EDVOTEK® MyLab™ #1213

How Do We Keep Our Food Safe?

STORE AT ROOM TEMP.

EDVOTEK®

Designed for the Classroom
SINCE 1987

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OBJECTIVES

- Students will learn about the 4Cs of food safety.
- Students will learn about the different ways food is treated to kill bacteria.
- Students will use milk and indicator dye to determine whether temperature retards food spoilage.

COMPONENTS

This experiment contains reagents and disposables for three (3) experiments.

- Indicator dye
- Dilute Acetic Acid
- Sodium Bicarbonate
- pH paper
- Reaction tubes
- Large pipettes
- Small pipettes

REQUIREMENTS

- Milk samples: pasteurized and ultra high temperature (UHT), skim, reduced fat or whole
- Refrigerator
- Test tube holders
- Permanent markers

PRELAB

Make sodium bicarbonate solution (basic solution) by adding 10 mL tap water to the tube with sodium bicarbonate powder. Add 2 mL at a time and cap and mix in bewteen. Let powder completely dissolve.

GENERAL SAFETY PRECAUTIONS

Parental or adult supervision required.

1. Designate a clean and uncluttered area for performing experiments.
2. Read all instructions before you begin.
3. Do not eat or drink. Do not apply make-up or contact lenses. Adult(s) should not smoke while performing experiments.
4. Wash your hands before and after performing the experiment.
5. Gloves and goggles should be worn routinely as good laboratory practice.
6. Disinfect the counter top or bench with 70% isopropyl alcohol (rubbing alcohol, or place clean newspaper over the area to be used.

WARNING: Choking hazard. Product may contain small parts. Not appropriate for children under 5 years old. No animals were tested in the manufacture of this product.

INTRODUCTION

Why is food safety so important? Well, obviously because we all have to eat food to survive. And because we want to survive, we have to make sure it doesn't make us sick in the process. You're probably familiar with some of the bacteria that have made people sick from eating contaminated food, such as *E. coli* and *Salmonella*.

Escherichia coli

So how do we go about making sure our food is safe and preventing foodborne illnesses? Bacteria are all around us, all the time. The key to food safety is to control bacteria. The fact is that they grow and multiply very fast. Under the right temperature and environment certain bacteria such as *E. coli* double every 20 minutes – that's millions of cells in a few hours. We have to control bacteria with good sanitation, food safety and personal hygiene. Also remember that it's everyone's responsibility to keep our food safe.

Our food chain starts in farms and end at our food table. It is important that every one involved in growing, processing, transporting and handling food be aware of how to keep our food free of harmful bacteria. There are many places that pathogenic (harmful) bacteria such as *E. coli* can contaminate our food. To avoid bacterial growth in our food, cleanliness is very important: always wash hands before and after cooking; wash cooking utensils with hot, soapy water, and keep cooking area clean. Proper storage of food is necessary to control bacteria. Keeping foods chilled slows down bacterial growth.

There are also many ways to protect our food as it is being grown. As an example, *Salmonella*, a common pathogen is often found in the intestines of chicken and contaminates chicken. Scientists use a blend of non-pathogenic (friendly) bacteria that are present in mature chickens that they spray on one day old chicks. These good bacteria eventually are ingested and compete and displace *Salmonella* and provide us with safe chicken.

Pasteurization is another important way to destroy and free our food of bacteria. The process was first described by Louis Pasteur a French chemist in the 1800s who was trying to avoid spoilage of wine. This process uses heat or irradiation to destroy microorganisms that cause diseases. Milk is one of the first food products that were pasteurized. This was necessary because milk is pooled from many cows, and if one is sick due to a bacterial infection the entire batch of milk from thousands of cows would be spoiled and discarded.

Pasteurization is achieved by heating liquids and foods for certain amounts of time at relatively low temperatures. For example, eggs are heated at 57°C for 75 min. The time/temperature ratio will inactivate bacteria. Higher temperatures will require shorter periods of time but will not keep eggs liquid. Irradiation is a newer method where food is exposed to various high-energy sources or radiation to destroy food pathogens. This treatment will destroy bacterial DNA and destroy the bacteria themselves. More recently food, especially those that contain water such as juices, salsa and cold cuts are exposed to Ultra High Pressure (UHP) treatment from 30 seconds to a few minutes. The UHP will kill bacteria without affecting the nutritional value of the food or taste. Beyond this treatment, food needs to follow the **4Cs** - Keep food **Clean**, **Cook** it well, **Chill** by storing in the refrigerator and avoid **Cross-contamination**.

In this experiment, we will test the importance of one of the 4Cs. We will see how chilling food will help control bacteria. Milk will be used as a growth medium for bacteria. An indicator dye will be added, that will lose its color when bacteria grow in the milk. As bacteria grow in milk, oxygen will be used up. The lack of oxygen will turn the dye colorless. The effect of various temperatures on milk will be determined based on color changes. Cold temperatures hold more oxygen. Warm temperature helps bacterial grow faster. Light also causes the dye to change color faster. Students can compare differences in bacterial growth between different types of milk, such as whole vs. reduced fat vs. fat free milk. Students can also compare differences in pasteurized and non-pasteurized juices. Non-pasteurized juice can be compared against the equivalent pasteurized juice for bacterial growth. In each case, the amount of contamination will be measured over time and pH will be measured and recorded.

EXPERIMENTAL PROCEDURES: Activity 1

Test the **pH** of indicator dye and determine what can change its color.

1. With a permanent marker, **LABEL** 2 test tubes as #1 and #2.
2. Use a large pipette to **ADD** 2 mL of water to each tube.
3. Use small pipette to **ADD** 4-5 drops of indicator dye to each tube.
4. **CAP** tubes and **MIX** by inverting. **RECORD** color of solution.
5. **TEST** the pH of the indicator dye solution by placing a drop from either tube onto a strip of pH paper.
6. **COMPARE** the color and determine the pH. **RECORD** your results.
7. Use a small pipette to **ADD** 10-15 drops of dilute acetic acid to tube #1. **CAP** and **MIX** by inverting. **RECORD** color of solution.
8. Use a different small pipette to **ADD** 10-15 drops of sodium bicarbonate solution to tube 2. **CAP** and **MIX** by inverting. **RECORD** color of solution.
9. **TEST** the pH of each solution by placing a drop of the solution on different strips of pH paper. **RECORD** your results.

NOTE: To minimize plastic waste, rinse and reuse all tubes and pipettes for the different activities.

EXPERIMENTAL PROCEDURES: Activity 2

Use milk to test whether **temperature** has an effect on retarding food spoilage. You can test <u>different types of milk</u> to see if different components in milk such as fat or lactose or how milk was pasteurized effect food spoilage. You can also <u>vary the conditions</u> such as: milk with/without cap at room temp.; milk with/without cap at room temp. in the dark; milk with/without cap refirgerated.

1. Use a large pipette to **ADD** 2 mL of milk to each tube.
2. Use a small pipette to **ADD** 6-10 drops of indicator dye to each tube.
3. **CAP** tubes and **MIX** by inverting. **RECORD** color of solution.
4. **TEST** the pH of each solution by placing a drop of the solution on different strips of pH paper. **RECORD** your results.
5. **PLACE** tube #1 in a tube holder and leave at room temperature.
6. **PLACE** tube #2 in a tube holder and leave in a refrigerator.
7. **CHECK** tubes after 24 hours. **RECORD** color of solution.
8. **TEST** the pH of each solution by placing a drop of the solution on different strips of pH paper. **RECORD** your results.

RESULTS CHART

Conditions (e.g. whole milk at room temp.)	Color	pH	Color after 24 hours	pH after 24 hours.

ACTIVITY 1 RESULTS

Indicator dye (basic/blue); test pH

Add dilute acetic acid = blue → yellow/orange
Add sodium bicarbonate = blue → blue

NOTE: pH reactions may vary slightly due to differences in municipal or well water sources.

ACTIVITY 2 RESULTS

Bacterial contamination: Color changes will vary depending on the pH of the products tested.
Undetectable bacterial contamination: Blue/green solution

1. Tubes of milk left at room temp. will change from blue/green to orange before tubes of milk left in the refrigerator.
2. Tubes of milk with higher fat content left at room temp. will change from blue/green to orange before tubes of milk with lower fat content.

EXTENSION

Students can test different fruit juices, pasteurized vs. homemade.

TERMS AND CONDITIONS

- FOB: Washington, DC
- Safety Data Sheets are available on our web site and by request.

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References:
www.foodsafety.gov
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http://www.foodsci.uoguelph.ca/dairyedu/resazurin.html