



## HOW DOES AN EPIDEMIC SPREAD?

### HEALTH STANDARDS:

**STANDARD/GOAL 1:** Students will understand health promotion and disease prevention concepts and practices.

**Indicator 3:** Students will analyze how medical research, government regulations, and public health policies influence health promotion and disease prevention.

**Benchmark 3:** Examine health practices which may cause and /or spread/ prevent disease.

**STANDARD/GOAL 3:** Students will understand the benefits of practicing health-enhancing behaviors which reduce health risks.

**Indicator 1:** Students will evaluate health-enhancing behaviors which promote wellness.

**Benchmark 1:** Distinguish short and long term consequences of risky and harmful behaviors.

### OVERVIEW:

<b>DESCRIPTION:</b>	Students exchange solutions (that could represent body fluids) with others in the class. A pathogen in one student's original solution is passed to other students to simulate the spread of an epidemic disease.												
<b>PURPOSE:</b>	Show how a disease may spread throughout a group of people.												
<b>LAB SKILLS:</b>	Use pipette to transfer solutions from one container to another.												
<b>MINIMUM LAB SETTING:</b>	This lab can be run in an ordinary classroom, if there is a way to dispose of liquid waste and to clean test tubes.												
<b>TIME REQUIRED</b>	<p>This lab can be run in a 50-minute lab period if the following times are allotted for various steps:</p> <table> <tr> <td>Pre-Lab Discussion</td> <td>5 minutes</td> </tr> <tr> <td>Rounds 1-3 of student contact</td> <td>5 minutes</td> </tr> <tr> <td>Testing for infected students</td> <td>3 minutes</td> </tr> <tr> <td>Establishing the infection pattern</td> <td>30 minutes (if needed)</td> </tr> <tr> <td>Testing for original carrier</td> <td>2 minutes</td> </tr> <tr> <td>Cleanup</td> <td>5 minutes</td> </tr> </table>	Pre-Lab Discussion	5 minutes	Rounds 1-3 of student contact	5 minutes	Testing for infected students	3 minutes	Establishing the infection pattern	30 minutes (if needed)	Testing for original carrier	2 minutes	Cleanup	5 minutes
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## LABORATORY PREPARATION:

**Note:** If there are an odd number of students in your class, you will either need to participate in the exchange yourself, or have one student not participate and be the class recorder. The ideal number in a group is 10 or 12. If necessary the group can be larger but not smaller.

### Solutions for the test tubes:

**NaOH is caustic. In preparing the bottle of diluted Solution A to put in the tub and take with you for presentations, wear gloves and safety glasses. Be sure there is good ventilation. Always add the NaOH slowly to the distilled water when mixing.**

Solution A – Mix 25 ml. of 1M NaOH to 100 ml. of distilled water (this supply bottle of NaOH will need to be mixed prior to the presentation. Recommend doing this in your office.)

Solution B – Distilled water

The HOTT kit will have the solutions labeled in 250 ml. bottles for your use. When pouring solutions into the test tubes, one tube should be filled 2/3 full with Solution A (Typhoid Mary) and the other test tubes should be filled 2/3 full with Solution B (not infected). Make a mental note of where you place the Solution A tube and then note which student picks up that tube.

## MATERIALS AND EQUIPMENT REQUIRED:

Plastic Pipettes	1 per student (25 in HOTT kit)
Test Tubes	1 per student (24 in HOTT kit)
Test Tube Rack	1 per group of students (2 in HOTT kit)
Solution A	1 test tube filled per group (16 oz. bottle in HOTT kit)
Solution B	All other test tubes filled (16 oz. bottle in HOTT kit)
Phenol Red Solution	To test fluids after exchanges are complete (glass vial in kit)

## PRE-LAB DISCUSSION:

Read the introduction section of the student handout. You may add any prevalent disease information for your area (influenza or RSV etc). Continue with the purpose and lab safety and method.

## PROCEDURE NOTES:

### SAFETY CONSIDERATIONS

Review the safety procedures with your students. If Solution A comes in contact with skin or eyes flush immediately with water.

Demonstrate how to use the pipette. Tell students to completely squeeze the bulb of the pipette before inserting it into the test tube, then insert the pipette into the solution and allow the bulb to expand, drawing up the solution into the pipette. All students should have their solution drawn up before exchanging with their contact.

Discourage students from making contacts with students sitting right next to them. Encourage them to make contacts randomly within their group. The results of the lab are better if each student finds a new contact for each round. So, ask students to find a new contact and wait to exchange fluids until the entire group has a new contact

and you will tell them when it is time to exchange fluids. If a student does not have a new contact, help them switch with other students before the exchange of fluids is done.

Use a clean pipette to add a drop of phenol red to each student test tube. Encourage the students to stir the phenol red into their solution and wait 30 to 60 seconds for the color reaction to complete.

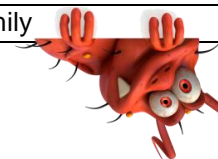
### SAMPLE DATA AND CALCULATIONS:

The sample data are from a class of ten students.

**DATA TABLE**

Student Name	1 <sup>st</sup> Round	2 <sup>nd</sup> Round	3 <sup>rd</sup> Round
*Josh	Bailey	Andrew	Heather
*Andy	Andrew	Heather	Tyler
*Emily	Heather	Logan	Madison
*Tyler	Logan	Madison	Andy
*Alexis	Madison	Bailey	Logan
Bailey	Josh	Alexis	Andrew
Andrew	Andy	Josh	Bailey
*Heather	Emily	Andy	Josh
*Logan	Tyler	Emily	Alexis
*Madison	Alexis	Tyler	Emily

\*Persons testing positive for disease after round 3



### CONCLUSIONS:

- All students whose solutions test red are infected. These students are marked with an asterisk in the first column of the sample data table.
- First find the original carrier:
  - Begin with students uninfected after Round 3 (Bailey and Andrew)
  - Based on Bailey and Andrew's contacts, determine the two students who would have tested positive immediately after Round 1:
    - Eliminate Josh and Andy since Josh contacted Bailey and Andy contacted Andrew in Round 1.
    - Eliminate Alexis since she did not infect Bailey when she contacted her in Round 2.
    - No others can be eliminated in this fashion, but Heather would have tested positive immediately after Round 1, since she contacted an uninfected person on Round 2 (Andy) and another uninfected person in round 3 (Josh).
    - Since Heather tests positive after Round 1, so must her contact in Round 1 (Emily). But it is not possible to know which of them infected the other. Their stock solutions must be tested with phenol red to determine whether Heather or Emily was the original carrier.

#### To trace the path of transmission:

Follow Emily's and Heather's contacts in Round 2:

- ▶ Emily infects Logan in Round 2.
- ▶ Heather infects Andy in Round 2.

Follow Emily's, Heather's, Logan's, and Andy's contacts in Round 3:

- ▶ Emily infects Madison in Round 3.
- ▶ Heather infects Josh in Round 3.

- ▶ Logan infects Alexis in Round 3.
- ▶ Andy infects Tyler in Round 3.

**EXTENSIONS OF THE LESSON (If there is time):**

1. Relate this scenario to the occupations talked about in the previous HOTT session.
2. Use the SD Dept. of Health Infectious Disease Surveillance Report to discuss what diseases are prevalent in SD. A copy is attached to this packet and may be reproduced for your use.