# Digestion

## Introduction:

In this study we conducted an experiment that entails the concept of digestion. We were eager to explore the effects that enzymes have on digestion. My partners and I constructed a simulation that correlates with human digestion in the most appropriate manner. We observed the enzyme amylase which is dominantly present in our saliva. We extracted saliva through chewing a piece of gum and disposing of the saliva into a designated cup. Through the creation of 5 test tubes filled set at different with the accompaniment of a base which was just water. Are hypothesis was that the enzyme amylase will work most effectively in an optimum ph level of close to 7. Ultimately, we predicted we would be best able to detect active enzymes of amylase to be more active in pH environments closer to that of 7.

## Materials and Methods:

Materials used were pH Paper, Lugol's Iodine Solution, Benedict's Solution, Sugar Free Gum, HCl, NaOH, Starch, DI Water, Saliva, Test tubes, Pipets, pH probe, marker, and a pipette. Rinse Waste In the experiment we designed, we established 6 set tubes set at precise pH levels. The test tubes were filled with 4mL of deionized water and 2mL of starch. We also had a test tube that consisted of 4 mL that was not altered. We were able to alter the pH of each test tube through the use of hydrochloric acid to decrease the pH and sodium hydroxide to increase the pH. We put 3 drops of HCL in test tube 1 to get it to 2.98. Test tube 2 was given 1 drop of HCL and 3 drops of NaOH to set it at 5.04. The third tube was set at 7.25 with the addition of 2 drops of NaOH. The fourth tube was set at 8.85, and 3 drops of NaOH were needed. The fifth test tube was set at 10.30 with 7 drops of NaOH. We placed these test tubes in the warming station for an hour that had a temperature at 37 degrees Celsius. After this, we split each test tube in half. Therefore, we had two identical concentrations for each test tube. We conducted a maltose test on one of them, and a starch test on the other one. We did this through two solutions. To test for starch we used Lugol's solution, and for maltose we used Benedict's solution. 3 drops per 2 mL were used for the starch testing. For the maltose, 1 mL of Bendicts was matched to each millimeter in the test tube. Through this we can understand if the starch was broken down by the

enzyme or not. In the starch test, a dark purple would indicate to us that there is an apparent presence of starch. Shades of brown and similar colors represent a smaller amount of starch. In regards to the Maltose test, red shows the strongest presence of maltose. Orange, green and blue, follow in strength in that order.

**Results:**

First, I must note that at the end of this lab my group and I concluded that we should have put in a higher concentration of saliva in order to appropriately analyze our data to the best of our ability. With this being said, we got information that our amount of maltose was all negative. This is one of the primary reasons we believe that we should have applied more saliva. For our starch test we obtained data and will express the presence of starch in positive and negative terms. Tubes 2 and 3 that were tested for starch came back with a positive rating +++. This means that starch was present and therefore the amylase did not do too much. At 2.98 we got negative results and at 10.30 we had a slight presence of starch. We found the presence of amylase to be most abundant in the solution that was a base with a pH level of 7.25. This correlates with our hypothesis that the optimum temperature for the enzyme amylase to be active is at as close to 7 as possible.

| | Deionized Water | Starch | Hydrochloric acid or Sodium Hydroxide | pH Level | Saliva |
|---|---|---|---|---|---|
| **Base** | 6mL | NA | 2 drops of NaOH | 7.25 | 1 drop |
| **Test Tube 1** | 4mL | 2mL | 3 drops of HCl | 2.98 | 1 drop |
| **Test Tube 2** | 4mL | 2mL | 1 HCl and 3 NaOH | 5.04 | 1 drop |
| **Test Tube 3** | 4mL | 2mL | 3 drops of NaOH | 8.85 | 1 drop |
| **Test Tube 4** | 4mL | 2mL | 7 drops of NaOH | 10.30 | 1 drop |

**Discussion:**

As stated previously in the lab, I believe that the optimum pH level for salivary amylase is around 7. The chemical buffers act on it to prevent it from getting to acidic or to basic which facilitates in maintaining the pH level at 7. The tube that the amylase was optimized in was the basic tube which supports the concept that the ideal pH level for it to act as an enzyme is is the 7.0 pH level. I do not believe that salivary amylase could continue to act as a catalyst in the stomach during digestion. This is because the pH of the stomach is simply way too acidic for amylase to be able to act. pH of stomach is 3 where we need it to be at 7 in order for it to work effectively.

**References:**

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