



Pandemic

Middle Level Lesson Plan

Topic Infectious diseases

Grade Levels 7-8

Overview

Today we live in a world that has outstanding health-care facilities, a wide array of medicines and treatment options, sanitary living conditions, safer food storage and handling, and health agencies monitoring illnesses. However, despite having greater services, knowledge, and prevention strategies, humans continue to spread many infectious diseases today. Why are humans vulnerable to widespread outbreaks of infectious diseases? What factors, in addition to the human body's ability to handle infectious diseases, play into the situation?

This episode of *QUEST* revisits the 1918 influenza pandemic, which plagued all parts of the United States, including Maine, New Hampshire, and Vermont. In the video, several key questions are explored: Do conditions today mirror those in 1918? Are there new factors that could contribute to an epidemic? What current prevention strategies might help prevent such a devastating event from recurring?

Introduction

The focus of this teaching unit is to broaden students' understanding of infectious diseases – what they are, what causes them, how they are spread, and what can be done to prevent widespread transmission of these communicable diseases. Students will participate in a simulated outbreak and will also study the events of a historic epidemic that occurred locally. Given what they have learned, students will then be asked to predict whether such a widespread transmission of an infectious disease could happen today.

At the end of this teaching unit, students will be able to:

- Describe an epidemic.
- Compare and contrast the conditions present during the 1918 influenza outbreak with conditions present today.
- Describe in general the characteristics of infectious diseases.
- Name several infectious diseases, describe their causes, and describe their effects on the human body.
- Describe the transmission of infectious diseases.
- Identify prevention strategies for infectious diseases.

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Time Allotment Six to seven 45-minute class periods.

Accessing Prior Knowledge

By the time students reach middle school, they should know that the human body has numerous defense mechanisms -- such as tears, saliva, skin, and white blood cells – to ward off potential microbial threats to its well-being. Many students will be aware of common illness prevention strategies such as regular hand washing, avoiding sick people, handling food safely, getting regular checkups, eating healthy foods, and getting enough sleep and exercise. In addition, many students will have experienced illnesses like chicken pox and will recognize that there are some diseases that humans can get only once. Students will also know, from firsthand experience, that some diseases can be prevented by receiving a vaccination.

Concepts to Clarify

Students should know that germs exist; they are generally introduced to this concept at a very young age. However, students may not have a deep understanding that each infectious disease is caused by a specific microorganism. They may have difficulty perceiving differences among the types of illness presented in this *QUEST* episode because of a tendency to lump infectious diseases with all types of human disorders. It is important that students understand the concept of an infectious disease so that they can develop an understanding of the unique health risks associated with communicable diseases.

Studies have shown that students often view “health” and “illness” as two distinct categories, rather than viewing them as conditions on the same continuum. Moreover, students often believe that germs and medicine cause instantaneous changes in the body. Research also indicates that while students often have the vocabulary for many aspects of health-related issues (especially those covered heavily by the media), they do not understand the related science.

Historically, it has been very difficult for scientists to isolate and determine the causes of various diseases. Even when specific microbes have been identified, it is often difficult to find effective treatments. This is due to a number of reasons, including (1) the type of microbe (virus vs. bacteria) and (2) the rapid evolution of microbial life because of most microbes’ short life spans. While these ideas may be difficult for middle school students to grasp, it is important for them to recognize that prevention strategies are being monitored and improved upon continually and are generally in a state of flux.

A great deal of “folklore” exists about how people get particular illnesses. Some of these beliefs can be hard to debunk (e.g., people catch colds by getting wet). Point out to students the flaws behind these myths to correct any misconceptions. (The wet didn’t cause the cold, but a person’s immune system can be stressed by the elements and may not be able to combat infection as effectively, thus becoming more susceptible to illness.)



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CONNECTIONS TO THE STANDARDS

National Science Education Standards	Benchmarks for Science Literacy	Maine Learning Results	New Hampshire Curriculum Framework	Vermont Learning Standards
<p>Science in Personal and Social Perspectives (5-8)</p> <p>Personal Health</p> <p>2. The potential for accidents and the existence of hazards imposes the need for injury prevention. Safe living involves the development and use of safety precautions and the recognition of risk in personal decisions. Injury prevention has personal and social dimensions.</p> <p>Life Science (5-8)</p> <p>Structure and Function in Living Systems</p> <p>6. Disease is a breakdown in structures or functions of an organism. Some diseases are the result of intrinsic failures of the system. Others are the result of damage by infection by other organisms.</p> <p>3. Behavior is one kind of response an organism can make to an internal or</p>	<p>Chapter 6E: Physical Health (6-8)</p> <p>3. Viruses, bacteria, fungi, and parasites may infect the human body and interfere with normal body functions. A person may catch cold many times because there are many varieties of cold viruses that cause similar symptoms.</p>	<p>C. Cells (5-8)</p> <p>- Identify the causes and effects of diseases, explaining their transmission, and identify prevention strategies.</p> <p>Health and Physical Education (5-8)</p> <p>A. Health Concepts:</p> <p>- Explain the relationship between healthy practices and prevention of injury, illness, and disease.</p>	<p>Life Science</p> <p>3d. Curriculum Standard 6 (Grade 6)</p> <p>- Explain how the human body remains healthy and fights off disease, i.e., the immune system, the influence of diet, food and exercise, the influence of microorganisms (bacteria, viruses, protista).</p> <p>Curriculum Standard 7: (Grade 10)</p> <p>- Describe the use of technology in the prevention, diagnosis, and treatment of disease, e.g., sanitation, medicines, organ transplants, adequate food and water supplies.</p>	<p>The Human Body (5-8)</p> <p>7.14.bb: Demonstrate an understanding of the human body systems for obtaining and providing energy, defense, reproduction, hormones, immunity, and coordination of physical functions.</p> <p>Healthy Choices (5-8)</p> <p>3.5.aa: Describe how lifestyle, pathogens, family history, and other risk factors are related to the cause or prevention of disease, injuries, pregnancy, and other health issues.</p>



CONNECTIONS TO THE STANDARDS Continued

<p>environmental stimulus. A behavioral response requires coordination and communication at many levels, including cells, organ systems, and whole organisms. Behavioral response is a set of actions determined in part by heredity and in part from experience.</p>				
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Materials Needed

- TV with VCR
- QUEST *Pandemic* video
- Computers with Internet access for student or teacher use (to download articles)
- Chart paper and markers
- Graph paper
- Calculator (optional)
- Activity 3 simulation materials:
 - permanent marker
 - 1 dropper bottle of dilute ammonia solution
 - 1 dropper bottle containing phenolphthalein solution*
 - 1 gallon of distilled water
 - small clear cups (1 per student)
 - safety goggles (*see recipe in body of Activity 3)
- 1 copy per student of each of the following reproducible handouts:
 - Student Handout 1: Agents of Infectious Disease
 - Student Handout 2: Viewer’s Guide – Examining Conditions
 - Student Handout 3: QUEST at Home: A Problem of Epidemic Proportions!

I. Introducing the Concepts

The purpose of the first activity is to find out what students already know about infectious diseases and about their role in disease epidemics. After sharing their current knowledge about common “childhood” infectious diseases, students will engage in some preliminary research to develop a working definition of infectious disease. At the close of the activity, students will be asked to consider what factors turn a childhood disease into an epidemic. They will further be asked to consider whether these conditions are in place today.

Activity I: What Are Infectious Diseases?

Step 1

Note: Before eliciting student responses, you may wish to define and clarify the concept of childhood disease as referring to “once in a lifetime” illnesses like chicken pox – once you’ve had this kind of illness, you can’t get it again. These diseases do not include illnesses or other medical issues like colds, flu, or injuries.

Begin by asking students if they have ever had “a childhood disease” or have ever heard of anyone in their family or neighborhood having a “childhood disease.” As students offer answers, record the types of illnesses on the board or on chart paper. As students conclude their contributions, ask them to name other childhood diseases that they may have heard of, perhaps from literature or history. Add these to the list.

Step 2

Ask students to think about how the illnesses on this list are similar – what do they have in common? You will already have elicited the idea that you can only get them once, but students may also suggest that the list contains illnesses that you can receive vaccinations for, that typically older people (grandparents or great-grandparents) had experienced when they were younger, etc. It may be helpful to have student volunteers share any details about particular illnesses that they know about to help generate ideas.

Step 3

Explain to students that this list contains illnesses that scientists call infectious diseases. (The list will likely include: pertussis (whooping cough), measles, hepatitis B, chicken pox, measles, mumps, rubella, diphtheria, and smallpox. If the list is incomplete, you may wish to add to it now.)

Step 4

Option I – If your students have Internet access:

Explain to students that they are going to use the following Web site:

http://www.health.state.ny.us/nysdoh/communicable_diseases/en/index.htm. It contains “fact sheets” about the specific infectious diseases on your classroom master list. (**Note:** Before students begin exploring this



site, explain that they will use the information they find to create a class “definition” for the term infectious disease.) Now direct students to read the fact sheets of two to four different infectious diseases and then discuss what they have read with a partner:

Option 2 – If your students do not have Internet access:

Follow the basic procedure described above, but use printouts of the fact sheets that you have downloaded in advance from the Web site, as well as any other available reference materials you can find. (Many pediatricians’ offices or your school nurse may have pamphlets about childhood diseases that would be suitable.) Be certain that the information you select indicates whether the disease is caused by a virus or bacterium and describes disease transmission. Also be careful to select fact sheets that give information about the disease in a clear, concise, easy-to-read style.

Step 5

Reconvene as a large group. Elicit ideas from students to create a class definition for the term infectious disease. A suitable definition should include the idea that infectious diseases are caused by a particular virus or bacterium and that they are passed from person to person or organism to organism.

Step 6

Close the lesson by asking students if they have heard of other infectious diseases that may not already be on the master list. Add appropriate diseases to the list as they are mentioned (e.g., AIDS, rabies, Lyme disease, West Nile virus, SARS, or Mad Cow disease). Ask students why they think they have heard about these diseases. Be sure to elicit the point that the general public knows about these diseases because they are widespread and have affected an unexpectedly high number of individuals. (Students may suggest the term epidemic at some point during this discussion.) Explain to the class that they will be learning more about infectious diseases in the next few lessons – how they are spread, what causes them, and what we can do to prevent them.

2. Exploring the Concepts

In the next activity, students will use a worksheet and the Internet (or other available resources) to learn about the general differences between viruses and bacteria – how they reproduce, how they infect, how infected people are treated, how infection can be prevented, and the conditions that favor their growth.

Activity 2: Viruses and Bacteria

Step 1

Prior to the start of this activity, prepare a piece of chart paper by labeling it with the words *Questions for Further Study*. This will be used for the close of the activity.



Step 2

Remind students that one reason why infectious diseases are spread easily from one person to another (or from one organism to another) is in part because they are caused by a certain type of tiny microorganism – a virus or a bacterium – that people usually do not realize is present. Explain to students that they will use a variety of Web resources (or, if your class does not have Internet access, a variety of appropriate reference materials) to investigate the similarities and differences between these two disease-causing agents.

Step 3

Distribute copies of Student Handout 1: Agents of Infectious Disease. Explain that students are to use the handout to guide them as they explore the recommended Web sites (or other appropriate reference materials) to find out more information about viruses and bacteria. Mention to students that they may find it helpful to include sketches of certain viruses and bacteria in the margins of their handouts.

Step 4

Circulate among the students as they work, offering assistance as needed.

Step 5

Have students first share their findings in small groups of three to four, then as a whole class. If discrepancies arise and cannot be resolved, make a note of these on the chart paper labeled Questions for Future Study. Write up any other questions students have or wish to investigate further about viruses, bacteria, or infectious diseases in general.

Step 6

To close the activity, get students thinking about the possibility of widespread outbreaks of infectious diseases. Ask if they have ever heard of widespread outbreaks of the types of infectious diseases they have been learning about – either recently or in the past, in our country or in other countries. Have students think about how such widespread outbreaks occur. You may wish to relate these events to smaller-scale experiences that are probably more familiar to students – for example, perhaps a student's entire family has "taken turns" coming down with a cold or the flu.

Ask students to think about what preventative measures they personally take to avoid such illnesses. Then, in contrast, ask what preventative measures society takes. The idea is to get students to begin thinking about epidemics and their related conditions.

3. Developing the Concepts

In the following activity, students will experience an "epidemic" by participating in a disease transmission simulation. They will analyze the transmission of an infectious disease through a "population" and work backwards to determine the source of the infectious disease. Students will then use this information to predict the further spread of the disease.

Activity 3: Epidemic Simulation

Step 1

Before beginning the activity, use a permanent marker to number enough clear plastic cups so that each student will have one. Fill each cup about one quarter full of distilled water. Place 1 to 2 drops of the phenolphthalein solution* in one of the numbered cups; this will be the “contaminated” cup. Remember the number of this cup, because its owner will be the “source” of the disease in this simulation. (You may wish to preselect a trustworthy, cooperative, self-confident student and explain to this person that he or she will be role-playing the “source” of the infectious disease.)

Note: You can buy premade phenolphthalein solution or make your own using an over-the-counter laxative containing phenolphthalein (such as Feenamint). Crush 1 tablet of the laxative with a spoon and mix with 1-2 spoonfuls of rubbing alcohol. Stir until the tablet dissolves.

Step 2

Introduce the activity by explaining that today the class will be participating in an exercise that models how an infectious disease can be transmitted from person to person without individuals even knowing it. Remind students that this is a simulation – a way to show the transmission of disease – which means that some parts of the simulation may not accurately represent what would actually happen in “real world” situations.

Step 3

Begin the scenario by telling students that one person in the room has recently returned from a world-class ski resort in the western United States, where he or she has enjoyed some of the most spectacular skiing! Unfortunately, this person has also unknowingly been exposed to the measles. At this point, ask students what they think might happen if someone in the class was exposed to the measles.

Step 4

Explain to students that they will each be receiving a cup containing a clear liquid. Go over your safety expectations with students. Remind them that because they will be handling an “unknown” liquid, they should wear safety goggles, and they should not smell or taste the liquid. Caution them to be extremely careful when handling their cups.

Step 5

Inform students that the liquid in each cup represents a person. Again, remind them to use caution around the unknown substance and to wear safety goggles during the activity. Now give each student one numbered cup. Make a master list (either on the board or on chart paper) of each student’s name and cup number.

Step 6

Instruct students to “interact” with their classmates by exchanging the contents of their cups with three other people in the room.



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Note: Be certain that students fully exchange the contents of their cups by dumping all of the liquid from one cup into another person's cup, then dividing the mixed liquid equally between the two cups.

Step 7

Now direct each student to name, in order, all of the people with whom he or she has just interacted. Direct students to use the master list of students and cup numbers to help them list their interactions correctly.

Step 8

Explain to students that you have a test solution that will indicate which “people” (cups) have been exposed to the measles. Place 1 to 2 drops of the ammonia solution in each of the numbered cups. If any solution turns pink, the test is positive (meaning they “have” the measles); if it remains clear, the test is negative (unaffected).

Step 9

After all solution samples have been tested, refer the class to the master list of student names/cup numbers. Circle all cup numbers on the list that represent samples that tested positive.

Discuss the outcome of the simulation with the class. Ask the following questions:

- Are these the results you expected?
- Why or why not?

Challenge students (perhaps in small groups) to figure out the originator of the disease by working backwards.

Step 10

Process the results of the activity with the class. Remind students that this has been a simulation. Ask whether they think it was a realistic one, and have them defend their opinions. Students may recall information they have learned already about measles in particular (e.g., it can be prevented by receiving proper vaccinations) or about the spread of infectious diseases in general. Ask students if they think this particular outbreak would qualify as an “epidemic.” Encourage them to research this idea further.

Step 11

Ask students to imagine what would happen if this simulation were carried out beyond the walls of their classroom to the rest of the school and community. Ask:

- What do you think would happen?
- Who would be infected first? Why?

Again, the idea is to get students thinking about the vast number of factors that contribute to wide-spread outbreaks of disease.

(**Note:** Another option is to alter the scenario described above using an actual CDC case or historic episode. See the Resources section for ideas about more in-depth infectious disease transmission scenarios.)



4. Synthesizing and Applying the Concepts

Students will now view the QUEST *Pandemic* video. Using a viewer's guide, they will examine the conditions that were present in the 1918 influenza epidemic and compare them to the conditions that exist worldwide and locally today. Students will use information from the video and from the previous activities to create a "public briefing" predicting the next potential epidemic.

Activity 4: QUEST: Pandemic Video

Step 1

Distribute copies of Student Handout 2: Viewer's Guide – Examining Conditions. Give students a few minutes to familiarize themselves with the handout. Explain that the purpose of this viewer's guide is to help them focus on certain aspects of the video – mainly the conditions that existed at the time of the flu epidemic of 1918. Inform students that after the video, they will be pulling together their knowledge of conditions gained from the video with their prior knowledge of viruses and bacteria, transmission, and prevention to become "infectious disease detectives."

Step 2

Play the video. This may require two class periods, depending on the structure of your schedule. You may wish to pause periodically so that students have time to jot down some notes.

Step 3

Assemble students in groups of three or four. Distribute copies of Handout 3: Predicting Pandemics. Explain that each group will use all of the information they have gathered thus far in the teaching unit, including their notes from the video, to consider as a group the following issues:

- Do any of the conditions that were present in 1918 and that fueled the flu epidemic exist today? If so, list them.
- Could these conditions fuel another epidemic? If yes, explain how. If not, explain how things are different.
- Using your knowledge of infectious diseases (types, reproduction strategies, transmission, and prevention methods), predict what type of infectious disease is most likely to threaten people in Maine, New Hampshire, or Vermont.
- Use the Internet or other available resources to learn about specific infectious diseases that are considered especially threatening to people today – worldwide, in the United States, and in our particular state (or region).
- What additional factors do epidemiologists consider when attempting to predict (and prepare for) widespread outbreaks of infectious diseases?

- Come to a consensus on what your group perceives as the biggest infectious disease threat to your state. Prepare a short (two- to three- paragraph) “briefing,” supported by facts, that informs your classmates about this infectious disease. Be sure to include the following in your briefing:
 - the name of the disease
 - the type of disease (bacterial or viral)
 - its mode of transmission,
 - prevention strategies
 - current “status” in your state

- Be certain to link your predictions to the knowledge you have gained about the conditions necessary for rapid transmission of disease.

Step 4

Have student groups take turns presenting their work. Encourage the class to ask questions. As a follow-up, lead a whole-class discussion about what measures are in place to help society cope with widespread outbreaks of disease. What can be done – both individually and by society at large – to avoid epidemics?

Step 5

Revisit the Questions for Further Study list that was generated in Activity 2. Answer any questions that remain unanswered at this point.

Step 6 (Optional)

Distribute copies of the NASA article “Outbreak Alerts from Space.” (This can be downloaded prior to class at http://science.nasa.gov/headlines/y2004/112mar_disease.htm?list970308.)

Read and discuss this article with students.

As another optional follow-up activity, arrange for a state or local epidemiologist or microbiologist to visit the classroom. Share your students’ infectious disease predictions with this professional. In addition to commenting about the students’ predictions, the guest might speak about other issues associated with infectious diseases – such as laws, prevention methods, changing and current conditions, etc. The guest might even be able to share images or prepared microscope slides of microbes that are responsible for causing infectious diseases.

5. Extending the Concepts

In this take-home activity, students will examine microbe reproduction through a mathematical exercise. They will gain an understanding of why microbes that are associated with infectious diseases can become highly prevalent in a very short time. They will also be introduced to the concept of “super germs.”



Activity 5: QUEST at Home: A Problem of Epidemic Proportions

Step 1

Distribute one copy of *QUEST* at Home and some graph paper to each student. Review the directions on the handout with the class. (**Note:** Since numbers will increase rapidly as students perform the math required by this assignment, allow them to use calculators – preferably calculators with exponent capabilities. If students have not yet studied exponential numbers, this activity offers a good demonstration of when, why, and how exponents are used in the “real world.”) Assign due date.

Safety Warning: Point out to students that this activity simulates culturing bacteria. Remind them that real bacterial cultures should only be done in a laboratory setting with the proper equipment and using proper techniques. Stress that it is never a good idea to expose oneself to “unknown” strains of microbes. Many individuals can have severe, even life-threatening, reactions to these unknowns.

Step 2

Have students share their findings with classmates and, if possible, with parents. If the issue does not arise spontaneously, be sure to point out that one of the simplest, most effective ways to avoid contracting an infectious disease is by frequent and thorough hand washing and by keeping one’s hands away from the mouth!

Community Connections

Agencies like the Centers for Disease Control (CDC) and World Health Organization (WHO) monitor and provide public information regarding the status of a number of infectious diseases. Encourage students to find out about state and local public health organizations in your area. What are their roles and responsibilities?

Government Agencies

Maine

Infectious Disease Epidemiology Program

<http://www.maine.gov/dhs/boh/ddc/Infectious.htm>

Bureau of Public Health

<http://www.state.me.us/dhs/boh>

New Hampshire

Department of Health and Human Services

<http://www.dhhs.state.nh.us/DHHS/BCDCS/default.htm>

Vermont

Vermont Department of Health – Agency of Human Services

<http://www.healthyvermonters.info>



Career Opportunities

Discuss some of the following related career categories with students. If possible, invite one or more of these professionals to come to school and speak with the class about their jobs and what they entail.

Microbiologist: The field of microbiology offers a number of possibilities. Some microbiologists study the outbreak of diseases, other monitor food borne microbes, while others specialize in a particular viruses, bacteria, or protist. A good place to learn more about microbiologists' work is

http://www.microbe.org/careers/what_do.asp

Pharmaceutical careers: The pharmaceutical industry offers several related careers, including sales, research and development, and marketing. Have students investigate the many steps and people involved in producing a particular drug.

Medical careers: Several medical professions are related to infectious disease. From epidemiologists studying the progression of disease to internists, pediatricians, health care officials, and public health workers, all of these careers play a significant role in public health issues related to pandemics.



Resources

Infectious Disease “Fact Sheets” and Other Related Resources

This site includes an alphabetical listing of communicable diseases; text was written for the general public.

http://www.health.state.ny.us/nysdoh/communicable_diseases/en/index.htm

This is the Centers for Disease Control and Prevention’s (CDC’s) infectious disease and condition A-Z index.

<http://www.cdc.gov/ncidod/diseases/index.htm>

This site was developed to support the San Diego Natural History Museum’s exhibit Epidemic! The Natural History of Disease. It is an excellent source of teacher background material; it also contains a “just for kids” section, resources, and the natural history of disease.

<http://www.sdnhm.org/exhibits/epidemic>

Infectious Disease Transmission Scenarios

Outbreak! An Events-Based Science Module by Russell G. Wright, Dale Seymour Publications, 1999

In this teaching module, students play the roles of citizens who are trying to determine the cause of an unknown disease spreading through the area. Students are initially “hooked” into the unit by watching media footage of the 1995 Ebola outbreak in Zaire. This hands-on, interactive unit is well suited for middle-school students.

This lesson was originally published in the November/December 2003 issue of NSTA’s Science Scope. Based on an actual CDC case, it simulates the transmission of a food-borne illness. In the scenario, some students take the role of “investigator,” while others take the role of “victim.” Interviews are conducted and a variety of evidence is considered, such as what the victims ate, where and when they traveled, when they got ill, and with whom they have come in contact.

<http://science.nsta.org/enewsletter/2003-11/ss.pdf>

Developed by NIH (National Institutes of Health), this lesson is part of a comprehensive curriculum called Emerging and Reemerging Infectious Diseases. Students become involved in a simulated measles outbreak at a high school. They track transmission patterns by graphing and try to explain why some individuals get the measles and some do not. The simulation is designed to be conducted twice to show the role vaccines play in preventing rapid transmission of infectious disease.

<http://science.education.nih.gov/supplements/nih1/diseases/guide/activity4-1.htm>

This lesson, developed by a middle-school teacher, engages students in the historical epidemic known as the Black Plague. This interdisciplinary, hands-on journey allows students take the role of an early European traveler. As they make stops along the way, they map the spread of the disease.

http://www.mcn.org/ed/curl/cw/Plague/Plague_Sim.html



This site offers an example of an Official CDC Health Update.

<http://www.premierinc.com/all/safety/public-health/downloads/CDC-update-measles-08-02-04.pdf>

Information on Typhoid Mary can be found at both of these sites.

<http://history1900s.about.com/library/weekly/aa062900a.htm>

<http://www.straightdope.com/mailbag/mtyphoidmary.html>

Information Specific to Influenza

This supporting site for the PBS American Experience documentary Influenza 1918 has a “people and events” section including a letter from doctor at Camp Devens, Massachusetts, information about Victor Vaughan, an epidemic time line, maps, and other support materials related to that historic epidemic.

<http://www.pbs.org/wgbh/amex/influenza>

This is an excellent source of teacher background information about the influenza outbreak of 1918. The site includes historical pieces as well as graphs and a map of the outbreak. Portions of this site may be useful and of interest to middle-school students.

<http://www.stanford.edu/group/virus/uda>

Disease Outbreak News and Organizations that Monitor Infectious Diseases

Part of the Centers for Disease Control's site, this contains information on the flu, including updated maps of current outbreaks, information specific to the flu in the United States, and general information. This site is regularly updated throughout the flu season.

<http://www.cdc.gov/flu>

This World Health Organization site contains a wealth of information about infectious diseases found worldwide.

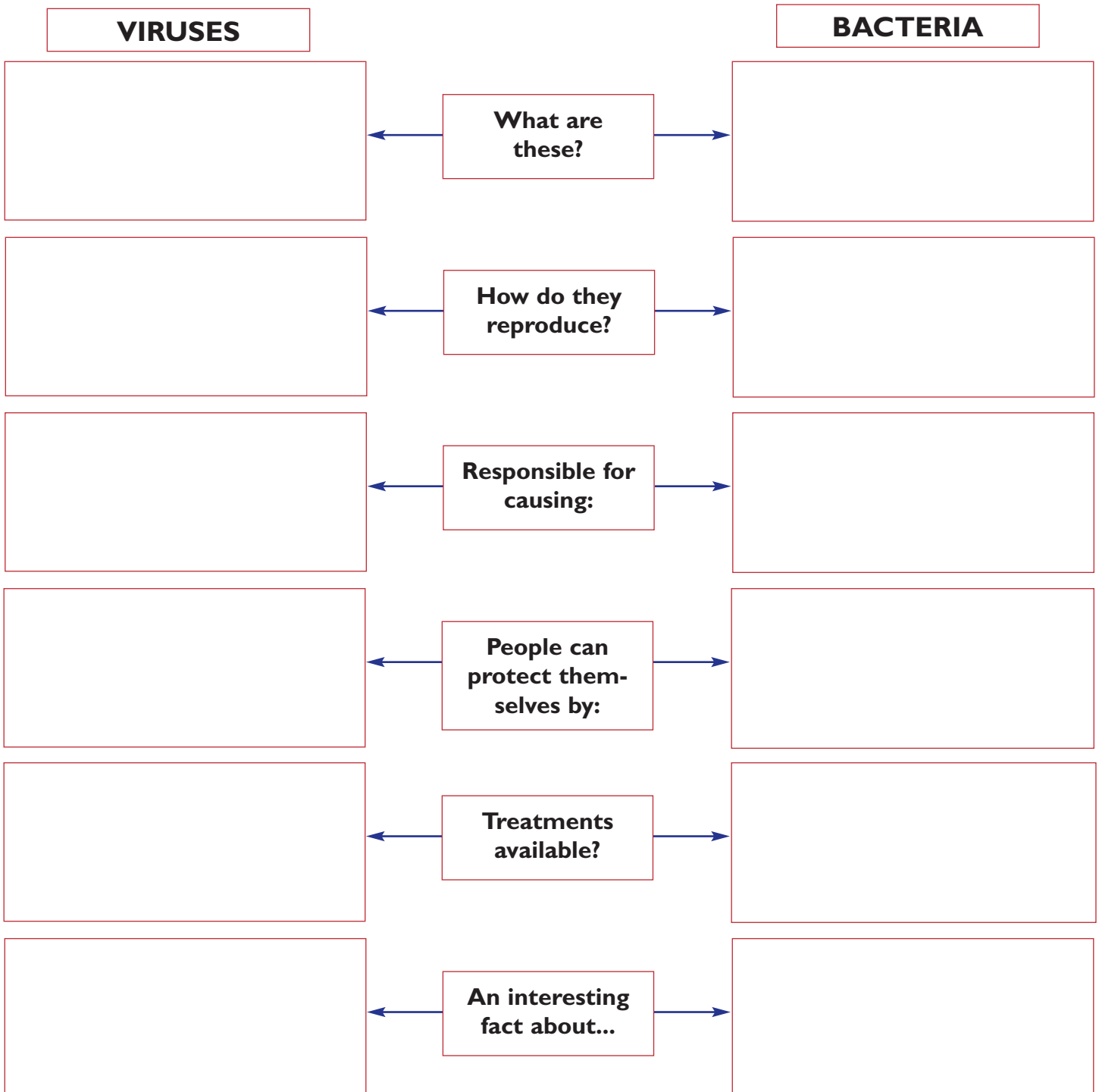
<http://www.who.org/aboutwho.en/disease-er.htm>

This is the official site of the United Health Foundation.

<http://www.unitedhealthfoundation.org/shr2003/components/infectdisease.html>

Agents of Infectious Disease

Directions: Investigate the similarities and differences between viruses and bacteria – both disease-causing agents. Use the Web sites listed below or other reference materials provided by your teacher.





Internet Resources on Viruses and Bacteria

This site offers basic information about both viruses and bacteria and their roles in human diseases.

<http://www.niaid.nih.gov/publications/microbes.htm#a>

The Body Basics Library at this site contains solid information about microbes that cause problems for the human body.

http://www.kidshealth.org/teen/your_body/health_basics/care_about_germs.html

This site describes the differences between bacteria and viruses.

<http://vanderbiltowc.wellspring.com/dh/Content.asp?ID=511>

This site was developed by eighth-graders to explain replication of viruses and characteristics of viruses.

<http://www.mansfieldct.org/schools/mms/staff/hand/Bactvsvir.htm>

Information on bacteria can be found here.

<http://www.microbe.org/microbes/bacterium1.asp>

Information on viruses can be found here.

<http://www.microbe.org/microbes/virus1.asp>

This site is primarily useful for its good pictures of viruses; the text is overly complicated. It may be most helpful to navigate the site using the left-hand bar to locate each virus by name.

http://www.tulane.edu/~dmsander/Big_Virology/BVHomePage.html



Viewer's Guide: Examining Conditions

Directions: Use the chart below to compare conditions present during the influenza pandemic of 1918 to the conditions present worldwide and locally today.

Influenza Pandemic of 1918	Today
Example: Limited, slower, global travel	Example: Rapid travel



Predicting Pandemics

1. Do any of the conditions that were present in 1918 and that fueled the flu epidemic exist today? If so, list them. _____

2. Could these conditions fuel another epidemic? If yes, explain how. If not, explain how things are different. _____

3. Using your knowledge of infectious diseases (types, reproduction strategies, transmission, and prevention methods), predict what type of infectious disease is most likely to threaten people in Maine, New Hampshire, or Vermont. _____

4. Use the Internet or other available resources to learn about specific infectious diseases that are considered especially threatening to people today – worldwide, in the United States, and in our particular state (or region). _____

5. What additional factors do epidemiologists consider when attempting to predict (and prepare for) wide-spread outbreaks of infectious diseases? _____



A Problem of Epidemic Proportions!

You're on a Quest!

Imagine that you wanted to witness a live bacterium's ability to reproduce rapidly. You would put the bacterium in a test tube, add the proper food and nutrients, and provide it with the perfect temperature. Under these optimum conditions, bacteria reproduce about every 20 minutes. Bacteria reproduce by doubling, so after 20 minutes, 1 bacterium would be 2; after 40 minutes, 2 bacteria would be 4, and so on. Assuming that you start with one bacterium, how many bacteria would you have after 1 day (24 hours)?

1. Use a separate sheet of paper to create and extend the following data table:

- a. How many bacteria exist after the first hour? _____
- b. How many bacteria exist after three hours? _____
- c. How many bacteria exist after 24 hours? _____

Time	Bacteria
0	1
20 min	2
40 min	3
60 min	4

d. Do you think this type of bacterial growth would actually happen in the test tube? Explain why.

2. On a separate sheet of graph paper, make a line graph that contains the bacterial data for the first three hours of growth.

- a. What is the shape of the line in your graph? _____
Does it seem to represent accurately the pattern of growth you would expect if you added the rest of the data to your graph? Explain. _____

3. Each entry in the data table represents one generation for bacteria. Explain how the data table and graph would look if you were using humans instead of bacteria. Why? _____

4. A growing concern in the health community is the emergence of “super germs” – microbes that can no longer be managed using traditional antibiotic treatments (such as penicillin) or antibacterial disinfectant-type household cleaners. Use the Internet, or other available resources, to find out about “super germs.”

a. Why is this resistance happening? _____

b. How is it related to the rapid reproductive rates of microbes that you have just explored? _____

c. Imagine that you are a health-care professional or an epidemiologist. What course of action would you take when dealing with the public on the “super germ” issue? How could this be beneficial? _____

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