

<b>CHAPTER 6</b> HANDOUT	<b>Alternate Investigation: Digestion of Lipids</b>	<b>BLM 6.2.8</b>
<b>Question:</b> How can you observe the digestion of lipids by pancreatic lipase?		

### Test for Lipase Activity

Lipid digestion begins and ends in the small intestine. The arrival of fats in the duodenum stimulates the secretion of bile, which emulsifies fat droplets. The chemical digestion of fats by hydrolysis is carried out by lipase secreted in the duodenum. The resulting glycerol and fatty acids are absorbed into cells of the villi by diffusion.

You can observe the activity of pancreatic lipase by adding lipase to a phenolphthalein cream mixture. As the lipase breaks down triglycerides in the cream to fatty acids, the hydrogen ions from the fatty acids lower the pH of the cream mixture. Phenolphthalein is pink in a basic solution and colourless in an acidic solution.

### Hypothesis

State a suitable hypothesis for this investigation.

### Safety Precautions



Some of the chemicals used in this investigation may be toxic. Take extra care to avoid getting them in your eyes, on your skin, or on your clothes. Flush spills immediately with plenty of cool water and inform your teacher.

### Materials

- three test tubes
- test tube holder
- wax pencil
- plastic sandwich wrap
- dilute sodium carbonate solution
- warm water bath set at 37 °C
- 6 mL of cereal cream
- 2 mL of lipase solution
- a few grains of bile salts
- phenolphthalein pH indicator
- distilled water
- 3 medicine droppers (approximately 1 mL)

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### Procedure

- Use the wax pencil to label the test tubes A, B, and C. Test tube C will act as your control test.
- Use a clean medicine dropper to add 2 mL (2 full medicine droppers) of cream to each test tube.
- Use a clean medicine dropper to add 1 mL of sodium carbonate solution to each test tube.
- Add a few grains of bile salts to test tube B.
- Use a clean medicine dropper to add 1 mL of distilled water to test tube C.
- Use a clean medicine dropper to add 10 drops of phenolphthalein solution to each test tube.  
NOTE: You may need to add a bit more sodium carbonate to your test tubes to change the pH to a weak base (phenolphthalein should be pink in each test tube).
- Add 1 mL of lipase solution to test tube A and test tube B just before you place them in the warm water bath. Work with two other students to get the lipase into these two test tubes at the same time.
- Cover each test tube with a small piece of plastic sandwich wrap and shake to mix the solution in each tube.
- Record the colour of the mixture in each test tube in the chart below.
- Place the test tubes in a water bath or incubator at 37 °C for 15 minutes. Record the colour of the mixture in each test tube after the 15 minutes in the warm water bath.

Test Tube	Ingredients	Colour before digestion	Colour after digestion
A	2 mL cereal cream 1 mL sodium carbonate 1 mL lipase solution 10 drops phenolphthalein		
B	2 mL cereal cream 1 mL sodium carbonate 1 mL lipase solution a few grains of bile salts 10 drops phenolphthalein		
C	2 mL cereal cream 1 mL sodium carbonate 1 mL distilled water 10 drops phenolphthalein		

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**Analysis**

1. Which test tube showed the fastest colour change from pink to milky-white? \_\_\_\_\_
2. What was the purpose of the phenolphthalein in this investigation?
3. What was the purpose of adding bile salts to test tube B?

**Conclusions**

4. Based on your observations, infer what happened in each test tube. Explain your reasoning.
5. Which conditions mimicked conditions in the duodenum? Explain.