



Drexel-SDP GK-12 ACTIVITY

Subject Area(s): life science

Activity Title: Bacteria!

Grade Level: 6 (5—8)

Activity Dependency

Time Required: Three class periods: an introduction to the microscope, a session for gathering and plating microbial samples, and a microscope analysis of the colonies one week later.

Group Size: 4-6 students

Summary: This activity is designed to act as a bridge between the Landforms and Environments sections of the 6th grade curriculum. As students learn about the terrestrial and aquatic systems of the earth, they can also learn about the microbial life that inhabits these landforms. An early knowledge of microorganisms and the tools used to study them will assist in the more intensive study of habitats later in the year, during the Environments portion of the curriculum.

Keywords: microscope, bacteria, microorganism, scale, lens, focus

Educational Standards

- Science: 4.1.7, 4.3.7
- Math: 3.1.7, 3.2.7, 3.3.7b, 3.5.7, 3.6a

Learning Objectives

Students will:

- study microbial life typical of a pond environment
- study microbial life typical of a soil environment
- study microbial life in their own school and home environments

Materials List

Each group needs:

- sample dishes
- nutritive agar gel
- methylene blue stain
- sterile cotton swaps
- inoculating loops
- microscope slides

If these materials are not available in the classroom, they can be purchased in a set, such as the **Microbial Scavenger Hunt** kit from Fischer Scientific (catalog no. S32006). The kit also includes dried samples of aquatic and soil microbial life, which can be re-suspended in water for culturing.

To share with the entire class:

- an optical microscope

Vocabulary / Definitions

Word	Definition
Optical light microscope	
Bacteria	
Microorganism	
inoculating loop	
Methylene blue	
Objective lens	
Coarse/fine focus	
Microscope stage	
microhabitat	

Procedure

Background

Students should first learn the characteristics of **moneran** (bacterial) life. They should be aware bacteria are tiny living organisms, with individual organisms on a typical size scale of micrometers (or one millionth of a meter). Bacteria live in colonies, and around found in several characteristic shapes (rods, spheres, filaments, and spirals). Each organism is an individual cell, lacking a cellular nucleus. Some bacteria are parasitic, while others produce their own food. Bacteria are found in nearly every imaginable habitat, and can be dangerous or harmless to humans. Further details about specific common types of bacteria can be found in any reference source, or in the opening activity of the **Microbial Scavenger Hunt** kit.

Before the Activity

- Students should also be familiar with the components and operation of a simple optical microscope. An excellent resource for microscope information, entitled **Microscope Mania**, may be found permanently linked at **The Science Spot** (© T. Trimpe): <http://sciencespot.net/Pages/classbio.html#micro>
- Students can gather bacteria from a number of sources. A sample from a river or stream (or the dried pond life from the kit) serve as excellent sources for aquatic organisms. Soil-borne bacterial also be found in the kit, or can be obtained by adding a teaspoon of soil to a quart of distilled water. In either case, a sterile cotton swap can be dipped in the water to gather a bacterial sample.
- Students may wish to study bacteria that live in their own school and home environments. Excellent sources for bacteria include light switches, telephones, sneakers, bathroom fixture handles, air vents, kitchen cutting boards, counter tops, etc. Food, such as milk and yogurt, are also rich sources of bacterial life. **It is dangerous to culture bacteria from the mouth and nose. Do not take swap samples from these areas, or cough onto the culture plates.**



- A Petri dish should be prepared with a nutritive agar solution, suitable for bacteria culturing. Follow the instructions for preparing the agar gel. Students should ensure that bubbles are kept to a minimum. The dish should be covered with a lid to prevent contamination by airborne bacteria.
- Using a permanent marker, label three sections on the bottom of the Petri dish. Each of these sections may be used to culture microbes from a different source. After rubbing a cotton swap on the surface to be tested, lift the lid of the Petri dish and gently streak the swap over one section of the Petri dish. Students should take care not to gouge the surface of the agar.
- After all three segments of a Petri dish have been swapped, the dish should be sealed with masking tape and placed, upside down, in a 37°C incubator for several days. If an incubator is not available, samples should be kept in a warm (not hot) place, such as a sunny windowsill or atop a warm radiator.

- After several days, bacterial colonies should be visible to the unaided eye. Students should make note of the size, number, and visual properties (color, texture, etc.) of the bacteria from each microhabitat.



- Using an inoculating loop, transfer one of the bacterial colonies onto a microscope slide. **Gloves and other protective lab gear should be worn during the process.** The bacteria should be spread out on the slide surface and allowed to dry for 15 minutes.
- After drying, the slide should be passed over a candle flame 3 times to help affix the bacteria to the glass surface.
- Place several drops of methylene blue stain on the slide and allow it to remain for 2 minutes. This step is best done over a sink or container.
- Rinse the slide with distilled water. The bacteria can now be observed under a microscope.



- Following the experiment, the disposable Petri dishes should be discarded. A 10% bleach solution should be used to clean all areas used during the experiment.

Safety Issues

- Students should wear gloves and safety glasses while handling bacterial samples. They should be reminded to keep their hands away from their faces, and to wash their hands thoroughly with soap and hot water after the activity.
- Students should **not** attempt to collect bacteria from their respiratory tracks, including their noses, mouths and throats. These microorganisms can be quite infectious and harmful.
- Laboratory surfaces should be cleaned with Lysol or a 10% bleach solution at the conclusion of the activity.

Assessment

Post-Activity Assessment

At the end of this activity, students should be able to identify the primary characteristics of bacteria, and should know several common types. They should also be proficient in the use of a microscope. Students should be able to identify the main components of an optical microscope (objective lenses, stage, light source, eyepiece) and describe its function. They should have an understanding of the wide variety of habitats in which bacteria can be found, including water, soil, and surfaces they come in contact with on a daily basis.

As a reading and writing exercise, students can research the types of bacteria commonly found in the human body, and the positive and negative effects of these organisms.

References

Trimpe, Tracy. The Science Spot: Biology Lessons (Microscope Mania). 2003. Accessed September 1, 2007. < <http://sciencespot.net/Pages/classbio.html#micro> >.

Redirect URL:

<http://gk12.coe.drexel.edu/modules/doc/Matthew%20Cathell/bacteria%20modules/Bacteria%20Module.pdf>

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