

Food Explorations Lab II: Examining Emulsions

STUDENT LAB INVESTIGATIONS

Name: _____

Lab Overview

In this investigation, you will add substances to oil and water to determine which one(s) will act as an emulsifier to form a homogeneous solution.

Lab Objectives:

In this lab, you will learn how to...

1. Observe physical changes occurring when substances are added to a heterogeneous lipid mixture.
2. Identify and distinguish between homogeneous and heterogeneous mixtures.
3. Relate the structure of a cell membrane to the observed properties of a lipid mixture.

Lab Safety: Before beginning ANY investigation you should put on your safety goggles and apron. It is important to avoid getting chemicals on your hands. Always wash your hands following the completion of an investigation. When handling food, you should also wash your hands prior to beginning an investigation.

Lab Question

Which of the following substances has the ability to act as an emulsifier? (Circle your answer.)

Salt

Ground Mustard

Honey

Paprika

Predictions: I predict _____ will allow vinegar (water) and oil to mix because...

MATERIALS

5 medium mason jars	$\frac{5}{8}$ cups white vinegar
$\frac{5}{8}$ cups olive oil	1 teaspoon ground mustard
1 teaspoon honey	1 teaspoon paprika
1 teaspoon salt	1 large bowl
1 set of measuring spoons	1 liquid measuring cup
1 black marker	5 labels
1 kitchen timer or stopwatch	6 paper plates
1 whisk	fresh romaine lettuce
6 plastic forks	

PROCEDURE

1. Prepare your Mason jars by measuring $\frac{1}{8}$ cup vinegar and $\frac{1}{8}$ cup olive oil to each jar.
2. Label each of your jars with 1 of the following: "Control" (vinegar and oil only), "Salt", "Mustard", "Honey", and "Paprika".
3. Once your vinegar and oil samples have been prepared, you are ready to begin. Draw your *visual* observation of the vinegar and oil mixture in Table A.
4. Add 1 teaspoon of each substance (ground mustard, honey, paprika, and salt) to their labeled jars. For instance, you should add 1 teaspoon of salt to the jar containing vinegar and oil that is labeled "salt".
5. Put lids on the jars tightly. With all group members participating, shake the jars vigorously for about 30 seconds.
6. Set your kitchen timer for 10 minutes. Observe the contents of each jar as time passes. Use the stopwatch to help determine how long it takes for each mixture to separate and record the time in Table B.

NOTE: Not all mixtures will separate due to the presence of an emulsifier.

7. Draw your observations of each mixture **after 3 minutes** have passed in Table C. Label the oil and vinegar layers on the drawings of the mixtures that have separated.
8. After you have completed your observations and conclusion, wash your hands.
9. Make observations as you combine the contents from 4 jars (vinegar/oil, ground mustard, honey, paprika), and $\frac{1}{2}$ of the salt jar into 1 large bowl, and as you use a whisk and mix together the ingredients.
10. You have made vinaigrette! Taste your vinaigrette with fresh romaine lettuce.

Table A: Emulsion Observations Before Treatment

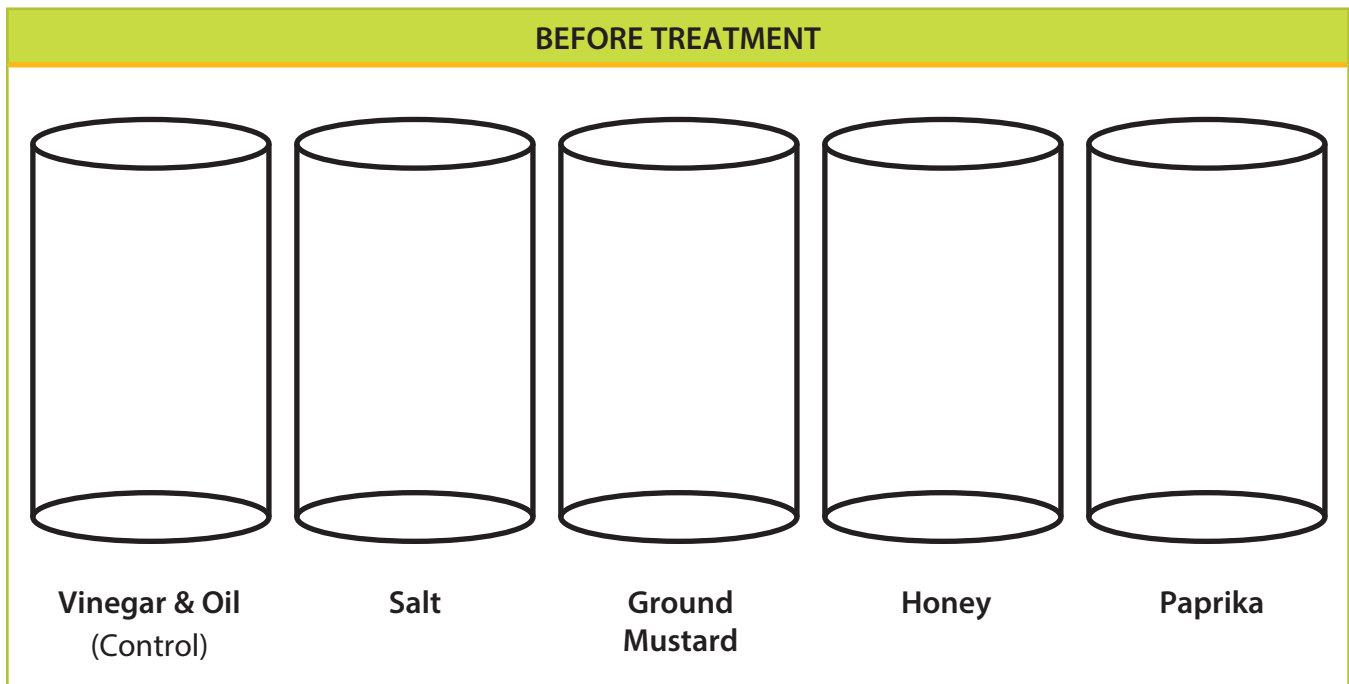
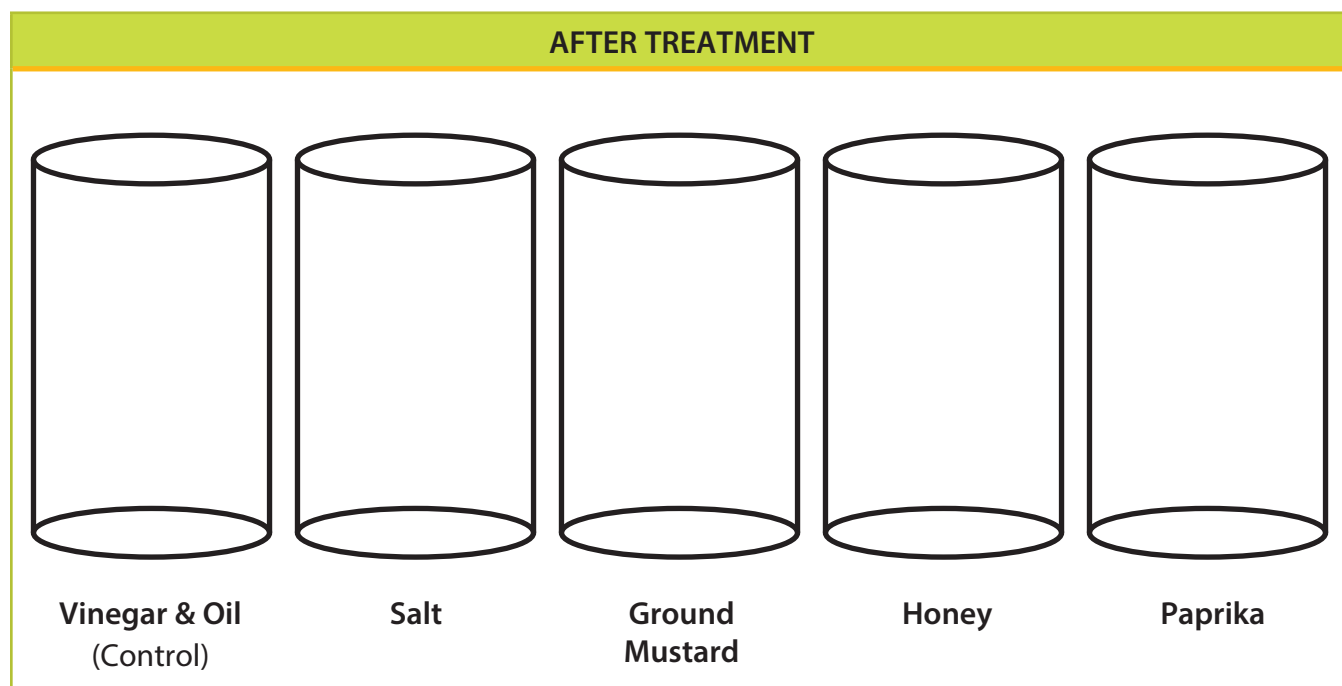


Table B: Emulsion Treatment Observations

	Vinegar & Oil (Control)	Ground Mustard	Honey	Paprika	Salt
Length Time to Separate (Minutes and Seconds)	Almost immediately (within 10 seconds)	Did not separate	30 seconds	1 minute	30 seconds

Table C: Emulsion Observations After Treatment



Conclusion:

1. Compare the jars after waiting the 10 minutes to your diagrams in Table C. Describe the changes observed and explain why these changes occurred.

All the vinegar and oil in the jars began to separate after 10 minutes, however the ground mustard jar did not fully separate (if at all).

2. Compare your initial response to the lab question to the actual results and identify the substance(s) that act as emulsifiers.

Ground mustard acted the most like an emulsifier. Mustard seeds contain protein, carbohydrate, and oil. When ground, the protein and carbohydrates coat the oil making it hydrophilic and instead of hydrophobic.

3. Compare and contrast the jar labeled *control* to the other four samples.

The jar labeled *control* did not create a homogeneous mixture, which was similar to the salt, paprika, and honey jars.

4. Based on your reading, what type of mixture is each sample? (Heterogeneous or Homogenous)

Vinegar and Oil: *Heterogeneous*

Salt: *Heterogeneous*

Ground Mustard: *Homogeneous*

Honey: *Heterogeneous*

Paprika: *Heterogeneous*

5. Compare and contrast the vinaigrette mixture before and after using the whisk.

The mixture was layered and separated before using the whisk. After using the whisk, the mixture became homogenous.

6. Describe the appearance of the vinaigrette on the Romaine lettuce.

The oil and vinegar seemed to fall to the bottom of the plate leaving some on the lettuce and the seasoning stayed on top of the lettuce.

7. Think about the cell membrane and how your observations of water (vinegar) and oil relate to the cell membrane. Why is it important for the cell membrane to be composed of lipids?

It is important for the cell membrane to be composed of lipids because it acts as a barrier and provides structure for the cell.

Student Investigations Lab Extension

MATERIALS

- emulsion droplet
- 1 microscope slide and cover slip
- 1 microscope
- 1 dropper
- 1 small cup of water

Directions to Use a Microscope

1. Plug the microscope in (if applicable) and turn it on.
2. Adjust the magnification to the lowest power.
3. Make sure the stage is lowered all the way and place the slide on the microscope stage. Slowly raise the stage using the coarse focus knob (large knob) so you can see the object clearly through the ocular lens. Do not let the slide touch the objective lens.
4. Using the fine focus knob (small knob), adjust the focus so the object looks clear.
5. If the object is too dark or too bright, you can adjust the diaphragm until you can see all the details.
6. Once the object is in focus, you may change to higher powers. However, be sure the lens does not hit the slide.



View Emulsion under Microscope:

1. Obtain a sample emulsion (jar containing identified emulsifier).
2. Make a wet mount slide by placing a drop of water on a clean slide.
3. Place a drop of emulsion on the slide.
4. Observe using the microscope under 4X power and then 10X power.
5. In the box on page 243, draw your observations in high power (10X).

Fat Emulsion Drawing
10x

Conclusion:

1. Describe your magnified emulsion observations.