

SciGuides Lesson Plan

Guide: Science and Our Food Supply: Grades 5-8

Theme: Retail and Home

Title: Hands Off, Bacteria!

Author(s): FDA/NSTA

Grade Level: 5-8

Subject Area:

Life Science/Health

Standards Alignment-National Science Education Standards:

- Science in personal and social perspectives
 - Personal health
 - Natural environments may contain substances (for example, radon and lead) that are harmful to human beings. Maintaining environmental health involves establishing or monitoring quality standards related to use of soil, water, and air.
 - Risks and Benefits
 - Students should understand the risks associated with natural hazards (fires, floods, tornadoes, hurricanes, earthquakes, and volcanic eruptions), with chemical hazards pollutants in air, water, soil, and food), with biological hazards (pollen, viruses, bacterial, and parasites), social hazards (occupational safety and transportation), and with personal hazards (smoking, dieting, and drinking).
 - Important personal and social decisions are made based on perceptions of benefits and risks.

Time Required:

Two 45-minute class periods

Overall Lesson Goal:

This experiment challenges students to identify variables involved in hand washing. They will design experiments to discover the best method for washing their hands to reduce the spread of bacteria. Students will also analyze and present the data.

Individual Learning Objectives:

- Students will be able to identify variables in hand washing.
- Students will design experiments to discover the best method for washing.
- Students will analyze and present the data.

Prerequisite Knowledge; Misconceptions/Preconceptions:

Humans are one of the biggest sources of food contamination in restaurants. So, hand washing is critical to keep food safe. For example, contamination can occur when workers don't wash their hands and then prepare or serve food.

Procedures/Instructional Strategy:

Advanced Preparation

- Gather a collection of materials for students to use in their lab designs.
- Put Glo-Germ™ (or cooking oil and cinnamon on your right hand just before the students enter the classroom.

SAFETY FIRST

- Wash your hands *before* and *after* the lab.
- Seal all inoculated Petri dishes with Parafilm or masking tape. Remind students never to open a dish with organisms growing in it. Some organisms could be dangerous pathogens.
- Destroy all disposable Petri dishes using safe techniques after the experiment is completed, or soak each used Petri dish in a bleach solution.
- Disinfect all lab surfaces before and after working in the lab.
- Disinfecting Bleach Solution: 20 ml of liquid household bleach (chlorine bleach) in 1 L of tap water.
- To Disinfect Countertops:
 - Put solution in spray bottle and label the bottle, "Disinfecting Solution."
 - Wipe off counters to remove any visible soil.
 - Spray the disinfecting solution on counters and leave it on for two minutes.
- **Note:** Use the solution within 24 hours then dispose it down the drain. Solution will lose its effectiveness in 24 hours.

INTRODUCTION

Greet each student with a hearty handshake as he/she enters the classroom. (Only you know at this point that Glo-Germ™ is on your hand.) When the students get settled, ask them:

- *When was the last time you washed your hands?*
- *What have you touched since then? What have you touched in the past two hours? In the past four hours?*
- *Do you think your hands have picked up bacteria recently? (Let the students discuss the things they touched in the last few hours. Hopefully, someone will remember that you shook everyone's hand.)*
- *Could I have spread bacteria to your hands through my handshake? Let's find out. (Now take out the ultraviolet light and let the students examine their hands and classroom surfaces.)*
- *How many people or surfaces have come in contact with my "bacteria" without coming in contact with me?*

- *Would you want to eat a sandwich made by people who didn't wash their hands? Why?*
- *Have you ever seen signs in restaurant bathrooms stating, "Employees must wash hands before returning to work"? Why are these signs so important? (One of the most common ways to transmit food-borne bacteria is by using the bathroom, not properly washing your hands, and then touching food.) Note: For a real-life outbreak case involving a food worker who did not properly wash his hands, see the *Outbreak Alert* activity on pages 73–77.*

We know that hand washing is extremely important. Today we're going to do a scientific investigation to learn more about the role hand washing plays in helping keep us healthy and our food safe. Let's begin our investigation . . .

Lab 1

1. Ask students the following:
 - *What are some of the different variables involved in hand washing? (Washing or not washing, using soap or no soap, the time spent washing hands, the temperature of the water, scrubbing hands versus just rinsing.) Have students develop an experiment to discover the best method for washing their hands.*
 - *How could we test whether or not hand washing has been effective? (To determine the most effective hand washing techniques, you can use Glo-Germ™ and an ultraviolet light or cinnamon and cooking oil to represent "bacteria." Students can test which of the following actions get rid of the most bacteria:*
 - cold versus warm versus hot water
 - scrubbing versus not scrubbing hands
 - using soap versus not using soap
 - length of time spent scrubbing (20 seconds is the recommended amount of time for effective hand washing)

Note: Students can also use Petri dishes to sample hands before and after hand washing.

2. Have students form teams of three to four students. Ask each team to design an experiment or activity to investigate hand washing. They can choose to show how germs are spread by poor hand washing habits, the effectiveness of different hand washing techniques in reducing bacteria, or they can investigate their own hand washing hypothesis.
3. Have students write down their research question, hypothesis, and the procedure they plan to use. Challenge them to include the scientific principle behind their findings.
4. Let each team present their hypothesis and experimental design to the class. Encourage all students to discuss the merits of each suggested test. After the class discussion, give the teams time to revise their hypotheses and experimental designs if they wish.

Lab 2

1. Have students conduct their experiments.

2. Ask students to observe and record their results, and then create a chart or graph to show the data from their experiments. Complete the lab by having the teams write their conclusions.
3. Have the teams present the results of their experiments. Encourage students to include any problems they may have had and what they would do next time to avoid those problems. Remind students to explain the science behind their discoveries.

SUMMARY

Hands are one part of the body that are most exposed to microorganisms because they touch many things every day. Thorough hand washing with hot, soapy water removes bacteria from hands.

Outcome/Assessment:

1. *How do bacteria spread?* (They can spread from person to person, from people to foods and objects.)
2. *What methods worked best to remove “bacteria” from your hands?*
3. *Why do certain methods (e.g., scrubbing time, use of soap, etc.) work better to remove bacteria than others?*
4. *Did your experiment give you any ideas for conducting further research on hand washing?*

Extensions:

- Create a brochure on hand washing for young children.
- Set up an appointment to talk at an elementary school or preschool, a nursing home, Girl or Boy Scout meeting, PTA group, etc. Demonstrate the Glo-Germ™ activity in relation to food safety.
- Contact a local health center or doctor’s office to find out their hand washing policies.
- Relate the results of this activity to your food-borne pathogen and record.

Internet Resources:

- *Food Safety A to Z Reference Guide* (See the following terms: *Bacteria, Foodborne Illness, Food Safety, Germ, Handwashing, and Pathogen.*) Also see the 4 Cs section on pages 54–63. www.foodsafety.gov/~fsg/teach.html
- *Dr. X and the Quest for Food Safety* video Module 4 — Retail and Home www.foodsafety.gov/~fsg/teach.html
- Food Safety Quiz for Kids/FDA http://www.fda.gov/oc/opacom/kids/html/wash_hands.htm
- Gateway to Government Food Safety Information www.foodsafety.gov
- Handwashing Fact Sheet/Purdue University <http://www.cfs.purdue.edu/safefood/foodsafety/post1c.html>
- What Are Germs?/Kids Health www.kidshealth.org/kid/talk/qa/germs_prt.htm
- Why Do I Need To Wash My Hands?/Kids Health www.kidshealth.org/kid/talk/qa/wash_hands_prt.htm
- Why Is Handwashing Important?/CDC www.cdc.gov/od/oc/media/pressrel/r2k0306c.htm

- Partnership for Food Safety Education www.fightbac.org
- The SDA Kids Corner/The Soap and Detergent Association www.cleaning101.org/sdakids

Classroom Resources:

- Glo-Germ™ (see Resources on page 86) and ultraviolet light
 - Tip: Cinnamon, along with cooking oil can be used in place of Glo-Germ™ and ultraviolet light. If using cinnamon, rub one tablespoon of cooking oil all over your hands until completely coated. Sprinkle one 1 teaspoon of cinnamon on hands and rub it around until it's evenly distributed. The cinnamon can represent bacteria.
- Hand washing soap
- Paper towels
- A source of running water
- Petri dishes with nutrient agar and covers for each team of three to four students (optional) *Dr. X and the Quest for Food Safety* video, Module 4—Retail and Home