

**Pre-Lab**

1. Why would a drug used to treat a bacterial infection 10 years ago not have the same effect today?
2. Explain the effects of antibiotic resistance in society.

**Introduction**

→ Annotate the purpose of the lab by circling words that you think are the most important.

→ If you have taken antibiotics lately, you probably have seen the label on the bottle that you must follow the directions completely and take the medicine until it is gone. Why?

Millions of harmless bacteria naturally live on and inside of your body. When harmful bacteria appear on the scene, your body's immune system can usually keep a small population of them under control. If, however, these bacteria reproduce too quickly, you suffer consequences—and this is called an infection. Antibiotics help your body fight off an infection by killing off these harmful bacteria. Unfortunately, a small number of bacteria in any population may not be affected by the antibiotic. These bacteria, which are considered more resistant to the treatment, continue to reproduce and grow. Completing the full course of the antibiotic as prescribed helps make sure that these bacteria do not survive and therefore won't make you ill or infect anyone else.

**Investigating A Bacterial Infection**

Today you are going to simulate what happens when someone has a bacterial infection. The doctor prescribes an antibiotic to be taken every day for at least eight days. The colored disks in this simulation will represent the harmful bacteria that are in the body.

**Level of Resistance**

Least resistant bacteria  
Medium resistant bacteria  
Extremely resistant bacteria

**Represented by**

blue disks  
green disks  
red disks

Each time you roll the dice, the number you roll will determine what action should be taken.

**Experimental Question**

→ What happens if you don't take your antibiotic prescription for the entire duration?

<sup>1</sup> Adapted from: <http://www.flinnsci.com/media/1167812/bf11236.pdf> and New Visions for Public Schools

## Hypothesis

A good hypothesis has this format and punctuation: If \_\_\_\_\_, then \_\_\_\_\_ because \_\_\_\_\_.

If  
then  
because

| Independent Variable | Dependent Variable     |
|----------------------|------------------------|
| →                    | →                      |
| Control Group        | Controlled Variable(s) |
| →                    | →<br>→                 |

## Materials

- Lab for each student
- 50 disks (20 blue, 15 green, 15 red) (per group)
- 1 die (per group)

## Procedure

- 1. In this activity, you and your partner will work together to simulate what happens during the clash between antibiotics and bacteria during an infection. Begin with 20 disks: 13 blue, 6 green, and 1 red . These disks represent the harmful bacteria living in your body before you begin to take the antibiotic. Set extra disks to the side for now.

2. **Step A:** Time to take the antibiotic... Toss the dice and follow the directions below:

| Number Tossed | Event                                                          | Result                                                                                                     |
|---------------|----------------------------------------------------------------|------------------------------------------------------------------------------------------------------------|
| 2, 3, 4 or 5  | Antibiotic was taken at the appropriate time--bacteria killed. | Remove 5 squares in the following order: remove blue squares first, followed by green, then red as needed. |
| 1 or 6        | Antibiotic was not taken at the appropriate time.              | Do not remove any squares.                                                                                 |

3. **Record** in the Google Sheet linked in Classroom the number on the dice and how many of each type

of bacteria are left in the body.

4. Bacteria are constantly reproducing in the host; in this case, the host is the patient's body. If one or more bacteria of any type (color) are still present in the patient's body after each dose (after each dice toss), **add 1 disk of that color** to the population.

EXAMPLE: A patient takes antibiotics and there are 0 blue, 5 green and 3 red bacteria left: add 1 green and 1 red disk to the population.

5. **Repeat** steps 2-4 at least 8 times (or until all bacteria have been eliminated) and record it in the data table.
6. Using the data from the table, **construct a line graph** in Sheets displaying the number of each type of bacteria vs. the number of doses. Use different colors to plot the following data:
- Total number of bacteria
  - Least resistant bacteria
  - Medium resistant bacteria
  - Extremely resistant bacteria.
7. **Create a title and legend** to explain your graph and paste it here.

## Analysis

1. Did the antibiotic help you to completely kill all of the harmful bacteria living in your body? Explain.
2. Suppose most infected people stopped taking the antibiotic when they began to feel better. (For example, consider the point in the simulation when there are only three harmful (red) bacteria left.) What do you predict might happen to an antibiotic's ability to kill the harmful bacteria if the infection returns?
3. Use your data and graph to describe how the population of each type of bacteria changed over the course of the antibiotic treatment?. (Your answer should describe **all three** of the types of bacteria.)

4. Why is it important to complete the full course of an antibiotic as prescribed?

**Conclusion: Was your hypothesis supported? Be sure to explain your reasoning! (Sentence starters: “Yes, my hypothesis was supported. I know this because...” or “No, my hypothesis was not supported. It was not supported because...”)**

Think - Talk - Open Exchange



**Describe**

→ Describe what you did in the lab below. Why do you think that this lab was done in class this unit?



**Explain**

→ Explain the phenomena that you observed during this lab. How does this relate to what we are studying this unit?

Talk with your partner(s) about what you write in the describe and explain sections; one person at a time and then you can move to an open exchange about everyone's thoughts.

→ Write down new ideas that you heard during your discussion with your lab partner(s).

