Mr. Ulrich/Mrs. Ryan
Regents Biology

Salivary Amylase Lab

Background: Enzymes are protein catalysts. This means they are chains of amino acids with a particular shape that allows them to interact with a specific molecule called a *substrate* to bring about a chemical reaction. When the reaction is complete, the enzyme is unchanged and able to interact with another substrate molecule. Many enzymes are present in your digestive system. Each digestive enzyme breaks down a specific type of macromolecule. For example, pepsin breaks down protein and lactase breaks down lactose, a disaccharide. Digestion begins in your mouth with saliva which contains an enzyme called amylase. Amylase works to break down complex carbohydrates. Through hydrolysis, amylase breaks down the polysaccharide, AKA starch, into the monosaccharide, glucose. In this experiment, Lugol's Iodine solution will be used to test for the presence of polysaccharides in test tubes and Benedict's solution will be used to test for the presence of simple sugars.

Start salivating….you're going to need it!
(Think "foodie" thoughts)

Purpose: To observe the results of enzyme action.

Pre-lab questions:
What does Lugol's iodine solution test for?

What is the color change for a positive Lugol's test?

What does Benedict's solution test for?

What is the color change for a positive Benedict's test?

What do we call compounds that change color to show chemical properties?

What determines a proteins shape?

Material:
6 test tubes – two labeled A, two B and two C
Test tube rack
Test tube holder
Hot plate with beaker of boiling water
Starch solution
Corn starch
Lugol's iodine solution with dedicated pipet
Benedicts solution with dedicated pipet
Safety goggles
10-ml graduated cylinder

Procedure:
First we need to prepare our solutions for testing. There will be two of each preparation – one set for the Benedict's/simple sugar test and one set for the Lugol's/starch test.

1. Using a graduated cylinder measure 5 ml of starch solution into each "A" test tube and put them in the test tube rack.
2. Work up a good amount of spit in your mouth and spit it into the "B" test tubes. You don't need to measure it but it should fill about 1 cm of the tube. Put them in the rack.
3. Now for the "fun" part. Put about ½ tsp (the tip of a plastic spoon) of dry cornstarch in your mouth. DO NOT SWALLOW IT. It's not poisonous. We need it for testing though.
4. Slosh it around in your mouth for a moment until it is a runny goo and then spit it into test tube "C". If it sticks to the side of the tube and doesn't run the side into the bottom of the test tube it wasn't runny enough.
5. Repeat the process for the other test tube "C".

Now we set up the sugar test.

1. Take one set of test tubes (A, B, and C) and put 5 drops of Benedict's solution into each test tube.
2. Swirl each tube and carefully place them in the boiling water bath.
3. Wait 5 minutes for results. While waiting, go on to the starch test.

While the sugar test runs, complete the starch test.

1. Put 5 drops of Lugol's solution into each of the remaining test tubes (A, B, and C) in the rack.
2. Note the color change (if any) of each test tube in table 1.
3. Analyze the results (what do the results tell us about the presence of starch in each tube?) in table 1 as well.
4. After 5 minutes, note color changes and analyze the results from the sugar test (is sugar present?) in table 1.

Results:

Test tube	Iodine test (include color)	Starch present?	Benedict's test (include color)	Simple sugars present?
A (starch sol'n)				
B (saliva)				
C (Saliva and starch)				

Analysis and Conclusion Questions:

1. What would be a good hypothesis for this experiment?

2. Prove or disprove this statement: Saliva contains enzymes that break down starch into simple sugars.

3. Why did we include water and starch test tube in the experiment?

4. Why did we include the test tube with only saliva in the experiment?

5. Mr. Ulrich loves cheese but it doesn't start chemically breaking down in the mouth. Why not?