DIGESTIVE ENZYMES LAB

Introduction:

Enzymes make the body go! They are proteins which are made by the cell and which act as catalysts. Catalysts speed up chemical reactions. “Speed up” is, in a sense, an understatement. Without these catalysts, chemical reactions would take place so slowly that it would be as if they weren’t taking place at all.

Most enzymes do their work in the cell. Others are produced by the cell but released to do their job elsewhere. Such is the case with the enzymes we will study today. Salivary amylase (also known as ptyalin) is produced by cells in the salivary glands and released, through ducts, into your oral cavity. Pepsin is produced in the gastric glands and released through ducts into your stomach. Let’s see what they do.

Procedure:

In this lab we will be working in groups of 3! Each group will have their own experiment. After your group completes the lab, you will share your results/data by writing them on the board.

1. Pepsin Experiment

Materials:

- 4 solo cups
- 4 plastic sandwich bags
- 4 small, morsels of each of the following:
  - Hard boiled egg white
  - Bread
  - Beef Jerky
  - Potato
- 4 pieces of dental floss
- Warm water (40°C)

Steps:

1. Make sure your solo cups are numbered 1, 2, 3, 4. If they are not find some that are.
2. Place approximately 1-2 inches of warm water in the bottom of each cup.
3. Place one sandwich bag into each cup with the top folded over the top of the cup.
4. Follow the flow chart below in adding the appropriate amounts of each solution to your “lab stomach”. Use graduated cylinders for measuring fluid volumes. TAKE YOUR STOMACH TO THE SOLUTIONS!!!!

<table>
<thead>
<tr>
<th></th>
<th>Stomach 1</th>
<th>Stomach 2</th>
<th>Stomach 3</th>
<th>Stomach 4</th>
</tr>
</thead>
<tbody>
<tr>
<td>Distilled Water</td>
<td>80 mL</td>
<td>40 mL</td>
<td>40 mL</td>
<td>0 mL</td>
</tr>
<tr>
<td>HCl</td>
<td>0 mL</td>
<td>0 mL</td>
<td>40 mL</td>
<td>40 mL</td>
</tr>
<tr>
<td>Pepsin</td>
<td>0 mL</td>
<td>40 mL</td>
<td>0 mL</td>
<td>40 mL</td>
</tr>
</tbody>
</table>

5. Tie a small length of dental floss to each piece of food. The floss should be long enough to suspend and periodically remove each morsel of food.

6. Suspend the 4 kinds of food in each of the stomachs. (Stomach #1 should have 1 piece of bread, 1 piece of egg, 1 piece of beef jerky and 1 piece of potato, etc.)

7. Observe the suspended food every 10 minutes for 40 minutes.

8. Record your observations in the data table provided.

9. To clean up: Leave everything in the ziplock baggie, put the dental floss that is hanging out in the baggie, seal the baggie, put the entire baggie in the garbage. Empty the solo cup and place back on counter. DO NOT THROW SOLO CUP AWAY!!!!

2. Salivary Amylase Experiment

1. Check your test tubes to make sure they are numbered 1, 2, 3.

2. Place the initials of one person in your group at the top of the test tube.

3. Make small marks on each test tube about 1 cm and 2 cm from the bottom.

4. Follow the flow chart below in adding the appropriate amounts of each solution to each test tube. Do not count the bubbles in the measurement of saliva.

<table>
<thead>
<tr>
<th></th>
<th>Tube 1</th>
<th>Tube 2</th>
<th>Tube 3</th>
</tr>
</thead>
<tbody>
<tr>
<td>Distilled Water</td>
<td>1 cm</td>
<td>1 cm</td>
<td>0 cm</td>
</tr>
<tr>
<td>Saliva</td>
<td>1 cm</td>
<td>0 cm</td>
<td>1 cm</td>
</tr>
<tr>
<td>Starch</td>
<td>0 cm</td>
<td>1 cm</td>
<td>1 cm</td>
</tr>
</tbody>
</table>

5. Put about 75 mL of warm water (37°C) in the bottom of the beaker.

6. Place the test tubes in the beaker for 10-15 minutes.
7. After 10-15 minutes place 20 drops of Benedict’s (blue) solution in each test tube. Benedict’s detects the presence of sugar.
8. Place the test tubes with the Benedict’s in the boiling water. You are looking for a color change.
9. Record your results below.
10. To clean up dump the contents of your test tube down the sink. Rinse out your test tube and put it on my desk.

Data Table – Salavary Amylase Experiment

<table>
<thead>
<tr>
<th></th>
<th>Tube 1</th>
<th>Tube 2</th>
<th>Tube 3</th>
</tr>
</thead>
</table>

Benedict’s Results

Conclusion Questions:

1. Stomach #4 is intended to simulate the conditions of your stomach. Why was it necessary to set up each of the other three stomachs? Consider the importance of each one separately.

2. What do the results tell you about the contents of each test tube?

3. If you got a positive Benedict’s test in one of the test tubes, why was it also necessary to do the Benedict’s test on the other two?

4. The gastric glands of the stomach secrete pepsin and hydrochloric acid. What prevents this gastric juice from digesting itself?

5. After completing this lab: Why is it important to chew your food at the beginning of the digestive process?