



The IMAGINARIUM  
science discovery center

## HEAD TO TOE WORKSHOP GRADES 3-4 POST ACTIVITY

### PROTEIN EATERS

Your body breaks down proteins when you digest them.

What protein digesters can you find in the supermarket?

Life would not be possible without a group of chemicals found in living things that control every step of every chemical reaction that contributes to life. These chemical regulators are called *enzymes* because they were first discovered in yeast cells. The word *enzyme* means "in yeast."

Enzymes are also proteins, a class of compounds made of chains of small molecules called amino acids. There are about twenty-four amino acids that form the "alphabet" of proteins, which are like paragraphs -- each has with its own meaning.

All organisms must continually make their own proteins, and the source of raw materials is food -- other once-living things. Of course, the protein in a food is different from the protein of the food user. So food must be digested or broken down into amino acids in order to be rebuilt up again into the specific proteins that the food user needs.

Since protein digestion is a chemical reaction, there are, as you might have guessed, a group of enzymes that break down protein. These enzymes can be found in a number of products, both natural and manufactured, from your supermarket.

In this experiment, you can watch proteins being broken down.

**Note:** This is a fairly involved procedure that can take several days to complete.

### MATERIALS AND EQUIPMENT

- An adult helper
- A package of unflavored gelatine (Knox® for example)
- A small plastic container from the supermarket deli department (about 4 ¼ inches in diameter)
- Measuring cup
- Water
- Refrigerator
- Small plate
- Knife
- Labels
- Pen or pencil
- Snack size zip plastic bags
- Measuring spoons

Any or all of the following:

- Meat tenderizer
- Tablet contact lens cleaner
- Liquid detergent with enzymes (like Tide®)
- Laundry spot remover with enzymes
- Fresh pineapple, papaya and/or figs
- Garlic Press
- Small dishes
- Strainer
- Large cups

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## Method of Investigation

**NOTE:** Since you are using the stove, have an adult help you.

1. Prepare the gelatine *substrate*, which is the material on which the enzyme acts. Gelatin is pure protein.
  - Put the unflavored gelatin in the plastic container.
  - Add the ½ cup cold water. Let the mixture soften for about 10 minutes.
  - Then add one cup of boiling water.
  - Put in the refrigerator to cool and gel for 24 hours.
2. Remove the gelatine substrate from the container. To do this, set the plastic container in hot water for two or three minutes. Put a small plate upside down over the top of the plastic container and shake the container so the gelatine falls out onto the plate.
3. Cut the gelatin into 1-inch cubes. Write a label for each sample you are testing plus the labels “DRY CONTROL” and “WET CONTROL.”
4. Put each label along the top of a zip plastic snack-sized bag. Put a cube of gelatin into each bag. After you put in each solution containing the enzyme, zip each bag closed.
5. The DRY CONTROL bag just gets closed with only gelatine and no liquid. Put one tablespoon of water in the WET CONTROL bag along with the gelatin cube.
6. Mix ¼ teaspoon of the meat tenderizer in a small dish with one tablespoon of water. Pour it into the bag marked “MEAT TENDERIZER.”
7. Put a tablet of contact lens cleaner into another small dish with one tablespoon of water. When it has dissolved, pour it over the gelatin cube in the bag labeled “CONTACT LENS CLEANER.”
8. Put one tablespoon of liquid TIDE® over the gelatine cube in the bag labeled “TIDE.”
9. Put one tablespoon of the laundry spot remover in the appropriately labeled bag.
10. Peel and cut up some of the fresh fruit into small pieces.
  - Compress the fruit pieces through the garlic press into small dishes.
  - You need about one tablespoon of juice from each fruit.
  - Strain the juice as you pour it over the gelatine in the appropriately labeled bag.
11. Tilt all the bags so both the gelatin cube and the liquid are in the same corner. Set each bag in a large cup. Look at the bags after an hour then look at them periodically for the next day or so. Look at the size of the gelatin cube and look at the solution.