



**A PILOT DVD PROJECT**

***THE SMALLEST MENACE IS NOT DENNIS***

***Fluid Exchange Laboratory***

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**Activity:** Fluid Exchange Laboratory

**Time Frame:** One class period (50-55 minutes) for fluid exchange laboratory experiment, one to two additional class periods for discussion of sexually transmitted diseases and behavioral aspects of its transmission.

**Materials:**

1. Test tubes (30 or the same number as students in class)
2. Test tube racks (enough for all test tubes)
3. Distilled water or standard pH tap water
4. Bromothymol Blue
5. Slips of paper ( 30 or the number of students in class) numbered
6. Distilled vinegar
7. 6 Beakers
8. Droppers
9. Copies of student handout for laboratory

**Teachers Directions:**

? Students should have completed sections on viral structure and function, replication of viruses and be familiar with Chapter 7 of DVD Microbe Menace. You may want to review Chapters 12 and 13 before lab.

? This lab experiment works best if students are NOT prepared for the lab. Simply have them come into classroom and proceed with the directions as they enter.

! Part A. Prepare the following items for Part A before class.

? Numbered slips

1. Cut paper into 30 equal strips, approximately 2 x 3 cm.
2. Number each strip with a number (1-30 for a class of 30 students). Place all 30 numbers in hat (or box) and randomly remove 5. Record these number as the *potential pool of infected individuals*.

? Test Tubes

1. Label each of 30 test tubes with a number (1-30)
2. Mix 2 mL of distilled vinegar with 18 mL of water in a 50 mL graduated cylinder or small beaker. Aliquot 5 mL of this solution into 3 test tubes that correspond to 3 of the 5 numbered slips that you chose randomly in Step 2 above. Record the numbers of these 3 test tubes. These are the *infected* tubes; you need to know which tubes were initially infected.
3. Add 5 mL of water to each of the remaining 27 test tubes.
4. Place all 30 test tubes in racks at an accessible station near the classroom door.
5. In the front of the room set up 6 beakers with about 20 mL of bromothymol blue in each.

6. Run a test using 5 mL of tap water and 10 drops of bromothymol blue to make certain that a blue color results. Acidic tap water, with a pH <6 will turn the indicator yellow. If your tap water is acidic, neutralize it by adding drops of dilute NaOH until a blue color results, or use distilled water.

## I Part A Fluid Exchange

? It is important to be prepared for this part of the activity because organizational problems distract students from the bigger picture. A suggested flow for the fluid exchange follows. Modify the activity to suit your class.

### ? Conducting the Fluid Exchange

1. As the students enter the classroom, ask them to take a numbered test tube from the rack you have set up. Tell them to hold the tube, without spilling the contents, until you give further directions.
2. When everyone has a tube, tell him or her to record the number of his or her tube on his or her lab handout.
3. Now reveal to the students that before class you have chosen five numbers at random. Read the five numbers to the class and ask these students to raise their hands.
4. Tell the class that three of these five students hold tubes containing a fluid that is *infected* with something that cannot be seen. Make it clear that this is a demonstration. There is no real infectious agent and they are in no danger.
5. Ask the five students in the *potential pool* to come to the front and have each choose four numbers from the hat. (They cannot choose their own numbers because those numbers no longer are in the hat). This step will help spread the infection. This strategy also ensures that some numbers will not be chosen (5 in a class of 30) and, therefore, that some students will not exchange fluid with a student from the *potential pool*.
6. Instruct these same five students to exchange fluid with the students holding tubes corresponding to the four numbers each has chosen.
7. Ask students to exchange fluids in the following manner:
  - a. Pour the entire contents of one tube into the second tube.
  - b. Pour the entire contents of the second tube back into the first tube.
  - c. Repeat steps a and b two more times.
  - d. Divide the solution evenly between the tubes at the end of mixing.
8. Next instruct everyone in the class to exchange fluid with the person who has the tube with the next higher number in the 1-30 sequence (for example, tube 6 should exchange with tube 7, tube 30 should exchange with tube 1). Students do not have to do this in order (That is, tube 6 does not have to wait to exchange with tube 7 until tube 5 first exchanges with him or her). This step is important if you choose to discuss the details of fluid exchange in the real world. For example, if students argue that they

would never sleep with anyone in a high-risk group, this step demonstrates infection by secondary spread.

9. After the exchanges are complete, ask the students to proceed to the front of the room where the beakers of bromothymol blue are set up. Ask each student to add 10 drops of the indicator dye to his or her tube. Infected tubes- those originally containing a vinegar solution – or those involved in exchanges with vinegar solutions will turn yellow; tubes containing only water will remain blue.
10. After students have completed the experiment, have them work in pairs, groups or individually to answer the questions on the lab handout. You may also want to have a discussion concerning how the experiment matches or does not match real life. Discuss sexual partner selection process in teenagers, number of partners, past histories of partners to help students see the number of partners is not just who they have had sex with, but all the people their partners have had sexual contact with. You may want to build a history tree ( similar to a family tree) of past and present partner(s). Have students estimate how many people past and present partner(s) have had sexual contact with. Discuss ethnic constrains on behavior, parental influences, peer influences.

? Possible questions to ask to begin discussion include:

How does our experiment match real life? How is it different?

? Were students surprised at the number of people that became infected?

? What could you do to limit your own risk of being infected?

? Should HIV/AIDS status be public knowledge?

? What do your friends think about premarital sex? What does your family think?

? How many sexual partners do you think most teenagers have during their high school years? Is this pretty average? What about your own group of friends?

### **Students Directions:**

(See Attached Black Line Master: Fluid Exchange Laboratory)

### **Evaluation:**

1. Completed laboratory report
2. Group reports on web research if doing extensions

### **Extensions:**

° Have students select another sexually transmitted disease and do presentation (either orally, written, or multimedia) on disease. You may want students to work in small groups for this project.

° Information to be covered in research:

? Viral or bacterial agent and type

? Mode of transmission

? Treatment, curable or simply treatable

? Impact on society as well as individuals

? Susceptible populations (at-risk groups, pre-existing conditions)

**Web Connections:**

- ? Status of AIDS/HIV in U.S. and other countries
- ? Current treatment regimes, future research possibilities
- ? Groups at risk: teenagers, young adults, and homosexuals
- ? Life expectancy ( differences based on nationality, age, sexual preference, etc)

**? Sources for information:**

- ? nih.gov
- ? cdc.gov
- ? pbs. org/
- ? discover.com

## FLUID EXCHANGE LABORATORY

**Purpose:** To understand that some diseases can be spread through the exchange of body fluids

### Procedures:

Take one numbered test tube from the rack. Hold the tube without spilling the contents until given further instructions.

Record the number of the tube on sheet of paper.

Five numbers have been chosen at random. Raise your hand if you have one of the selected numbers. Three of these five students holding tubes contain a fluid that is infected with something that cannot be seen. This is ONLY a demonstration. There is no real infectious agent.

The five students in the potential pool come to the front of classroom and each will choose four (4) numbers from the hat. This step will begin the spread of the infection.

The original five students will exchange fluids with the four students they selected from the drawing in the following manner:

1. Pour the entire contents of one tube into the second tube
2. Pour the entire contents of the second tube back into the first tube
3. Repeat steps 1 and 2 two more times
4. Divide the solution evenly between the tubes at the end of mixing

Now everyone in the class will exchange fluid with the person who has the tube with the next higher number in the sequence from 1 to 40. (for example, tube 6 will exchange with tube 7, tube 40 will exchange with tube 1). You do not have to do this in order, that is tube 6 does not have to wait to exchange with tube 7 until tube 5 first exchanges with him or her. This step is important because in the real world if you knew who was high risk, you would try to avoid these individuals.

After the exchanges are complete proceed to the front of the room where there are several beakers of bromothymol blue. Each student will add 10 drops of the indicator dye to his or her test tube. Infected tubes – those originally contaminated or those involved in exchanges with other contaminated tubes will turn yellow; tubes that are not contaminated will remain blue.

### Questions:

1. What observations about the fluid exchange surprised you?
2. Many illnesses are spread by fluid transfer, including the common cold, hepatitis and AIDS. What types of behaviors spread these illnesses?
3. Is there any way people can eliminate completely their chances of contracting a sexually transmitted disease?
- \*4. Can you suggest reasons why viral diseases are so hard to cure or to prevent?