeat step 4.
9. In test tube D add two milliliters of the sucrose solution and one milliliter of water.
10. Repeat steps 4.

Data and Results:

Trial #1

	Skim milk and enzyme solution	*Skim milk and water*	*Sucrose solution and enzyme solution*	*Sucrose solution and water*
Positive	-	+	+	+

glucose levels after 2 minutes				

Trial #2

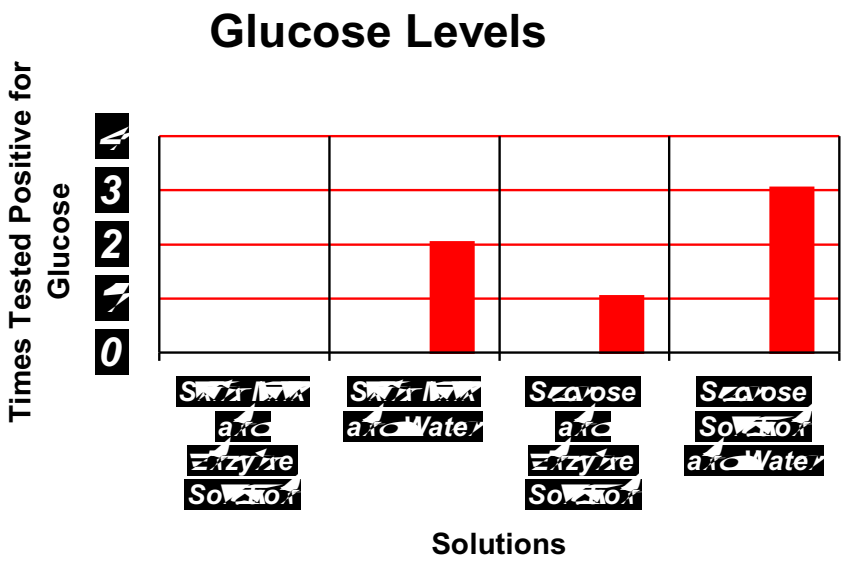
	Skim milk and enzyme solution	*Skim milk and water*	*Sucrose solution and enzyme solution*	*Sucrose solution and water*
Positive glucose levels after 2 minutes	-	-	-	+

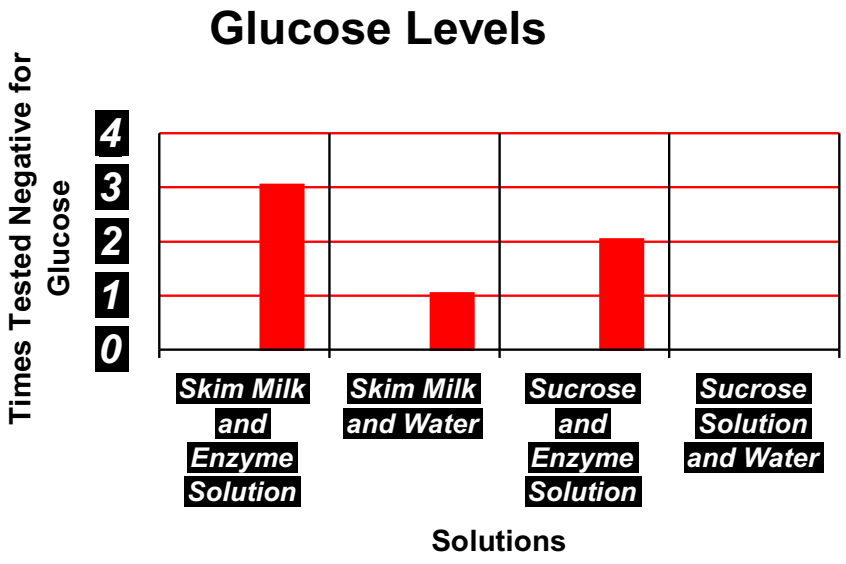
Trial #3

	Skim milk and enzyme solution	*Skim milk and water*	*Sucrose solution and enzyme solution*	*Sucrose solution and water*
Positive glucose levels after 2 minutes	-	+	-	+

Average (Overall)

	Skim milk and enzyme solution	*Skim milk and water*	*Sucrose solution and enzyme solution*	*Sucrose solution and water*
Positive glucose levels after 2 minutes	-	+	-	+





Analysis and Conclusion:

By looking at the data collected above it is evident that water helps increase the glucose levels. With the exception of a few results it is noticeable that the Sucrose Solution with Water was the solution that tested positive for glucose throughout all the trials. Following that solution was the Skim Milk and Water (tested positive for glucose for the two out of three trials) which is furthermore followed by Sucrose and Enzyme solution (tested positive for glucose once out of the three trials) and lastly the Skim Milk and Enzyme solution (tested negative for glucose all three trials). The data collected helps prove that the enzyme solution, lactase, did not help increase the glucose levels in the two different solutions that used the enzyme solution (Skim Milk and Enzyme solution, Sucrose and Enzyme solution). As seen on the overall data collected, the two solutions which had positive glucose levels when averaged out included Skim Milk and Water and Sucrose and Water. These two solutions were the only two which had positive results when averaged out, and this could possibly be due to the fact that the glucose was not broken down by the enzyme solution, lactase.

Most mistakes made in this experiment were accuracy ones in the data that was recorded. There are several different ways that this lab could have been improved. To began with, if the solutions were left together for longer than 2 minutes, the data might have been different. Some of the data that was collected during this experiment was not accurate, as for it would test positive for one trial and negative for the next. Also, the fact that in total there were only three milliliter mixed solutions in each test tube made the data limited. The lab could be improved if the total milliliter of the mixed solutions were higher, say 3 or 4 milliliters more in order to get more accurate information. If 3 or 4 milliliters more are added to the solution, the chances of collecting more accurate data almost doubles as for there is more of a solution.

Work **Cited:**

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