



Gross Growth

Students grow the germs on their hands, and see if washing hands removes germs.

TECHNOLOGY TOPICS

Processes

PROCESS SKILLS

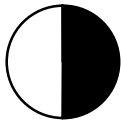
Collecting Information
Following Instructions
Analyzing and
Presenting Data
Communicating

GRADE LEVELS

1-8

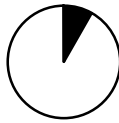
TIME REQUIRED

Advance Preparation



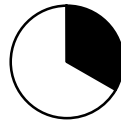
30 minutes

Set Up



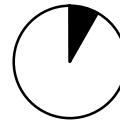
5 minutes

Activity



20 minutes

Clean Up



5 minutes

This activity takes place 2 times over the course of a week, gathering samples and culturing them in a container for a week, then examining the results.

SUPPLIES

- Growth medium for microbes (agar, gelatin, slices of grapefruit, slices of processed cheese), 1 per student
- Containers (petri dishes, margarine tubs, or Ziploc bags), 1 per student
- Labels (stickers, tape, permanent pen), 1 per student
- Soap

Optional:

- Several kinds of soap
- Cotton swabs
- Glo-Germ™

- ❑ Black light

ADVANCE PREPARATION

The growth medium needs to be prepared ahead of time.

- ❑ Slice up grapefruit so each student has a slice.
- OR
- ❑ Mix gelatin and set it in margarine tubs. For gelatin, use much less water than regular instructions. Use only 1 cup boiling water per packet of gelatin.
- OR
- ❑ Mix agar and set it in your petri dishes.

SET UP

- ❑ Set out the growth medium containers and labels, one per student.

INTRODUCING THE ACTIVITY

Let students speculate before offering answers to any questions. The answers at the right are provided primarily for the teacher's benefit.

People claim that it's important to wash your hands after you go to the bathroom, and before you eat anything. People claim this is because microbes (tiny living things you can't see), the germs that can get us sick, are everywhere, and we want to keep them off our food and out of our bodies. Ask students how could we prove those claims about washing hands and microbes with an experiment? Let the students speculate.

We're going to collect some microbes off your hands, and let them grow for a few days. When we grow microbes on something, scientists call that a "culture." The microbes grow into big clumps of millions of microbes, called a "colony." We're going to culture microbes from clean and dirty hands, and see how big the colonies get.

CLASSROOM ACTIVITY

Students should work in pairs. Each pair follows the directions below.

Procedure for Gross Growth

- 1** Each group will select one “clean hands” subject and one “dirty hands” subject.
 - (In an experiment, the subject is the thing that we study.)
- 2** The clean hands subject washes his hands with soap, and wipes the clean hand across the growth medium. He then washes his hands again.
- 3** The dirty hands subject wipes her hands a place that seems dirty (e.g. the floor, bottom of a shoe, soccer ball), then wipes her hand across the growth medium. She then washes her hands with soap.
- 4** Close and label the containers.
- 5** Put the containers in a dark warm place.
- 6** After a week, get out the microbe cultures, and show them to the students.
- 7** Have the students write descriptions of the different cultures and draw pictures of what they see growing on them.

CLASS DISCUSSION

Ask for student observations. There is no correct answer. Let students guide the discussion and present their hypotheses before discussing explanations.

What did the different cultures look like? Did some have more microbes than the others? What was the difference?

What are other ways that we keep microbes from making us sick?

We cook our food, we have toilets to take away germs to sewage treatment plants. We cover our mouth and nose when we sneeze and cough.

When you wash your hands, make sure you get every part of your hand. Don't forget your fingernails, or your thumb!

Some great photos of bacterial cultures are at:

http://www.aims.org.au/pathweek/ppt_show/img6.html

<http://www.visualsunlimited.com/browse/vu297/vu2978.html>

<http://www.bridgewater.edu/~sbaron/Bio%20405.jpg>

http://site.hylabs.co.il/upload/infocenter/info_images/17062004151208@Hemolitic_bacterial_culture.jpg

EXPLANATION

In-depth background information for teachers and interested students.

Until the 1860s, people didn't know about germs. People didn't know that cleaning cuts and keeping them covered was a good way to prevent infections. Doctors didn't even wash their hands before operating. Ignaz Semmelweis figured out that washing hands prevented sickness in the 1840s, but didn't have a way to explain why. Louis Pasteur, a French scientist, discovered germs in the 1860s. Joseph Lister was the first surgeon to clean instruments and his hands with antiseptic chemicals that kill germs. Deaths in his hospital fell by two-thirds after he started keeping everything sterile.

Medical workers today wear gloves to protect themselves from germs. Doctors also wear masks over their nose and mouth so they don't breathe germs on their patients.

If your hands look dirty, washing with soap is the best way to get them clean. Soap removes stuff from your hands. Soap also kills most germs. Hand sanitizer (e.g. Purell®) is a good alternative when soap is not available. Hand sanitizers use alcohol to kill germs. The germs are still there, but they're dead. Hand sanitizers don't remove stuff from your hands. (Note: stuff on your hands might be grains of sand or poisons.)

Antibacterial soaps have a special chemical, triclosan, which in the past killed germs. Over time, germs became resistant to triclosan. Today triclosan is useless. There's no reason to not buy antibacterial soap, but it doesn't do anything. Companies chose triclosan because they thought bacteria couldn't become resistant to it. They thought that since it killed bacteria in two different ways, no bacteria could evolve resistance to both ways at the same time. They were wrong. Just like in Jurassic Park, life finds a way.

OPTIONAL EXTENSIONS

- A.** This activity ties to the OMSI activity "Designing Bandages."
- B.** Have several students get their hands dirty in the same way, rubbing on the floor and their shoes, etc. Then have each of them use a different kind of soap: bar, liquid, antibacterial, alcohol hand sanitizer, washing with just water. Make a culture from each of their hands and compare.
- C.** Have the students use cotton swabs to more precisely gather microbes from different surfaces. Does the bottom of a shoe have more microbes than the doorknob? Does the computer keyboard have more microbes than the pencil sharpener?
- D.** Use Glo-Germ and a black light to practice good hand washing technique. Glo-Germ is invisible until you shine a special light on it. Have students put it on their hands, shake hands with other people and spread the simulated germs, and then wash their hands. If any Glo-Germ appears after they wash their hands, they can see which spots they missed.

Glo-Germ is sold by the Glo-Germ company: P.O. BOX 189 MOAB, UTAH 84532 or at www.glogerm.com.

SAFETY PRECAUTION: Take care with black lights. All Glo-Germ black lights are safe. Only UV-A lights should be used for Glo-Germ detection. UV-C lights can cause severe sunburns.

CROSS-CURRICULAR CONNECTIONS

LIFE SCIENCE

Invite a medical professional to speak to your class about antibiotics. Ask her to explain why we don't always need antibiotics, and should always take all our prescribed medicine, even if we feel better.

LANGUAGE ARTS

Have the students write a story from the point of view of a microbe.

Read The Magic School Bus Inside the Human Body to the class. Discuss.

CHEMISTRY

This lesson can be related to lessons on how soap works, and how soap was invented, such as OMSI's Let's Get Together, from Experiencing Chemistry.

MATH

Discuss doubling times. Bacteria divide into two bacteria every 20 minutes. The colonies we culture in this activity are a perfect example of exponential growth. Give students the problem: We started with one single microbe on the growth medium. The number of microbes doubled every 20 minutes. How many bacteria will be there in 3 hours? How many in 24 hours? How many microbes are in the colony a week later? How many would there be in a month, if they had all the food they wanted?