

Chemical Breakdown of Foodstuff (lab 9)

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## Introduction

The first thing that comes to mind when individuals talk about the digestive system is the weird noises that the stomach makes. However, the noises aren't the only thing happening, but the breakdown of the ingested food. Additionally, the digestive system is essential to our body as it absorbs the nutrients we need and removes the waste (Marieb et al., 2016). The digestive system tract begins in the mouth and ends in the anus for the exiting of wastes. For instance, before even eating, your salivary glands start getting active and stimulating, getting ready for the breakdown of food. In today's experiment, we will analyze the chemical breakdown of foods, which is the secretion of an enzyme that decomposes food into smaller molecules.

The experiment is based on the enzymatic activity of amylase, trypsin, and lipase. Each mentioned enzyme has an essential role in the digestive system. For instance, The salivary amylase test helps with the breakdown of starchy molecules and decomposes amylase turning it into maltose. Moreover, the trypsin test is an enzyme that helps with the digestion and breakdown of proteins (Marieb et al., 2016). Lastly, pancreatic lipase breakdown the fats in the food that is consumed. The experiment consisted in testing the enzymatic activity of amylase, trypsin, and lipase.

The experiment aims to analyze the effect of the different substances and their respective test and how they impact the digestive system. We observe the different results and what it shows and means. In addition, the benedict's test and Lugo's iodine are used in the amylase experiment to identify the presence of starch and maltose. For this reason, the test can be read by the color change, in the benedict's test, the presence of maltose will be an orange color. Not to mention that the iodine test will reveal black if it is positive for the existence of starch. Continuing with the other test that is analyzed today is the trypsin test which indicates the hydrolyzation Bapna by turning yellow (Marieb et al., 2016). Lastly, the pancreatic test indicates if the breakdown of

fats has occurred and its pH level, if the result comes as (pink/red) means is positive and becoming more acidic (Marieb et al., 2016).

### **Material and Methods**

The amylase experiment requires the following tools: Tile, pipettes, hot plate, clamps, ice, and six test tubes. The needed substances are distilled water, amylase, starch, maltose, Lugol iodine, and benedict's test. First, with a marker, the six tubes are classified as 1A,2A,3A,4A,5A, and 6A. Then, in their respective tube, 3 drops of the substance are added: the first 3 tubes have in common distilled water but differ in their secondary substance as 1A(amylase), 2A(starch), and 3A(maltose). Similarly, the three tubes remaining consist of amylase and differ in the procedure as 4A was boiled for 5 minutes and then had the starch added, 5A(starch) and 6A(starch) and was placed in cold temperatures of 0c. The rest of the tubes were placed in a water bath for an hour that maintained a temperature of 37c. Lastly, in a tile, one drop of each of the substances is added with Lugol iodine to indicate the presence of starch. Not to mention, in the tubes 3 drops of benedict's test are added to reveal the presence of maltose.

The trypsin experiment requires 5 tubes, in which each significant tube will have 3 drops of the following substances: Distilled water, trypsin, and Bapna. Likewise, the test tubes were classified as 1T,2T,3T,4T, and 5T. Distilled water is added for the first two tubes, but for the second substance, 1T(trypsin) and 2T(bapna). Comparatively, the last 3 tubes have added trypsin but differ in the procedure as in 3T is boiled for 5 minutes and then bapna is added into the tube, 4T(bapna) and, 5T(bapna) is left in cold temperatures that drop to 0c. Then the rest of the tubes are placed in a water bath for an hour that maintains the temperature of 37c. The result will show if Bapna was hydrolyzed.

In the experiment of the pancreatic lipase digestion of fats requires the following tools: 7 tubes, hot plate, clamp, microspatula, ice, and pipettes. The substances used are lipase, litmus

cream, distilled water, and a pinch of bile salts. And are added in their respective classified tubes. The 7 tubes are labeled as 1L,2L,3L,4L,5L,4B and 5B. In like manner, 5 drops of each of the substances are added to the tube. For instance, the first two tubes have distilled water added and differ in their second substance of 1L(pancreatin) and 2L(litmus cream). During the third tube 3L, pancreatin is added and then boiled for 5 minutes, when it is done, the litmus cream is incorporated in the tube. The rest of the tubes have pancreatin in common but differ in their procedure. For example, 5L have added litmus cream; the tube is placed in cold temperatures that drop to 0c. 4B have added litmus cream and a pinch of bile salt, the mixture is then mixed with a microspatula. Similarly, 5B have added litmus cream and a pinch of bile salt that is also mixed, then is placed in cold temperatures that drop to 0c. All the tubes except 4B and 5b are placed in a water bath for an hour that maintains the temperature of 37c. This experiment indicates if the breakdown of fats has occurred.

## Results

### Salivary Amylase Digestion of Starch:

The salivary amylase digestion starch experiment indicates three controls amylase, starch, and maltose. The test's purpose is to reveal the presence of starch (black) and negative (yellow). Similarly, the benedict's test shows the presence of maltose (orange) if hydrolysis has occurred and if absence negative (blue).

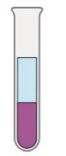
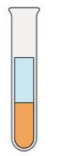
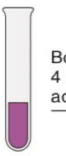
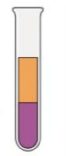
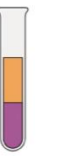
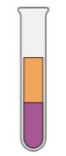
Salivary Amylase Digestion of Starch						
Tube no.	1A	2A	3A	4A	5A	6A
Additives (3 gtt ea)						
Incubation condition	37°C	37°C	37°C	37°C	37°C	0°C
IKI test (color change)	Yellow	Black	Yellow	Black	Yellow	Black
Positive (+) or negative (-) result	—	+	—	+	—	+
Benedict's test (color change)	Blue	Blue	Orange	Blue/Orange	Orange	Blue/Weak Orange
Positive (+) or negative (-) result	—	—	+	—, +	+	+

**Additive key:**




= Amylase   = Starch   = Maltose   = Water

### Trypsin Digestion of Protein:

The experiment of Trypsin indicates hydrolysis of Bapna, if positive (yellow) and negative (colorless).

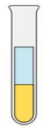
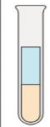

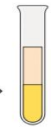
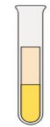

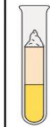
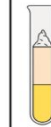
Trypsin Digestion of Protein					
Tube no.	1T	2T	3T	4T	5T
Additives (3 gtt ea)			 Boil trypsin 4 min, then add BAPNA. → 		
Incubation condition	37°C	37°C	37°C	37°C	0°C
Color change	Colorless	Colorless	Colorless	Yellow	Tint of Yellow
Positive (+) or negative (-) result	—	—	—	+	+

Additive key:

 = Trypsin     = BAPNA     = Water

### Pancreatic Lipase Digestion of Fats:

The pancreatic experiment reveals if the breakdown of fats by lipids has occurred. The table below indicates the presence of pancreatin positive (pink/red) and a negative (blue/colorless) if absent.

Pancreatic Lipase Digestion of Fats							
Tube no.	1L	2L	3L	4L	5L	4B	5B
Additives (5 gtt ea)			 Boil lipase 4 min, then add litmus cream. → 				
Incubation condition	37°C	37°C	37°C	37°C	0°C	37°C	0°C
Color change	Colorless	Blue	Blue	Pink	Blue	Red	Pink
Positive (+) or negative (-) result	—	—	—	+	—	+	+

Additive key:

 = Lipase     = Litmus cream     = Water     = Pinch bile salts

## Conclusion

Significantly, the three tests talked about today: Amylase, Trypsin, and pancreatic, had different results. The amylase test shows the amylase works best at digesting starch in normal body temperatures 37c. The test also indicates the presence of starch with the iodine substance added. It also shows the presence of maltose with the benedicts test. Moreover, the test tubes that presented positive with starch are 2A,4A, and 6A. At the same time, the tubes that tested positive for maltose were 3A, 5A, 6A, but in 4A, shown to be partially positive as the high temperature denatured the amylase at not digesting starch. Furthermore, the trypsin test shows the hydrolyzation Bapna which makes a yellow color if presence, as seen in the table 4t, was positive at normal temperature(37c). In comparison, 5t had a tint of yellow due to low temperature, which didn't allow bapna to hydrolyze properly. Finally, the pancreatic test indicates the breakdown of fats in certain temperatures, showing positive if pink or red. The table indicates that the digestion of fats doesn't occur in high temperatures but works in normal temperatures and low temperatures if bile salt is added.

## Reference

Marieb, Elaine Nicpon., et al. "Human Anatomy & Physiology Laboratory Manual. Cat Version 11th edition." *In SearchWorks Catalog*, 2016, <https://searchworks.stanford.edu/view/11693293>.