

Protein Reactions

Overview: After a brief lesson describing what proteins are and some of their properties, children will make predictions about how egg whites will react when various substances are added to them. The instructor will then add the various substances to the egg whites observing and noting the reaction.

Subject area: Kitchen Chemistry

Grade level: 3rd-7th

Oregon Benchmarks/Common Core Standards:

- *5-PS1 Matter and Its Interactions*
5-PS1-3: Make observations and measurements to identify materials based on their properties
- *MS-PS1 Matter and Its Interactions*
MS-PS1-1: Develop models to describe the atomic composition of simple molecules and extended structures

Objectives: Children will learn some basic properties of proteins and how they relate to cooking

Prep time: 10 minutes

Lesson time: 15 minutes

Materials needed:

- 5 clear glass jars
- 4 raw egg whites
- 1 whole raw egg
- 1 hardboiled egg, peeled
- Rubbing alcohol
- Baking soda
- Lemon juice
- Salt
- Forks to stir
- Note paper for each child (to document observations)

Space needed: A table or demo station and something to write on (chalkboard or easel)

Staff needed: 1

Pre-test of knowledge: Ask children if they know anything about protein.

Preparation Steps:

- Label four of the five jars with the following:
 1. Acid
 2. Base
 3. Organic solvent

4. Salt

- Reserve the fifth jar for step #3
- Add an egg white to each jar. Set up the jars on the table with the other supplies nearby.
- Pass out a piece of note paper to each child.

Presentation Steps:

1. Start a conversation with the children to find out what they already know about protein. Most will relate to protein as a food (eggs or meat), but talk to them about how protein is the building blocks for everything in their bodies.
2. Also talk about how microscopic proteins are all coiled up to make different shapes and those shapes determine how the protein looks and acts.
3. Changing the shape changes the way the protein looks and acts. For instance, a raw egg is liquid (crack open your raw egg into the unlabeled 5th jar), but if you cook it in boiling water, you change the shape of the protein and it becomes a solid (show hardboiled egg). This process is called *denaturing* the protein and it can happen when you combine proteins with certain substances or heat. The following experiment will show 4 different examples of substances that denature proteins.
4. Have the children predict what will happen as you add the different substances into the egg whites (nearly a pure protein). Write down their predictions.
5. Slowly add lemon juice (acid) to jar #1, baking soda (base) to jar #2, rubbing alcohol (organic solvent) to jar #3, and salt to jar #4. Stir after each addition.
6. Talk with children about how the egg whites changed and allow them time to document their reactions on their piece of note paper.