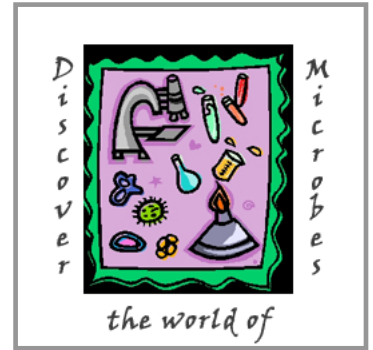


NABT 2006

Microbial Discovery Workshop

Friday, October 13 – Ballroom C
11:00am – 12:15pm



Dangerous Friends and Friendly Enemies: What Happens When Our Delicate Relationship with Microbes Changes

Facilitator: Liliana F. Rodriguez, MPH, RM(AAM), M(ASCP), The University of Texas Health Science Center at Houston

Workshop Outline

- I. Introduction to ASM's Video Podcast Series and MicrobeWorld.org website.**
- II. *Intimate Strangers* - Episode 6: Dangerous Friends and Friendly Enemies**
This video illustrates the microbial habitats diversity, the role of bacteria as normal flora of humans, consequences of changes in our relationship with microbes, and an outbreak investigation.
- III. Microbial Discovery Activity - Outbreak!**
In this exercise the spread of an epidemic in the classroom will be simulated. A harmless liquid will be shared with others in order to simulate the sharing of food, drinks, bodily fluids, or even touch. After this activity, participants should have a better understanding of how an infectious agent spreads, factors that can accelerate the process, and ways to prevent the spread of infectious diseases.
- IV. Presentation of the Microbial Discovery on-line resources.**
Participants in this workshop will receive information on additional teaching resources available at the American Society for Microbiology website.

Did you use this activity in your classroom?

Please send questions/comments to:

American Society for Microbiology
Education Department
1752 N Street, NW
Washington, DC 20036
EducationResources@asmusa.org

An Educational Program of



**AMERICAN
SOCIETY FOR
MICROBIOLOGY**

Microbial Discovery Workshop - Sample Lesson Planning Guide

Teacher:

Standards: Content A,C,F

Benchmark(s): _____

Course/Subject:

Dangerous Friends Friendly Enemies: What happens when our delicate relationship with microbes change.

Anticipatory Set

The Hook:

The study of how an infectious disease spreads through a population can ultimately lead to the prevention of the disease. A outbreak is about to occur in your classroom. Become a disease detective and see if you can help in the search for the source of contamination.

Review and Practice:

Students will need a general understanding of the type of microorganisms and the different ways in which microbes cause diseases in humans. For students to learn about microbes in an interactive way, ask them to log into MedMyst, (<http://medmyst.rice.edu>) and play the Germ Blasters in Mission 1, or visit the Microbe World's Meet the Microbes website at <http://www.microbeworld.org/microbes/>

Activate Prior Learning:

Questioning
 Individual work
 Discussions
 Home work
 Group work
 Reciprocal teaching

Value of the Lesson:

In this exercise students become disease detectives and solve an epidemiologic puzzle.

Objective/Outcome:

By the time students leave the classroom they will be able to learn the concepts involved in epidemiology, discuss the importance of epidemiology in disease prevention, and experience tracing the spread of a pathogenic microbe through a population.

Microbial Discovery Workshop - Sample Lesson Planning Guide

Instructional Delivery: Process

<p>Teacher Processes: Learning will be facilitated using a podcast from the American Society for Microbiology, inexpensive hand-on activities, group discussions and individual use of the internet.</p>	<p>Activities:</p> <ul style="list-style-type: none">• Discussion• Thinking skills<ul style="list-style-type: none">• Analyzing• Synthesizing• Evaluating• Cause-effect• Hypothesizing• Decision Making• Performance (written)• Graphic Organizers<ul style="list-style-type: none">• Word web• Podcast
<p>Student Process/Procedures: Before class, students will play with an internet-based program or review basic information about the different types of microorganisms on a website from ASM. The game consists of a futuristic setting designed for students to learn about pathogenic microbes. During class, students will exchange pieces of paper with one another to simulate the epidemiology of tracking an infectious agent. After this activity, the students should have a better understanding of how infectious agents spread from person to person and ways to prevent outbreaks.</p>	
<p>Guided Practice (Check for understanding): Using their <i>Distribution Record Sheet</i> as a "clues map," students should be able to determine who was the first person infected and the path of transmission of the mysterious microbe.</p>	

Microbial Discovery Workshop - Sample Lesson Planning Guide

Summary/Closure:

Clearly articulate (student/teacher):

After this exercise, students would have gained an understanding of pathogenic microorganisms, how epidemics occur, and how outbreak investigations are conducted. The basic principles taught here can be applied to learn about many infectious diseases that affect populations and can be adapted to a variety of scenarios. For example, the infectious agent could be HIV or another pathogen that is spread by human contact.

Assessment and Evaluation of Lesson:

Students will receive a Distribution Record Sheet to keep track of all their exchanges and help them trace their contacts during the epidemic. A Data Analysis sheet with 8 general questions is provided.

- Written exercise
- Observation
- Checklist

Homework:

None or students can be asked to complete the data analysis at home rather than in the classroom. An additional assignment could include the calculation of attack rates in a population.

Technology-Utilization:

The use of technology in this exercise is optional. Students can access MedMyst (<http://medmyst.rice.edu>), an internet-based game designed for learning about pathogenic microbes, or MicroWorld.org, and informative website maintained by the American Society for Microbiology

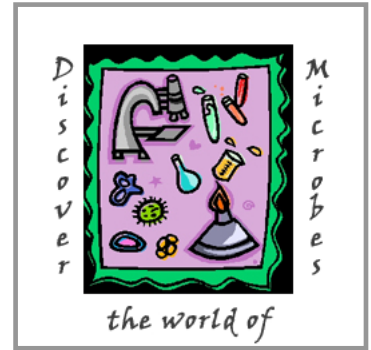
Materials:

- Worksheets
- Handouts
- Computers
- Access to Internet (optional)
- Calculators (optional)

Microbial Discovery Activity

Outbreak!

Investigating Epidemics



Abstract

This activity simulates how a pathogen can spread among a population. Students will exchange paper with one another to simulate the epidemiology of tracking an infectious agent. After this activity, the students should have a better understanding of how infectious agents spread from person to person and ways to prevent outbreaks. It can be adapted to a variety of scenarios. For example, the infectious agent could be HIV or another pathogen that is spread by human contact.

Intended Audience

K-4	
5-8	X
9-12	

Learning Objectives

At completion of this exercise, the student will:

- Learn the concepts involved in epidemiology.
- Discuss the importance of epidemiology in disease prevention.
- Experience tracing the spread of a pathogen through a population.

Necessary Student Background

Students will need a general understanding of the type of microorganisms and the different ways in which microbes cause diseases in humans. For students to learn about microbes in an interactive way, ask them to log into MedMyst, (<http://medmyst.rice.edu>) and play the Germ Blasters in Mission 1.

Keywords

epidemic, pathogens, infectious agents, transmission, epidemiology, prevention



General Information

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National Science Education Standards Addressed

Science Content Standard A: All students should develop abilities necessary to do science.

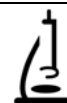
Science Content Standard C: All students should develop understanding of the structure and function of living systems.

Science Content Standard F: All students should develop understanding of personal health.

Science Content Standard F: All students should develop understanding of science and technology in society.

Activity Specifications

Classroom setting	X
Requires special equipment	
Uses hands-on manipulatives	X
Requires mathematical skills	
Can be performed individually	
Requires group work	X
Requires more than one (45 min) class period	
Appropriate for special needs student	X



Teacher Handout

Outbreak! Investigating Epidemics

Class Time

Approximately 45 minutes of class time are required.

Teacher Preparation Time

About 1 hour to cut paper strips and prepare the baking soda and pH indicator solutions. Two additional hours are required for paper strips to dry.

Paper strips

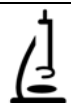
1. Count the number of students in the class. Cut up enough filter paper into strips approximately 1 inch by 3 inches so that each student gets five strips of paper. Coffee filters purchased at the grocery store work fine as the filter paper.
2. Group five strips together using a paper clip, small envelope, or some other method to keep the five strips together.
3. Randomly select one group of five strips and dip them into the saturated baking soda solution (directions below) for a few seconds. (The student who gets these strips will be “infected” and the agent of transmission.) For a really large class, (over 25) you may want to have more than one student receive the “infected strips.”
4. Allow the wet strips to dry on a clean surface. This should take about an hour or so.
5. Regroup the five “infected” strips and assemble in the same way as you did the other packets of five strips so that all the groups of five look alike.
6. If you want to know ahead of time which student picks the infected group of strips, then you can personally pass out the strips, taking note of who gets the “infected” packet.

Saturated baking soda solution for “infected” strips

1. Add a couple of tablespoons of baking soda to one cup of water.
2. Stir the baking soda so that it dissolves.
3. Keep adding baking soda until it does not fully dissolve and collects at the bottom of the cup. At that point the solution is saturated. Now dip five strips into the solution for a few seconds.

Red cabbage pH indicator

1. Cut a head of red cabbage in half. Using a grater, grate half the cabbage into small pieces.
2. Place pieces of cabbage into a large pot and add enough water to cover the shredded cabbage. 3. Bring the water to a boil and boil for 30 minutes.
4. Drain off the cabbage pieces and allow the cabbage juice to cool. (You can store this solution in the refrigerator for a number of weeks.)
5. On the day of the simulation, place the cabbage juice in a jar in a central location to serve as the “microbe testing station.” Alternatively, you can pour small amounts of the cabbage juice into plastic test tubes or paper cups, so that student groups have their own testing station.



Background

Epidemiology works to uncover and explain the factors that determine disease frequency and distribution. In the field of infectious disease, epidemiologists identify infectious agents; determine how they are spread, who gets infected, and the results of infection. This is a difficult task because not only are there different infectious agents, but there are also different environments in which they live, methods by which they spread, methods of invasion into the host, and different host abilities to fight the infectious agent. The possibilities are endless.

In order to answer these questions, scientists, physicians, public health care workers, and countless others combine their skills to accurately and methodically study the spread of a disease through a population. This is important because it helps to prevent the spread of future infectious diseases and limits the emergence of mutations of the disease.

Materials and Equipment

A. Before class

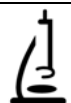
1. filter paper (a coffee filters from the grocery will work just fine)
2. scissors
3. paperclips or small envelopes
4. baking soda
5. water
6. measuring cup
7. red cabbage
8. pot
9. grater
10. jar or test tubes or paper cups

B. During class

1. *Distribution Record Sheet* and *Data Analysis Questions*
2. strips of paper
3. pen or pencil
4. indicator solution (cabbage juice)

Methods

1. Discuss the concept of epidemiology and how epidemiologists track the spread of disease.
2. Invite the students to think of questions they need to answer in order to identify the source of an unknown infectious disease.
3. Explain the purpose of the Center for Disease Control and Prevention and local public health agencies and their efforts to determine how diseases spread.
4. Tell the students that they will be receiving five strips of paper that represent an unknown pathogen (germ) that can be passed from person to person through methods such as touch or the exchange of bodily fluids.
5. Distribute the *Distribution Record Sheet*, *Data Analysis Questions*, and the strips of paper.
6. Instruct the students to write their initials or names on each of their five strips.
7. Begin the simulation by telling students to trade one strip with another student. On their *Distribution Record Sheet*, they should write down who they traded with, the name on the strip they gave away and the name of the strip they received.
8. **On the first trade, they have to give away one of their own strips.**



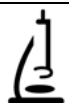
9. **On the following trades, they can give away any of the strips they have (their own or that of someone who has traded with them before), but give away only ONE strip per trade.**
10. As the teacher you decide how many trades or how long you want the trading to continue. There is enough space for eight trades on the *Distribution Record Sheet*, but you can have them trade as few as five times.
11. Once all trading has stopped, ask them to use the indicator solution (red cabbage juice to see who is holding the “infected” strips. **They should dip each strip one at a time because the color may bleed onto another strip. If the strip turns GREEN, it is one of the infected strips (i.e., it has been soaked in baking soda solution).**
12. Using their *Distribution Record Sheet* as a "clues map," students should be able to determine who the first person infected was, and the path of transmission of the mysterious microbe..

Safety Precautions

Do not use glass tubes as containers to distribute the indicator solution.

Assessment

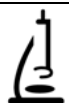
Have the students answer the questions in the data analysis in small groups and report back to the larger group about their conclusions.



Supplementary Information

Tips / Suggestions:

If the students have access to computers, they can play the MedMyst web adventure on cholera that employs some of the same type of epidemiological techniques. See <http://medmyst.rice.edu>.



Appendix

1. Extension Activities

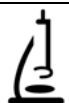
- *Health*: Determine what characteristics can increase the likelihood of contracting an infectious disease.
- *Health*: Discuss what environmental factors can affect the spread of an infectious disease.
- *Language Arts*: Interview a scientist or physician working in the field of epidemiology. Ask them questions about the diseases they study, what they do at work, and what infectious diseases concern them.
- *Mathematics*: Calculate the morbidity rate of the epidemic in the class by dividing the number of cases of the disease (assuming it was fatal) by the total number of students (population at risk).

2. Useful Books

- Hoff, B.H. and Smith, C., III (2000) Mapping Epidemics: A Historical Atlas of Disease. New York: Franklin Watts.
- Stephen, B.H., et al. (2001) Designing Clinical Research: An Epidemiologic Approach. New York: Lippincott Williams & Wilkins Publishers.
- National Research Council (1996) National Science Education Standards. Washington, DC: National Academy Press.

3. Useful Web sites

- Epidemiology Lessons for Middle and High School Students
<http://www.montclair.edu/detectives/index.shtml>
- Critical Thinking
<http://www.criticalthinking.com/>
- Historical Infectious Diseases
<http://www.rlc.dcccd.edu/MATHSCI/reynolds/history/history.htm/>
- History of Epidemics and Plagues
<http://uhavax.hartford.edu/BUGL/histepi.htm/>
- CDC-Teaching Material
<http://www.cdc.gov/excite/index.htm>



Student Handouts

Outbreak! Investigating Epidemics

Student Name: _____

Introduction

The study of how an infectious disease spreads through a population can ultimately lead to the prevention of the disease. An outbreak is about to occur in your classroom. See if you can help in this search for the source of contamination.

Terms and Definitions

Epidemiology - It is the scientific method of problem solving used by "disease detectives" to get to the root of a health problem in the community.

Epidemic - An epidemic occurs when there are more cases of a particular disease than expected in a given area, or among a specific group of people, over a particular period of time.

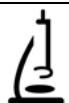
Outbreak - Many epidemiologists use the term outbreak interchangeably with epidemic. Some restrict the use of epidemic when a large geographic area is affected.

Vaccination - The process of giving a vaccine.

Vaccine - A vaccine is a substance that prevents a specific disease.

Quarantine - To restrict the activities or movement of people who may have been exposed to a contagious disease in order to prevent spread.

Hypothesis - A tentative explanation for an observation, phenomenon, or scientific problem that can be tested by further investigation.



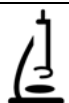
Activity

Materials Checklist

1. *Distribution Record Sheet* and *Data Analysis Questions*
2. Strips of filter paper
3. Pen or pencil
4. Indicator solution

Procedure

1. Pick up the *Distribution Record Sheet* and *Data Analysis Questions* and a group of 5 paper strips.
2. Write your name or initials on each strip.
3. When the teacher says trading begins, trade one of your strips with another student. Write down whom you traded with, the name on the strip you gave away, and the name on the strip you received on the *Distribution Record Sheet*.
4. **On the first trade, you have to give away one of YOUR strips (one strip per trade).**
5. **On the following trades, you can give away any of the strips that you have (a strip with your name or someone else's who has traded with you).**
6. Your teacher will tell you when the trading period will begin and end.
7. At the conclusion of trading, you will have to place each strip ONE at a TIME in the indicator solution.
8. If one of your strips turns GREEN, it indicates that you have now contracted an infectious disease. The name on the strip is the original source of the infection.
9. Using your *Distribution Record Sheet* figure out the path of transmission.
10. Answer the *Data Analysis Questions* as indicated by your teacher.



Outbreak! Investigating Epidemics

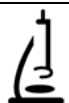
Student Handout

Name: _____

Distribution Record Sheet

Exchange Number	Name of person you exchanged with	Name on strip of paper you <u>received</u>	Name on strip of paper you <u>gave away</u>
1			
2			
3			
4			
5			
6			
7			
8			

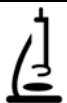
List below the names on the strips of paper that you ended up with after your final trade.



Outbreak! Investigating Epidemics Student Handout

Data Analysis

1. Who was the original source of the epidemic?
2. How did you get infected? (Who gave you the infectious disease?)
3. Were some people exposed to the infectious disease (microbe) but not infected?
4. How many people in the class were exposed to the microbe?
5. What factors might have increased the chance of exposure to the microbe?
6. It was possible to trade with the infected person but not get the disease. How do you think this relates to real life?
7. What do you think would happen if two people were the original source? What about ten people?
8. What factors affect the amount of exposure to a microbe in real life? Hint--- Does washing your hands affect your exposure? What other things may affect exposure?





M.D.A. Lesson Evaluation

American Society for Microbiology
1752 N. Street N.W.
Washington, D.C. 20036

Lesson Title:

Grade Level:

Course Title:

Teacher's Name:

Number of Students:

School District and Address:

Preparation

Yes

No

Notes:

Are the set-up procedures too complex for the purpose of the lesson?

Were the materials easy to acquire?

Did you have all applicable materials and equipment in your lab?

How much time did the lesson take to set up?

In class time?

Out of class time?

Lesson Design

Exceptional

Good

Poor

Unsatisfactory

Please rate the introductory activities.

Please rate the lesson/project

Please rate the experiment, in regards to student interest.

Handouts

Exceptional

Good

Poor

Unsatisfactory

Please rate the effectiveness of the teacher handout?

Please rate the effectiveness of the student handout?



M.D.A. Lesson Evaluation

American Society for Microbiology
1752 N. Street N.W.
Washington, D.C. 20036

Assessment

Can this lesson can be accomplished in the amount of time indicated by the author?

Yes

No

If no, how much time did the lesson take?

Are you planning any follow up activities?

If so, what assessments or reviews will you be using? (tests, essay, discussion, etc.)

How were the national science standards addressed in this lesson?

General

Was this lesson effective in conveying a particular concept/activity?

Yes

No

Would you teach this lesson again in future years?

Would you recommend this lesson to a friend?

How would you change this lesson if you were to teach it again?

Podcast

Was the podcast appropriate for the intended audience?

Yes

No

Was the podcast clearly linked to the lesson objectives?

Was the lesson enhanced by the use of the podcast?

Notes: