

Mayonnaise, an Edible Emulsion

Introduction

You've probably noticed that salad dressings made from oil and vinegar will separate into layers. If you shake a mixture such as this, you'll see tiny droplets of oil that eventually come together and form a separate layer again. However, we can stop these oil droplets from coming together by adding an emulsifying agent, which stabilizes the mixture into an *emulsion*. In an emulsion, one liquid is spread out into another thanks to the emulsifying agent.

In this lab, you will make mayonnaise, a well-known emulsion of salad oil and vinegar. Normally, the oil and vinegar would separate, but by using the fatty lecithin molecules found in egg yolks, we can easily form the thick, creamy condiment that has been enjoyed for centuries!



Materials

eggs	salad oil
mustard powder	salt
pipette	vinegar

Equipment

electric hand mixer	measuring cups and spoons
food-safe beakers, 250-mL	

Safety Considerations

- Raw eggs can contain *salmonella* bacteria; wash your hands thoroughly after completing this lab.

Procedure

1. In a 250-mL food-safe beaker, combine the following:
 - 1 egg yolk
 - $\frac{1}{8}$ teaspoon powdered mustard
 - $\frac{1}{4}$ teaspoon salt
 - $\frac{1}{2}$ teaspoon vinegar
2. Using an electric hand mixer, beat the mixture until the egg yolk is sticky.
3. Obtain $\frac{1}{2}$ cup of salad oil.
4. While beating the egg mixture constantly, use a pipette to SLOWLY add the salad oil to the mixture. DO NOT ADD ALL THE OIL AT ONCE OR YOU WILL RUIN YOUR EMULSION. The mixture should begin to thicken after you've added about half of your oil.
5. Once the mixture has thickened enough, add the remainder of the oil while beating the mixture.
6. Continue beating the mixture until it has thickened and the oil is evenly dispersed.
7. Taste your mixture by putting some on your finger or on a cracker.

Clean-up

1. Dispose of the mayonnaise in the trash, NOT THE SINK.
2. Clean the food-safe beakers thoroughly with soap and water using your hands, NOT A TEST TUBE BRUSH.
3. Return all equipment to its proper location.
4. Wipe down your lab area and wash your hands before leaving the lab.

Questions

1. How does your laboratory mayonnaise compare to commercially prepared mayonnaise?

2. Why do you think it is necessary to add the oil so slowly to successfully make an emulsion?

3. Name two other food products that are emulsions.

4. Food manufacturers now offer low-fat and even fat-free mayonnaise. How do you think they accomplish this?

5. List one way you could change this lab and describe how your results might be different.
