

2. Microorganisms lab

BACKGROUND: You probably all know that many diseases are caused by microorganisms, but what do these organisms look like? Do they all cause diseases? How do you tell them apart?

This lab will allow you to see common bacteria, protist and fungus types. It is the first of the diversity labs, where part of your lab work is to see different types of organisms. Resist the temptation to look quickly and say "yeah I saw it." Each of these organisms are seen in the lecture portion of the class, and the point here is for you to see the features we discuss. You should come in with your lecture notes handy to ensure you see the features we've discussed.

CONCEPTS

Understand the characteristics of these three groups, and especially the differences between bacteria and protists. See the [Bacteria and Protists](#) and [Plants and fungi](#) outlines

A. Microorganisms prequiz

Name three differences between bacteria and protists. Name two features shared by bacteria and protists. (Table 16.7; protists are Eukarya)

Name two unique features of fungi? (p355)

Are humans more closely related to bacteria, protists or fungi?

Do all bacteria cause disease? (p326) What about protists (p330)? Fungi (p359)?

Why do antibiotics kill bacteria but not people (p196)?

B. Observations of bacteria shapes, types and colonies

Some bacteria cause disease and some do not. But with organisms this small, how do you tell them apart? Traditionally, scientists have relied on several features to distinguish types of bacteria: shape, colony shape and characteristics, or uncommon structures. Another common way to distinguish bacterial types is by staining them (e.g. "Gram-negative" means the bacterial type is not stained by Gram staining). However, this is a bit time consuming so we will not do it here.

GOALS:

- 1) Draw the three shapes seen in bacterial cells.
- 2) Understand features of bacterial colonies that can be used to distinguish bacteria types.
- 3) Observe two features of bacteria— photosynthetic structures and capsules- that affect how bacteria interact with their environment.

1. Bacterial shapes

1. Obtain a slide that demonstrates the types of bacterial shapes. Use your compound microscope to observe the bacteria. Bacteria are very small, so you will have to use 1000x focus.
2. Observe the three major cell shapes— **bacilli**, **cocci** and **spirilli**— and draw them in the space provided. Note the magnification of the slide.
3. Note that our slides have light bacteria against a dark background. Also, there are comparatively few spirilli so you have to look around a bit to find them.

2. Bacterial shapes drawings

3. **Are all bacteria the same size, regardless of shape? About how big are bacteria?**

4. Can you see any other differences among the cells besides the basic shapes? What does this tell you about identifying bacteria?

5. Bacteria structures observations

1. Obtain a slide of the photosynthetic bacterium ("blue-green algae") *Anabaena*. Observe it using the compound microscope. Draw it in the space provided and note the magnification.
2. Likewise, observe the demonstration slide of the bacterium with a capsule. Draw it in the space provided.

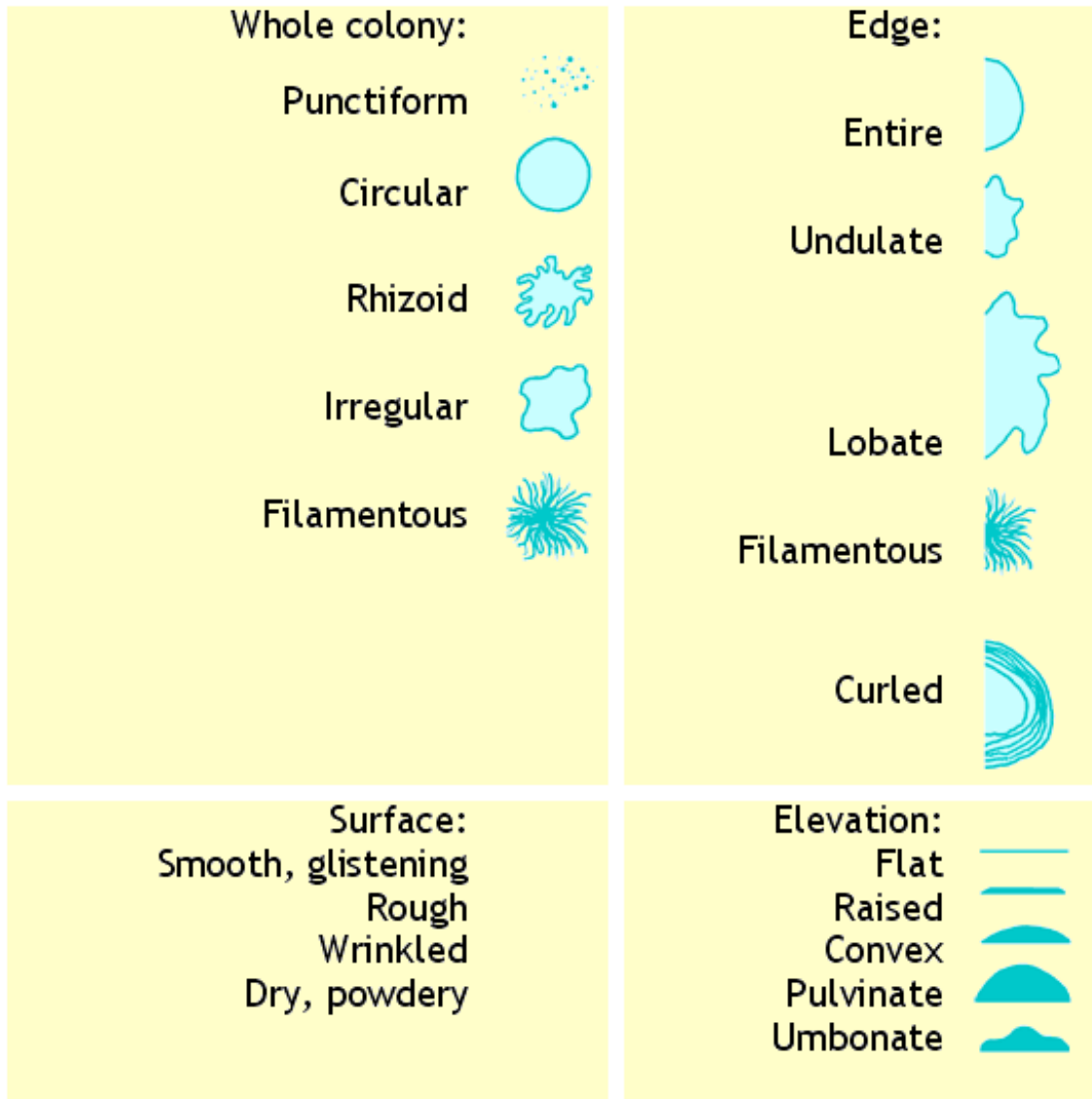
6. Bacterial structures drawings

7. What other structures does your textbook mention some bacteria possessing?

8. Colony characteristics observations

1. Obtain petri dishes of bacterial colonies from the side bench and observe using the dissecting microscope. **DO NOT OPEN THE PETRI DISHES!**
2. Draw each colony and note the approximate size.
3. Describe each colony using the terminology from Figure 2.1.

9. Figure 2.1 Bacterial colony characteristics



from
http://commons.wikimedia.org/wiki/File:Bacterial_colony_morphology.png

10.Colony characteristics drawings

11.What characters do the bacterial colonies share? In what characters do they differ?

C.Antibiotic sensitivity demo

GOALS:

- 1) Understand how we can test for resistance to antibiotics and compare efficacy of drugs.
- 2) Understand that different bacterial strains may differ insensitivity to the same compounds.

1. Antibiotic sensitivity procedure

1. Obtain a set of petri dishes demonstrating antibiotic resistance. We have one set per lab, so you will have to take turns.
2. Each plate has a bacterial lawn, onto which paper discs impregnated with antibiotics have been placed. The code on the

piece of paper indicates which antibiotic has been used; the same code is always used for the same antibiotic.

3. For each plate, measure the zone of inhibition– cleared area in the bacterial lawn– around each disc.
4. Record your data in the table provided.

2. Table 2.1 Antibiotic sensitivity table

Bacterium	Antibiotic	Zone width (mm)	Sensitive?
<i>E. coli</i>	Erythromycin (E)		(Y/N)
<i>E. coli</i>	Penicillin (P)		(Y/N)
<i>E. coli</i>	Streptomycin (S)		(Y/N)
<i>E. coli</i>	Tetracycline (TE)		(Y/N)
<i>B. megaterium</i>	Erythromycin (E)		(Y/N)
<i>B. megaterium</i>	Penicillin (P)		(Y/N)
<i>B. megaterium</i>	Streptomycin (S)		(Y/N)
<i>B. megaterium</i>	Tetracycline (TE)		(Y/N)

- 3. Was either of the bacteria types sensitive to the antibiotics? Was it equally sensitive to all of them? Did the two bacteria types differ in their sensitivities to any of the antibiotics?**

D. Disease transmission game

GOALS: To use a simulation to illustrate the pattern of disease transmission.

1. Disease transmission game procedure

1. Obtain a test tube of liquid. This represents your bodily fluids. Note what number is one your test tube.
2. Find a partner to exchange fluids.
3. Take up 1ml of fluid in your pipette.
4. Wait until your instructor says to exchange, and then put your 1ml of fluid in their test tube while they put 1ml in your test tube.
5. Record the name and test tube number of your exchange partner.
6. Your instructor will lead you through two more rounds of exchanges. Wait for your instructor before doing each exchange, or things get too chaotic.

7. Your instructor will then come around the room with an indicator solution, and put a few drops in your test tube. If it turns pink, you have been infected!
8. As a class, try to trace the pattern of infection back. Who was the original infected person (patient zero)?

2. Table 2.2 Disease transmission table

This may help you to figure out the path of infection.

Your test tube number: _____

Exchange	Person	Tube number
1		
2		
3		

3. Could you figure out who was originally infected? What would make this process harder?

4. Obviously people don't spread disease by with a pipette. How are diseases transmitted in real life? What are the easiest routes to prevent this?

E. Protist observations

GOALS:

- 1) Observe the structure of various protists.
- 2) Be able to describe what they have in common and how they differ from a fungus or bacterium.

1. Protist procedure

1. Obtain slides of *Amoeba*, Diatoms, *Spirogyra*, *Plasmodium*, *Paramecium* and *Trypanosoma* from the side bench
2. Observe each using a compound microscope
3. Draw the organisms in the space below.

2. Protist drawings

3. How can you tell a protist from a bacterium? A fungus?

**4. Which of the protists are photosynthetic? How can you tell?
How do they differ from photosynthetic blue-green algae?**

F. Fungi observations

GOALS:

- 1) Observe the structure of a fungus, including the hyphae, mycelium and reproductive structures
- 2) Be able to describe how this differs from a protist or bacterium

1. Fungi procedure

1. Obtain a *Rhizopus* plate from the side bench
2. Examine the plate under a dissecting microscope using overhead light.
3. Draw what you see below.

2. Fungus drawings

3. How can you tell a fungus from a bacterium? A protist?

4. How useful were the textbook characters (from your prequiz) in distinguishing these groups? Did you need other characters to tell them apart?