

Introduction: Assume that suddenly, for some unknown reason, our only food source is starch. Those people that can digest starch (those best adapted to this new environmental condition) have better survival chances. An enzyme present in human saliva, salivary amylase, begins starch digestion in the mouth. If some humans have more salivary amylase in their saliva, they would be better suited to this new environment than humans having little salivary amylase. Do humans have variation in the amount of amylase? Would this variation become an advantage for persons having more amylase if diets were restricted to starch?

Purpose: a) To determine how long it takes for your salivary amylase to chemically break down starch. b) To determine if there is variation in the amount of salivary amylase in different people.

Hypothesis: Read the procedure that follows and understand the data that is to be collected. Then write an hypothesis about variation of salivary amylase in the Biology class. Use the IF/THEN format and include your independent and dependent variables.

Materials: eyedropper 12 test tubes in rack 50 ml beaker stirring rod 10 ml graduated cylinder
iodine solution starch solution

Safety: DANGER- Iodine will permanently stain your skin and clothes.

Procedure:

1. Be sure that you begin with 12 clean test tubes.
2. Add one squirt of iodine (no more than $\frac{1}{2}$ a dropper) to each of your 12 test tubes.
3. Prepare a 12% saliva solution:
 - a. Collect 2 ml of saliva (not counting the foam) in a 10 ml graduated cylinder
 - b. Pour the saliva into a 50 ml beaker. Using the same graduated cylinder, measure 17 ml of water and pour this into the beaker with the saliva. Use a stirring rod to mix this solution.
4. Wash the graduated cylinder and use it to measure 7 ml of starch solution.
5. Using the eyedropper, add 20 drops of your saliva-water mixture to the 7 ml of starch solution in the graduated cylinder. Use the clean stirring rod to mix the starch and saliva-water mixtures. **MARK DOWN THE EXACT TIME YOU ADDED THE SALIVA TO THE STARCH.**
6. After 3 minutes, add 2 drops of the saliva-starch mixture from the graduated cylinder to test tube #1. Mix by swirling the test tube. Clean the dropper.
7. Record the color change (if any) on your chart. Use only the following colors: dark blue, blue-brown, brown-blue, brown.
8. After 3 more minutes, add 2 drops of the saliva-starch mixture to the next test tube of iodine. Swirl the tube and record the color in your data chart (see back for tables).
9. Continue adding liquid from the saliva-starch solution at three minute intervals until there is no color change from the original iodine.
10. Use the "standard tube" provided to decide at what point the starch is all broken down.

11. Enter your personal data on the Class Results data table on the board/overhead. Copy all of the class data onto your chart.

Data: Copy the following 2 charts on your paper.

Individual Results	
Time of starch breakdown	Color of iodine
0	Dark blue
3	
6	
9	
12	
15	
18	
21	
24	
27	
30	
33	
36	

Class Results	
Time of starch breakdown	Number of students
0	
3	
6	
9	
12	
15	
18	
21	
24	
27	
30	
33	
36	

Analysis 1: Create a graph of the class results on your paper. Ask yourself “What will be on the X axis? What will be on the Y axis? What units of measurement will be used?”

Analysis 2: Answer the following questions in complete sentences.

1. What is a mutation?
2. How are mutations related to evolution?
3. What are the four organic macromolecules?
4. What is an enzyme?
5. Which of the four macromolecules is it?
6. What is a test for the presence of starch?
7. How long did it take for your saliva to digest the starch?
8. How does your time compare to the time of other students?
9. How does your amount of amylase compare to that of other students?
10. Which time had the greatest number of students?
11. If our only food source is starch, which students would more likely survive? Explain.
12. How do some people have more amylase than others? (HINT: What does DNA have to do with proteins?)
13. Explain how mutations lead to variations within a species.
14. Think of and describe another example of variation in people and how it could be of adaptive value.

Conclusion: Was your hypothesis correct? Use the data to explain. Also, using the following terms, explain why having differences in all the "children" of any population is good. mutation variation environment adaptation natural selection