

Epidemiology

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Objectives

1. Define the following terms: epidemiology, epidemic, reservoir, and carrier.
2. Describe three methods of transmission.
3. Determine the source of a simulated epidemic.

Background

In every infectious disease, the disease-producing microorganism, the **pathogen**, must come in contact with the **host**, the organism that harbors the pathogen. **Communicable diseases** can be spread either directly or indirectly from one host to another. Some microorganisms cause disease only if the body is weakened or if a predisposing event such as a wound allows them to enter the body. Such diseases are called **noncommunicable diseases**; that is, they cannot be transmitted from one host to another. The science that deals with when and where diseases occur and how they are transmitted in the human population is called **epidemiology**. **Sporadic diseases** are those that occur occasionally in a population; an example is polio. **Endemic diseases** such as pneumonia are constantly present in the population. When many people in a given area acquire the disease in a relatively short period of time, it is referred to as an **epidemic disease**. Influenza often achieves epidemic status.

Diseases can be transmitted by **direct contact** between hosts. **Droplet infection**, when microorganisms are carried on liquid drops from a cough or sneeze, is a method of direct contact. Diseases can also be transmitted by contact with contaminated inanimate objects, or **fomites**. Drinking glasses, bedding, and towels are examples of fomites that can be contaminated with pathogens from feces, sputum, or pus.

Some diseases are transmitted from one host to another by vectors. **Vectors** are insects and other arthropods that carry pathogens. In **mechanical transmission**, insects carry a pathogen on their feet and may transfer the pathogen to a person's food. For example, houseflies may transmit typhoid fever from the feces of an infected person to food. Transmission of a disease by an arthropod's bite is called **biological transmission**. An arthropod ingests a pathogen

while biting an infected host and then transfers the pathogen to a healthy person in its feces or saliva. The continual source of an infection is called the **reservoir**. Humans who harbor pathogens but who do not exhibit any signs of disease are called **carriers**.

An **epidemiologist** compiles data on the incidence of a disease and its method of transmission and tries to locate the source of infection in order to decrease the incidence.


Materials

Glove, Unknown¹, Swab, Paper

Procedure

Work in groups of 5 to 10 students.

1. Divide the recording paper into six sectors labeled "1" to "5." *Carefully read steps 2-4 before proceeding.*
2. Put the glove on your left hand. Holding the swab, dip the cotton in your unknown powder and rub the powder on the palm of your left hand (i.e., on the glove). Gently shake off loose powder and reapply. Rub the powder over your entire palm.
3. Shake *left* hands with a classmate when the instructor gives the signal. Shake hands so your fingers touch the other's palm and vice versa. After shaking hands, touch your fingers to the first sector of the paper. Record the person's name and swab number.
4. Repeat step 3, shaking hands with four other classmates. Remember to touch your fingers to the corresponding sector of the paper after each handshake. Keep good records.
5. Examine your paper under a UV light and record your results in your Lab Report.

 **Caution:** Do not look at the ultraviolet light and do not leave your hand exposed to it.

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¹One swab is inoculated with a Glo powder. Glo powder fluoresces under ultraviolet (UV) light.

Lab Report
Epidemiology

Name _____

Date _____

Purpose _____

Results

Your swab # _____

	Name	Swab #	Fluorescence?
1.			
2.			
3.			
4.			
5.			

Conclusions

1. Who had the "disease?" _____
2. Diagram the path of the epidemic in your group.

Questions

1. Could you be the "infected" person and not have glo powder on your paper? Explain.
2. Do all people who contact an infected individual acquire the disease? Explain.
3. When does an epidemic stop?
4. What was the method of transmission of the "disease" in this experiment?

Teacher's Guide

	Per student
8.5 ×11 construction paper	1
Cotton swab	1
Latex glove or vinyl glove or plastic baggie	1
	Per group of 6-10 students
Numbered as unknowns	
5 ml beaker or Petri plate containing corn starch (1/4 tsp)	5
1 person in group should get	
5 ml beaker or Petri plate containing GloGerm* (1/4 tsp)	1
	Per class
UV lamps, long λ	2-3

*GloGerm can be ordered online at <http://www.glogerm.com/>

Answers

1. Could you be the "infected" person and not have glo powder on your paper? Explain.

Yes, your fingers could still be clean and your palm contaminated.

2. Do all people who contact an infected individual acquire the disease? Explain.

Not necessarily. Infection requires a sufficient inoculum.

3. When does an epidemic stop?

When the number of susceptible hosts decreases due to death or recovery.

4. What was the method of transmission of the "disease" in this experiment?

Direct contact.

This experiment was adapted from an experiment using bacteria instead of GloGerm in *Laboratory Experiments in Microbiology* by Christine L Case and Ted R. Johnson (Benjamin/Cummings Publishing Co., San Francisco, California).