

Name:

Oil Spill Remediation

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Water contaminated by oil is an environmental hazard. Even a small spill can cause major problems to ecosystems by destroying or inhibiting the natural flora and fauna. The purpose of this lab is to analyze how surfactants and bioremediation affect oil and water mixtures and discuss methods for the physical removal of oil. We will also discuss the use of oil-eating microbes to clean-up oil spills.

QUICK CHECK: What is a surfactant? What types of solutions typically contain them?



IDENTIFY THE PROBLEM

What is the problem you are trying to solve?

EXPERIMENT

You will need the following materials and equipment:

Water	Pipette tips	Crude oil
Three Containers with lids	Pipette (p1000)	Palmolive
Feather	Filter paper strips	Oil Eating Microbes (OEMs)
Marker		

PART ONE: OBSERVE THE EFFECTS OF OIL ON MARINE WILDLIFE

1. Dip the feather into the container with water. Record your observations.
2. Add 2000uL oil into the container from Step 1. Dip the feather into the mixture of oil and water. Record your observations. What scenario does this represent?

PART TWO: OBSERVE THE EFFECTS OF AGITATION ON AN OIL AND WATER MIXTURE

- 3. Create three oil spills by adding 30ml water and 2000 μ l oil into each container.
- 4. Now observe the three oil spills you have created. How does the oil interact with water?

- 5. An emulsion is a suspension of small globules of one liquid in a second liquid with which the first will not mix. How would you create an emulsion?

- 6. Tightly cap your containers. Vigorously swirl each container. What happens to the oil spill?

- 7. Let settle without any agitation for 5 minutes. What do you think will happen? Draw a picture below!

After 5 minutes do any of the flasks still contain an oil-in-water emulsion?

PART THREE: OBSERVE THE EFFECTS OF SURFACTANTS & BIOREMEDIATION ON AN OIL & WATER MIXTURE

- 8. Label each of the following as a control, surfactant or bioremediation
 - Palmolive dishwashing detergent:
 - Oil-eating Microbes:
 - Distilled water:
- 9. What prediction can be made about each solution?

10. Now add 2000 μl of each solution to the corresponding container. Make sure to label each container with the treatment solution you have added! Do not shake. What happens to the oil spill? **Record your observations immediately after adding each solution.**

Palmolive dishwashing detergent:

Oil-eating Microbes:

Distilled water:

11. What is the purpose of setting up the oil spill with added distilled water?

PART FOUR: EFFECT OF AGITATION ON OIL & WATER MIXTURE

12. Vigorously swirl each flask. What happens to the oil spill? Record your observations immediately after swirling each flask (i.e. before moving on to the next flask.)

Palmolive:

Oil-eating Microbes:

Distilled Water:

13. Let the contained oil spills settle without agitation for 5 minutes. Do any of the flasks still contain an oil-in-water emulsion?
14. Dip a strip of filter paper into each flask. Record your observations. Which piece of filter paper has the most oil on it? What does this suggest about the effectiveness of the dispersant?
15. Which treatment method produced the most stable emulsion? Was your hypothesis supported or unsupported?

DATA ANALYSIS

What was the effect of adding OEMs to an oil and water mixture? Speculate as to why you may or may not have noticed any effects.

What do you expect to see in the container treated with OEMs over the next 24 hours?

Critique each of the three methods tested, listing pros and cons, or any limitations.

CONCLUSION

Make your own conclusion. Based on the results of your experiment, which method(s) would be most effective in the remediation of an oil spill? Can surfactants be used to clean an oil spill? How do they work? Use a drawing to illustrate your explanation. What would be the effect of combining a surfactant with OEMs?