## enzyme chemistry

Enzymes are involved in a variety of chemical reactions in food systems. They act as 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 "ase" indicates that it is an enzyme. Therefore a lipase will break down lipids (fats), a protease attacks protein, and lactase hydrolyzes the milk sugar lactose. However, several enzymes that were discovered before this nomenclature was adopted retain their original names (e.g., trypsin, pepsin, papain, bromelin).

## **Amylase**

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.

demo 1. conversion of starch to sugar-flavor determination

Preparation Time 5 minutes

Laboratory Time 5 minutes

**Provide** student with an unsalted saltine cracker or a piece of bread.

*Direct* students to chew the cracker or bread while noting any change in flavor.

Students should observe an increase in sweet taste as their salivary enzymes hydrolyze the bland starch to sweet sugar.

## demo 2. conversion of starch to sugar chemical determination

Preparation Time 5 minutes
Laboratory Time 30 minutes

*Place* 1 g of potato starch in a labeled test tube containing 20 ml of water, mix, then place the tube in a 37°C water bath.

In a second labeled test tube, mix 1 g of potato starch, 15 ml of water and 1 ml of saliva and then place in a  $37^{\circ}$ C water bath.

*Incubate* the tubes for 15 minutes, then remove from the water bath and add 1 drop of iodine solution to each test tube.

Students should observe that starch will bind iodine and acquire a blue-black color. However, in the tube that contains the saliva, the amylase in the saliva will have hydrolyzed the starch into sugar, which is unable to bind iodine.

