Emulsifiers

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In this activity, students are given the role of a scientist in a food technology laboratory. They are asked to test a range of kitchen substances to find out which will act as an emulsifier. The activity is intended as a follow-up to work on emulsifiers and emulsions and students will need to be familiar with these terms.

Two versions of the student sheet are provided – one includes experimental instructions (**Emulsifiers (1)**) and the other asks students to plan the experiment themselves (**Emulsifiers (2)**).

Equipment required

- Boiling tubes and bungs
- Pipettes
- Spatulas
- Cooking oil – corn oil is particularly good as it is dark in colour, which makes it easier to see
- Access to water
- Washing up liquid
- Sugar
- Flour
- Mustard powder – Colman's is good and lasts far longer than ordinary mustard so can be used from year to year
- Salt
- Egg white
- Egg yolk
- Other test substances can be used if prefered.

Health and safety

Raw egg can be a cause of salmonella. Use eggs marked with the lion symbol. Use a disposable pipette to transfer the egg to boiling tubes and avoid handling it.

Warn students against tasting anything, *eg* sugar.

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Notes

The boiling tubes must be very clean – in particular, ensure they are not contaminated with detergent as this would result in all the test substances appearing to act as emulsifiers. Although the use of boiling tubes rather than test-tubes means that larger quantities of chemicals are consumed, the results are easier to see on this scale and it is much easier to clean up afterwards.

If the eggs are fresh it is fairly easy to separate the yolk from the white. Ensure no yolk contaminates the white; contamination the other way round is less of a problem.

This experiment could easily be done in a kitchen and adapted so that students initially make a salad dressing using oil and vinegar rather than oil and water. The test mixtures could be tasted as well as observed. If you do this, the mixture containing raw egg should not be tasted.

An emulsifier is a substance that stabilises an emulsion (a mixture of one liquid dispersed in another). Washing up liquid, egg yolk and mustard are emulsifiers. The other substances listed above are not. Students may observe colloidal mixtures in the other tubes, but these are not oil and water emulsions and it should be easy to identify two separate layers.

Answers

1. Washing up liquid, egg yolk and mustard are emulsifiers.

2. Emulsifiers are used in foods to hold a mixture of oil and water together so that it does not separate into unappealing layers.

3. The best emulsifier is usually the washing up liquid.

4. No. Further work/changes to the experiment could include: ensure the mixture is shaken with the same force for the same amount of time; use the same quantities of oil, water and emulsifier each time; leave each mixture for the same amount of time before making observations or observe them at regular intervals over a set period of time; repeat the experiment.

5. The best emulsifier for a salad dressing would be mustard. Although washing up liquid is a better emulsifier it would not taste good and egg yolk could contain harmful bacteria (although this is the emulsifier used in mayonnaise).

6. The answers to this could vary widely.

7. Lecithin is commonly used, as are various E-number additives.

8. Foods that contain both oil and water need to be stabilised and therefore contain emulsifiers. Many ‘diet’ and ‘low fat’ foods contain emulsifiers because the oil and fat usually found in these foods is often replaced by water so the mixture needs to be stabilised. Low fat margarine is one possible example.

Emulsifiers (1)

You are working in a food technology laboratory. You are asked to find out which of the following things found in a kitchen are emulsifiers:

- Washing up liquid
- Sugar
- Flour
- Mustard powder
- Salt
- Egg white
- Egg yolk.

You will need

- Boiling tube and bung
- Pipette
- Spatula
- Oil
- Water
- Test substances (as listed above).

Health and safety

You must not taste anything in a laboratory.

To think about

- What is an emulsion?
- What is an emulsifier?

What to do

- Put about 2 cm^3 oil into the boiling tube. Add about the same amount of water.
- Put a bung into the top of the tube and shake it. Remove the bung, leave the mixture to stand and observe what happens.
- Repeat the experiment but add a small quantity of one of the test substances before you shake the tube.
- Decide how to record your results so that they will be clear enough for someone else to read and understand easily.

Questions

1. Which of the substances you tested are emulsifiers?

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2. Why are emulsifiers used in foods?

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3. Which of the substances you tested is the best emulsifier?

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4. Is there enough evidence to make a firm conclusion? If not, what further experimental work could you carry out or how could you change your experiment to make your results more reliable?

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5. A salad dressing is made of oil and vinegar. An emulsifier is added to it. Which of the substances you have tested would be best for use in the dressing? Explain why you have chosen this substance and not any of the others.

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At home

Look at the packets of food in your cupboards at home or in the supermarket.

6. Which foods contain the emulsifiers you identified today?

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7. What other emulsifiers can you find?

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8. Which types of food contain emulsifiers?

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Emulsifiers (2)

You are working in a food technology laboratory. You are asked to find out which of the following things found in a kitchen are emulsifiers:

- Washing up liquid
- Sugar
- Flour
- Mustard powder
- Salt
- Egg white
- Egg yolk.

Health and safety

You must not taste anything in a laboratory.

To think about

- What is an emulsion?
- What is an emulsifier?

What to do

You need to plan what you will do to find out which of your test substances are emulsifiers and how you will record your results. When you have decided, you can carry out your experiment.

When you have finished, answer the questions below.

Questions

1. Which of the substances you tested are emulsifiers?

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2. Why are emulsifiers used in foods?

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3. Which of the substances you tested is the best emulsifier?

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4. Is there enough evidence to make a firm conclusion? If not, what further experimental work could you carry out or how could you change your experiment to to make your results more reliable?

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5. A salad dressing is made of oil and vinegar. An emulsifier is added to it. Which of the substances you have tested would be best for use in the dressing? Explain why you have chosen this substance and not any of the others.

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Look at the packets of food in your cupboards at home or in the supermarket.

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