Lab Report:
Chemical Breakdown of Food Stuff

By: Chapelle O'Brien
A&P II Lab/ Wed 2:30 – 5:00pm/ D057
Prof: Hoque

Introduction

For the human body to conduct the activities that it does on a day to day basis not just for survival but for pleasure as well as self-maintenance it needs to be fueled properly with energy and nutrients. A major part of how the body gets its fuel is through the digestion of food. Food digestion is made up of two components: the mechanical breakdown of food into what is called a bolus which is formed when food is broken down and mixed with saliva, followed by the chemical breakdown of the bolus. Both components are necessary for the break down and buildup of "Foodstuff" for energy in the form of ATP for cellular process and for the absorption of nutrients necessary for the body to maintain homeostasis.

The chemical breakdown of food is facilitated by bile which is created in the liver and pancreatic enzymes which as the name suggests, are created in the pancreas and moves to the small intestine where nutrient absorption begins. For the purpose of this lab, the focus will be on the role of enzymes as catalyst interacting with their substrates during the process of digestion. Different types of enzymes target different nutrients. The enzyme-substrate relationship that will be examined are amylase to starches, pepsin to proteins and lipase to fats. To understand how the enzymes function, know that digestive enzymes are hydrolytic enzymes; the prefix hydro- means water. "Their substrates or the molecules on which they act, are organic food molecules which they break down by adding water to the molecular bonds, thus clearing the bonds between chemical building blocks or monomers" (Marieb & Smith, 2018). The hypothesis suggests to examine the relationship between the enzyme and its substrate to test for the presence of said substrate and propose that the presence of heat will increase the catalyst reaction.

Materials/Methods

Activity 1: With the supplies mentioned this activity tests for the presence of and the breakdown of starch to the degree that the enzyme, salivary amylase has occurred through observation. The supplies used to test for amylase were test tubes, a beaker filled with distilled water, iodine, a hot plate, amylase and benedict solution.

Activity 2: Using 4 test tubes based with a lipid cream pH indicator, observation is used to distinguish a color change indicating an alteration in the pH based on the addition of the lipase enzyme. Bile salts, amylase and water were also used.

Activity 3: Using 5 test tubes each with an equal amount of egg white and an incubation period of 30 minutes. One of the test tubes remained at room temperature while the others were given a warm water bath, all of them were shaken and then observed for signs of digestion of albumin. The other substances used were water, pepsin, amylase, and hydrochloric acid.

Results/Data

Activity 1:

TUBE No.	1T	2T		3T	4T		4T
Additives	Water	Starch		Starch	Starch		Heated Amylase
Iodine (+) or (-)	+	+	Salivary Amylase (+) or (-)	–	+	Benedict Solution (+) or (-)	+
Color Change	N	Y	Incubation Condition (warm water bath)	Y	Y	Incubation Condition (Heated and then Cooled)	Y
			Color Change	N	Y	Precipitation Formed	Y

Activity 2:

Lipase Digestion of Lipids				
TUBE No.	1T	2T	3T	4T
Additives				
Lipid Cream W/pH indicator (pink)	Yes	Yes	Yes	Yes
Water	Yes			
Bile Salts	Yes		Yes	
Amylase				Yes
Lipase Enzymes	Yes	Yes	Yes	Yes

Color Change =production of fatty acid		**Yes (light pink)**	**Yes (yellow)**	

Activity 3:

Digestion of Proteins					
TUBE No.	**1T**	**2T**	**3T**	**4T**	**5T**
Additives					
Egg White	**Yes**	**Yes**	**Yes**	**Yes**	**Yes**
2ml Water	**Yes**				
2 ml Pepsin		**Yes**	**Yes**	**Yes**	
2 drops HCL		**Yes**		**Yes**	
2ml Amylase					**Yes**
Incubation (30 min)	✓	✓	✓	✓	✓
Warm Water Bath	✓		✓	✓	✓
Shaken	✓	✓	✓	✓	✓

Particle breakdown =Y or N		Y	Y	Y	

Discussion/Conclusion

In Activity 1 iodine was used to establish the presence of starch. When the testing enzyme amylase was introduced and heated, the digestion of starch was proven when the color turned clear. The precipitate at the end signified that there was a presence of simple sugars, so the enzyme amylase was effective in breaking down starch. In Activity 2 the testing enzyme lipase was observed overtime and indicated by a change in pH from pink to yellow or white. In tubes 2 and 3 there was evidence of lipid digestion but more in tube 3 which indicated that lipid digestion worked better with bile salts. In Activity 3, several substances where tested to see their effectiveness in the digestion of the protein albumin. It was then concluded that the enzyme pepsin produced the greatest digestion under the condition of having a more acidic pH as well as warmer temperature which was the environment in tube 3. It would also be a valid conclusion to assume that this would be the conditions of the stomach where proteins would be digested. Overall, it was concluded that enzymes are most effective to their substrates under heat as well as acidic conditions.

References

Haney, Patrick. "The Digestion of Starch by the Enzyme Amylase." *Youtube*, uploaded by Science and Technology, 1, June 2015, https://www.youtube.com/watch?v=ISf6ClTbg78

Jahn, Walter, "Lipid Digestion Experiment." *Youtube*, uploaded by Science and Technology, 29, March 2018, https://www.youtube.com/watch?v=ISf6ClTbg78

Jahn, Walter, "Pepsin Digestion of Protein Experiment." *Youtube*, uploaded by Science and Technology, 30, March 2018 https://www.youtube.com/watch?v=OgMBQVt0mz4

Marieb, Elaine Nicpon, et al. *Human Anatomy & Physiology Laboratory Manual: Fetal Pig Version*. Pearson, 2019.