**Enzyme Chemistry Lab**

**3.03 Understand the function of enzymes and phytochemicals**

**Safety**

* Wear Safety glasses when heating glass.
* Do not taste food starch from test tubes.
* Use hot pads or beaker tongs to move test tubes.

**Purpose and Background Knowledge**

Enzymes are involved in a variety of chemical reactions in food systems. They act as a catalysts (substances that speed up a chemical reaction but are unchanged by the reaction) that break down or build up biological compounds. Each enzyme is very specific for a particular chemical reaction. All enzymes are proteins that have a particular area (active site) that attaches to the chemical(s) destined to undergo the chemical change. These chemicals are called substrates, and their shapes are complementary to the active site of the enzyme.

Typically, enzymes are named for the specific reaction they catalyze. Often the beginning of the enzyme’s name is the same as the substrate, and the ending “as” indicates that it is an enzyme. Therefore a lipase will break down lipids (fats), a protease attacks a protein, and lactase hydrolyzes the milk sugar lactose. However, several enzymes that were discovered before this nomenclature was adopted retain their original names.

The breakdown of starch to its constituent sugar (glucose) occurs as a result of the action of amylase. Starch digestion begins in the mouth. As the food is chewed, amylase in the saliva hydrolyzes the bonds that link the long chains of glucose.

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| --- | --- | --- |
| Enzyme | Catalysts | Substrates |
| Lipase | Hydrolyze | Protease |
| Amylase | Glucose | Lactase |

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| --- | --- |
| **Equipment**  Hot water bath (37ºC)  2 test tubes  Beaker tongs | **Supplies**  Bread or unsalted saltine crackers (enough for class to sample)  2 g Potato Starch  2 drops of iodine  35mL of water  1mL saliva |

**Procedure**

1. Chew an unsalted saltine cracker or piece of bread.
2. Note flavor changes.
3. Place 1 g of potato starch in a labeled test tube containing 20 mL of water. Mix.
4. Place in water bath.
5. In a second labeled test tube, mix 1 g of potato starch, to 15 mL of water and 1mL of saliva.
6. Place in water bath.
7. Incubate both test tubes for 15 minutes.
8. Remove from water bath and add 1 drop of iodine solution to each test tube.

**Pre-Lab**

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| --- | --- |
| Purpose |  |
| Procedure Summary |  |

**Data**

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| --- | --- | --- | --- |
|  | Flavor at beginning | Flavor as you chew | Flavor after swallowed |
| Cracker or Bread |  |  |  |

|  |  |
| --- | --- |
| Test Tube | Color of sample after water bath and iodine added |
| With Saliva |  |
| Without Saliva |  |

**Post-Lab**

Questions

1. How did the flavor change in the cracker/bread sample as you chewed?
2. What causes the taste to change over time?
3. What chemical and physical changes occur during the hydrolysis process?
4. How did the color change with the addition of saliva in the test tubes?
5. Why did the tube with saliva not change to a blue-black color?
6. What are three other foods that would be hydrolyzed by amylase in human saliva?

**Lab Extension**

Science Literacy: Use the following image. Describe what you see and what is occurring. Explain this image, as you would, to someone you love. Use as many terms encountered today as possible.

