



I SECOND THAT EMULSION

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Annotation:

In this activity, students explore mixtures and emulsions by making mayonnaise.

Primary Learning Outcomes:

Students will be able to define the terms *colloid*, *emulsion*, and *emulsifier*.

Students will be able to describe the function of an emulsifier.

Students will be able to identify and describe common emulsions and emulsifiers used in the food industry.

Georgia Performance Standards

Characteristics of Science

SCSh8. Students will understand important features of the process of scientific inquiry.

Physical Science Content

SPS6. Students will investigate the properties of solutions.

Chemistry Content

SC7. Students will characterize the properties that describe solutions and the nature of acids and bases.

Duration:

Preparation: 15 minutes

Introduction: 10 minutes

Student Activity: 35 minutes

Conclusion: 15 minutes

Total Class Time: 60 minutes

Materials and Equipment:

Per Group

1. 1 Mixing bowl
2. 1 Wire whisk
3. 1 Measuring cup
4. Measuring spoons
5. 2 5-oz. Plastic sample cups (for vinegar and oil)
6. 1 Small plastic pipette
7. 1 Egg
8. 2 Tbsp. Vinegar
9. 1 c. Vegetable oil

Safety:

There are no safety hazards associated with this activity.

**Technology Connection:**

Not applicable.

Procedure:Teacher Preparation:

Obtain sufficient materials. Copy the *I Second That Emulsion* student handout.

Estimated Time:

15 minutes

Introduction:

Review introduction provided on the *I Second That Emulsion* student handout without revealing to students that they will be making mayonnaise.

Estimated Time:

10 minutes

Student Activity:

Students should follow the procedure provided on the *I Second That Emulsion* student handout.

Estimated Time:

35 minutes

Conclusion:

The emulsion prepared in this laboratory exercise is mayonnaise. Mayonnaise, like all emulsions, contains an emulsifier...in this case, the incredible, edible egg. Egg yolk contains the phospholipid lecithin. Each lecithin molecule contains a polar end that is attracted to water and a non-polar end that is attracted to oil. The result is that the lecithin dissolves half of itself in water and the other half in oil. Thus, droplets of oil can be dissolved in water creating mayonnaise.

Mayonnaise was invented in 1756 by the French chef of the Duc de Richelieu. After the Duc beat the British at Port Mahon, his chef created a victory feast that was to include a sauce made of cream and eggs. Realizing that there was no cream in the kitchen, the chef substituted olive oil for the cream and a new culinary creation was born. The chef named the new sauce "Mahonnaise" in honor of the Duc's victory.

Estimated Time:

15 minutes

Assessment:

Assessment should be based on completion of the *I Second That Emulsion* student handout.

I SECOND THAT EMULSION *Student Handout*

Introduction:

Oil and water don't mix! You've heard it a thousand times. You've probably seen it for yourself. But the truth is that we are surrounded by foods that are made by mixing oil and water. Salad dressing, butter, ice cream, and milk are all oil-water mixtures that don't separate under normal conditions. So how can we explain this? All of these food are emulsions. An emulsion is a colloid (a mixture of very tiny particles that are dispersed in another substance but do not settle out of the substance) in which liquids that do not normally mix are spread throughout each other. Emulsifying is done by slowly adding one ingredient to another while simultaneously mixing. This disperses and suspends tiny droplets of one liquid through another. To prevent the mixture from separating, an ingredient, known as an emulsifier, that is attracted to both oil and water is added, thus allowing the two to mix.

Purpose:

To prepare an emulsion of oil in water.

Materials:

- | | |
|--|----------------------------|
| 1. 1 Mixing bowl | 6. 1 Small plastic pipette |
| 2. 1 Wire whisk | 7. 1 Egg |
| 3. 1 Measuring cup | 8. 4 Tsp. Vinegar |
| 4. Measuring spoons | 9. 1 c. Vegetable oil |
| 5. 2 5-oz. Plastic sample cups (for vinegar and oil) | |

Procedure:

1. Add egg and 1 tsp. vinegar to mixing bowl.
2. Beat vigorously until slightly thick.
3. Add oil, 1 tbsp. at a time, while continuously beating the mixture, until 1/3 cup has been added.
4. Add 1 tsp. of vinegar and continue to beat mixture.
5. Repeat steps 2 and 3 until all liquids have been added.

Post-lab Questions:

1. Observe the appearance, texture, and aroma of the emulsion you created? What common food emulsion did you prepare?
2. Lecithin is the emulsifier in this emulsion. Which ingredient used in this recipe contains lecithin?