



AGsploration

The Science of Maryland Agriculture



Food Safety is For Everyone



GOAL STATEMENT:

Students will gain an increased awareness of foodborne illness and how it can be prevented.

OBJECTIVES:

- Students will identify the causes of foodborne illness.
- Students will learn the importance of good personal hygiene and proper hand washing practices.
- Students will identify common foodborne diseases.
- Students will learn how to identify sources of food contamination and prevention techniques.

REQUIRED MATERIALS:

- Computer, projector, and screen
- *Food Safety is For Everyone* PowerPoint presentation (grouped into 4 modules)
- Large plastic cups (8 per group)
- Permanent marker (1 per group)
- Round candies (such as Skittles or M&Ms) or beads (254 pieces per group)
- Black (ultraviolet) light (1 per class required; 1 per group is ideal)
- Bottle of Glo Germ gel*
- Access to sinks for hand washing
- Soap, hand sanitizer, and paper towels
- Food thermometers to show as examples

*Glo Germ can be ordered from various online retailers.

AMOUNT OF TIME TO ALLOW:

75 minutes. Extension activities will take additional time.

Background Information



Although the food supply in the United States is considered one of the safest in the world, illness caused by foodborne pathogens remains a significant health concern. In other parts of the world, deaths from foodborne illness are more widespread. Even though disease-causing bacteria are everywhere in the natural environment — in the soil, air, water, and in the foods we consume — foodborne disease is largely preventable. It is important to learn how to keep yourself and your family safe from infectious disease and to practice food safety habits with every meal.

Food safety is a very broad topic. The four PowerPoint modules accompanying this lesson provide extensive background information on various aspects of food safety. Preview the presentations and select those that are most useful for the concepts you wish to focus on. Modules 1 and 2 are recommended; modules 3 and 4 provide supplemental information.

Engagement

25 minutes



Ask students if they or anyone they know has ever had a foodborne illness. Allow students to share what they know with the class and discuss. Lead a discussion suggesting ideas about causes of foodborne illness and why foodborne illness is often under-reported.

Show and discuss the slides found in *Module 1: Foodborne Illness* contained in the PowerPoint presentation.

Exploration

20 minutes



Bacterial Growth

1. Have each student wash their hands with warm, soapy water. Students may use hand sanitizer if soapy water is not available.
2. Divide students into small groups. Give each group 7 plastic cups and a container of candy or plastic beads to represent bacteria.
3. Explain that students will be simulating bacterial growth over a hypothetical 2 hour and 20 minute period during which bacterial growth will reproduce (double) every 20 minutes. (Some real-life bacteria actually reproduce this quickly!) Have students use their permanent markers to label their cups with the following times: 0 minutes, 20 minutes, 40 minutes, 1 hour, 1 hour 20 minutes, 1 hour 40 minutes, 2 hours, 2 hours 20 minutes.
4. Have students start the simulation with 1 bacteria in the first cup (0 minutes). Tell students that the population will double every 20 minutes, and have them put the correct number of bacteria in each cup. (In order, the cups should contain 1, 2, 4, 8, 16, 32, 64, and 128 bacteria.)

5. Ask students to describe what happened during the simulation. Did the number of bacteria increase more at the beginning, middle, or end of the simulation and why? Students should agree that the number of bacteria increases faster and faster with time. Explain that exponential growth occurs when a population keeps doubling over time and eventually increases very rapidly. You may want to create a graph on the board to show a visual representation of how the growth occurs.

Personal Hygiene

1. Divide students into 4 groups.
2. Have each student apply a small amount of the Glo Germ Lotion to his or her hands and rub it in well. Tell students that this lotion represents dirt and bacteria that we pick up from contacting various surfaces.
3. Explain to students that each group will wash their hands using a different technique. Have students wash their hands as follows: group 1 students wash with water (no soap) for 5 seconds; group 2 students wash with water (no soap) for 20 seconds; group 3 students wash with soap and water for 5 seconds; and group 4 students wash for at least 20 seconds with soap and water. All students should dry their hands with a paper towel.
4. Darken the room. Have the students in each group stand together and shine the black light over their hands. The portion of Glo Germ that is left (representing dirt and bacteria that was not washed off) will fluoresce under the black light.
5. Ask students to observe the differences in the amount of dirt and bacteria left between groups. Students who washed their hands for only 5 seconds should show more simulated bacteria on their hands than the groups who washed their hands for 20 seconds. Also, soap should remove dirt and bacteria better than water alone.
6. Ask the class to suggest reasons why washing hands for a longer period of time did a better job of removing bacteria. Discuss ideas. Ask why soap removes more bacteria than water alone. Discuss student ideas and link to the concept that soap dissolves oils on the hands to which bacteria often adhere.

Explanation

10 minutes



Show and discuss the slides found in *Module 2: Personal Hygiene* contained in the PowerPoint presentation. Allow students to share their ideas and personal experiences related to the topic.

Extension



Hand Washing Experiment

Allow students to test a variety of hand washing and cleaning techniques and rate their effectiveness. Students may alter hand washing time or technique, water temperature, drying method, or type of soap. They may also experiment with different cleaning products such as hand sanitizer, Lysol wipes, and baby wipes. Have students hypothesize which method(s) will be most and least effective. As in the lesson, use Glo Germ lotion and a black light to determine effectiveness. You may need to mention that some substances such as hand sanitizer are designed to kill bacteria without actually removing them from the hands. Emphasize that any hand washing technique is better than not washing hands at all.

Cross Contamination Demonstration

Before students arrive for class, brush Glo Germ powder around the room on objects you know students will touch, such as a light switch, pencils, or sign-in sheet. You might also rub powder onto a stuffed animal and leave it somewhere in the room where students will pick it up and play with it. Show and discuss the slides in *Module 3: Cross Contamination*. Use the black light to show the presence and spread of simulated germs. Students will be surprised at the number of common surfaces that could potentially carry bacteria.

Temperature Demonstration

Show and discuss the slides in *Module 4: Temperature Matters*. Show students different types of food and appliance thermometers while you are teaching how to use a food thermometer. These can be bought at food and variety stores for under \$10.00 each.

Before class, heat a pot or kettle of boiling water. The hot water may be placed in a thermos to keep it hot until you use it. Pour some hot water into a shallow dish (i.e. a casserole dish) with sides that measure three inches or less. Pour the rest of the hot water into a taller container with sides five or more inches tall. Place a food thermometer in each container. Have students take the temperature of the water in both containers every four minutes and record each result. Ask students which container cooled faster and which container would be better for cooling foods. Explain that shallow containers allow cool down more quickly. Shallow containers are safer for cooling because they allow foods to pass through the “danger zone” more quickly and allow food to be placed in the refrigerator sooner.

Career Connections



- **Food Safety Specialist** — Also referred to as environmental health practitioners, these people work for private corporations and government agencies like the Food and Drug Administration and the Centers for Disease Control and Prevention. They ensure sanitary procedures for processing, preparing, and packaging food and also inspect equipment.
- **Food Safety Auditor** — Auditors inspect food processing plants, commercial slaughterhouses, and other food manufacturing businesses to ensure safety and sanitation regulations are upheld.
- **Food Scientists** — Food scientists use chemistry and microbiology to figure out the safest way to process foods and keep them healthy and tasty. They analyze the nutritional content of foods such as the levels of vitamins, minerals, fat, sugar, protein, and sodium. They determine the safest and most effective ways to process, package, preserve, and distribute food products. Additionally, food scientists ensure additives and preservatives are in compliance with the Food and Drug Administration regulations.

Evaluation



Student understanding can be evaluated through class discussion or assessment of completed activity data sheets. The following questions may also be used to evaluate student learning.

1. List three actions you can take to ensure the food you eat is safe.
2. Are all methods of hand washing equally effective? Why or why not?
3. Food safety begins on the farm where food is produced. What precautions can farmers take to ensure the food they produce is safe?

References



Federal Government Food and Drug Administration, <www.fda.gov>.

United States Department of Agriculture, <www.usda.gov>.

Federal Food Safety Information, <www.foodsafety.gov>.