

Food Explorations Lab III: Amylase in Action

STUDENT LAB INVESTIGATIONS

Name: _____

Lab Overview

In this investigation, you will observe the effect of your saliva's chemical digestion on the starch content in white and whole wheat breads.

Lab Objectives:

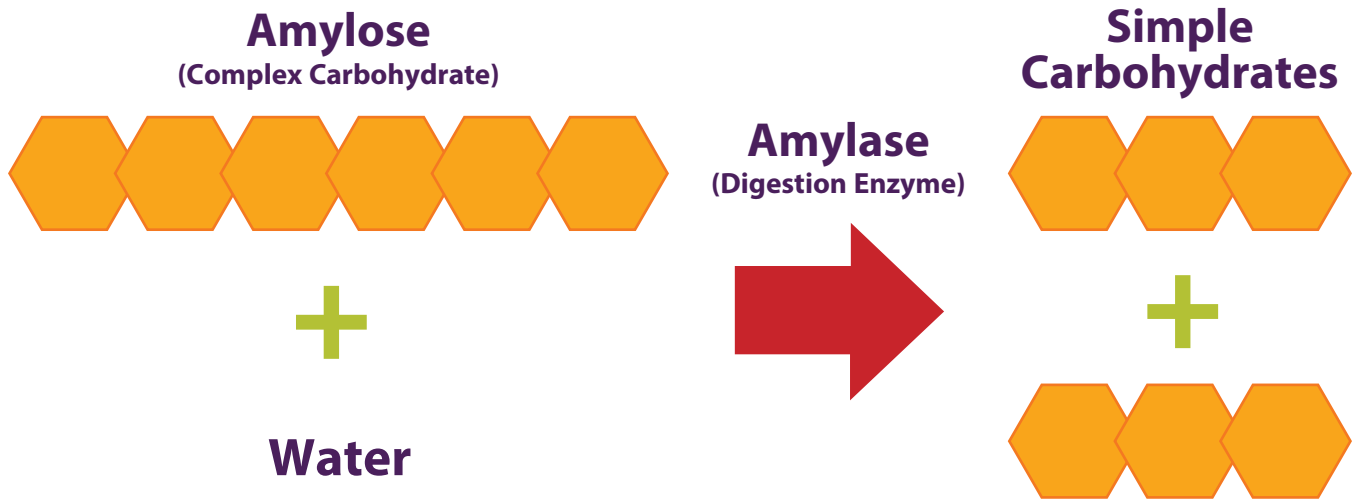
In this lab, you will learn how to...

1. Determine the differences in amylase digestion on starch in white and whole wheat bread.
2. Describe the relationship between amylose and amylase.
3. Explain mechanical and chemical digestion of carbohydrates.

Lab Safety: Before beginning ANY investigation you should put on your safety goggles and apron. It is important to avoid getting chemicals on your hands. Always wash your hands following completion of an investigation. When handling food, you should also wash your hands *prior* to beginning an investigation.

Special Note: Iodine is POISON! DO NOT consume any food with iodine on it under any circumstances.

Observation of Amylase in Action



Lab Question

Which bread type will test positive for starch after being exposed to salivary amylase? (Circle your answer.)

White Wheat Bread

Whole Wheat Bread

Both

Neither

Predictions: I predict _____ will test positive for starch after being exposed to salivary amylase because...

MATERIALS

- | | |
|------------------------------|--|
| safety goggles | 1 dropper |
| aprons (optional) | 1 stopwatch or kitchen timer |
| ½ slice of white bread | iodine solution (teacher will provide ONLY after you have finished chewing your bread samples) |
| ½ slice of whole wheat bread | |
| 1 paper plate (pre-labeled) | |

PROCEDURE

1. Tear each ½ slice of bread into thirds. Place one piece (⅓ of the half slice of bread) of each type of bread on the paper plate in the section labeled “Control.” Record your *visual* observations in Table A under the column labeled “Control.”
2. Choose one person in your group to chew the white bread sample. Take one piece of the white bread, place it in your mouth and chew it for **30 seconds**. Do not swallow the bread!
3. After chewing the bread for 30 seconds, spit it out onto the section labeled “30 seconds” under white bread. Record your *visual* observations in Table A under the column labeled “30 seconds.” Drink water in between chewing, if your mouth feels dry.
4. Take another piece of the white bread, place it in your mouth, and chew it for **1 ½ minutes**. Do not swallow the bread!
5. After chewing the bread for 1 ½ minutes, spit it out onto the Section labeled “1 ½ minutes” under white bread. Record your *visual* observations in Table A under the column labeled “1.5 minutes.”
6. Repeat steps 2-5 with the slice of whole wheat bread. Spit samples out on the plate sections chosen for wheat bread.
7. After you have finished chewing **all** of your bread samples, obtain iodine from your teacher.
8. Place two drops of iodine solution on each piece of un-chewed bread (this is the control). Record your observation in Table B under the column labeled “Control.” A positive test for starch will turn dark brown or black where the iodine comes into contact with the bread. Iodine will have little to no color when it comes into contact with a bread sample in which starch is no longer present (or present in negligible amounts).
9. Place two drops of iodine in the middle and on the sides of each chewed bread sample for each chewed bread type. Wait 10 seconds and then report if each test was positive or negative for starch in Table B under the columns labeled “30 seconds” and “1.5 minutes.”

Table A: Bread Chewing Observations Before Iodine Reaction

Bread Type	Appearance BEFORE Reacting with Iodine		
	CONTROL	30 SECONDS	1.5 MINUTES
White	White with a light brown crust	No change occurred	No change occurred
Whole Wheat	Light brown color with a darker brown crust	No change occurred	No change occurred

Table B: Bread Chewing Observations After Iodine Reaction

Bread Type	Appearance AFTER Reacting with Iodine		
	CONTROL	30 SECONDS	1.5 MINUTES
White	The bread turned a dark brown/black color	The bread turned a dark brown/black color, but the color was not as dark as in the control sample	No change occurred
Whole Wheat	The bread turned a dark brown/black color	The bread turned a dark brown/black color, but the color was not as dark as in the control sample	No change occurred

Conclusion:

1. Describe the color changes observed for both breads when iodine was placed on the control pieces.

Both breads turned a dark brown/blue color where the iodine was placed.

2. Compare and contrast the control bread pieces with iodine to those tested with iodine after 30 seconds and 1.5 minutes.

The control iodine was darker and changed the color of the bread instantly, while the bread that had been chewed for 30 seconds only had grainy spots of color change and the bread that was chewed for 1.5 minutes had little/no color change.

3. Using your observations, explain if your original response to the lab question was supported by the results.

Both breads tested positive for starch after being chewed for 30 seconds.

4. Compare and contrast your iodine test results for the white bread (made from milled grain) to the iodine results for the whole wheat bread (made from whole grain).

There were no differences in the iodine test results for the white and whole wheat breads. The fiber in whole grain bread does not interfere with amylase's ability to breakdown starch.

5. Using your answer to question 4, infer if the chemical digestion of amylose in whole grains is easier or more difficult than in milled grains.

The chemical digestion of amylose is more difficult in whole grains because they contain more amylose.

6. Describe how this investigation demonstrated both mechanical digestion and chemical digestion.

Mechanical digestion occurred through mastication (chewing the bread). Chemical digestion occurred when the enzyme amylase (found in saliva) began to break down the amylose.

7. Referring to the reading "Flour Power" and the diagram shown at the beginning of this lab investigation, explain what happens to the starch, amylose, during digestion in a person's mouth.

Amylose, a complex carbohydrate, is broken down by the enzyme amylase to a simple carbohydrate, which does not contain starch. Amylase is found in the saliva in a person's mouth.

Student Investigations Lab Extension

With help from your teacher, create a class chart reporting the results of starch tests of each group. Report if each test was positive or negative for starch.

Table C: Class Chart

Flour Type	Group	Appearance		Appearance	
		BEFORE Reacting with Iodine		AFTER Reacting with Iodine	
		30 SECONDS	1.5 MINUTES	30 SECONDS	1.5 MINUTES
White	GROUP 1				
	GROUP 2				
	GROUP 3				
	GROUP 4				
	GROUP 5				
	GROUP 6				
Whole Wheat	GROUP 1				
	GROUP 2				
	GROUP 3				
	GROUP 4				
	GROUP 5				
	GROUP 6				

1. Provide possible reasons to explain why varying results might occur.

If the 30 seconds samples sat out too long, the tests may produce a false-negative outcome because the amylase will continue to breakdown the starch present in the bread.

2. Brainstorm with your group other foods that might contain whole grains. List a minimum of three below.

whole wheat, graham flour

oatmeal

whole oats

brown rice

wild rice

whole-grain corn

popcorn

whole-grain barley

whole-wheat bulgur

whole rye