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the science of MICROBES

Post-assessment Activity: And Now, What Do You Know About Microbes?

from *The Science of Microbes Teacher's Guide*

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RESOURCES

Free, online presentations of each activity, downloadable activities in PDF format, and annotated slide sets for classroom use are available at www.bioedonline.org/ or www.k8science.org/.

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HIV virus particle. L. Howard, C. Daghlian, Dartmouth College.

INTRODUCTION

Microbial Challenges

Infectious diseases have plagued humans throughout history. Sometimes, they even have shaped history. Ancient plagues, the Black Death of the Middle Ages, and the "Spanish flu" pandemic of 1918 are but a few examples.

Epidemics and pandemics always have had major social and economic impacts on affected populations, but in our current interconnected world, the outcomes can be truly global. Consider the SARS outbreak of early 2003. This epidemic demonstrated that new infectious diseases are just a plane trip away, as the disease was spread rapidly to Canada, the U.S. and Europe by air travelers. Even though the SARS outbreak was relatively short-lived and geographically contained, fear inspired by the epidemic led to travel restrictions and the closing of schools, stores, factories and airports. The economic loss to Asian countries was estimated at $18 billion.

The HIV/AIDS viral epidemic, particularly in Africa, illustrates the economic and social effects of a prolonged and widespread infection. The disproportionate loss of the most economically productive individuals within the population has reduced workforces and economic growth in many countries, especially those with high infection rates. This affects the health care, education, and political stability of these nations. In the southern regions of Africa, where the infection rate is highest, life expectancy has plummeted in a single decade, from 62 years in 1990–95 to 48 years in 2000–05. By 2003, 12 million children under the age of 18 were orphaned by HIV/AIDS in this region.

> For an emerging disease to become established, at least two events must occur: 1) the infectious agent has to be introduced into a vulnerable population, and 2) the agent has to have the ability to spread readily from person to person and cause disease. The infection also must be able to sustain itself within the population and continue to infect more people.

Despite significant advances in infectious disease research and treatment, control and eradication of diseases are slowed by the following challenges.

- The emergence of new infectious diseases
- An increase in the incidence or geographical distribution of old infectious diseases
- The re-emergence of old infectious diseases
- The potential for intentional introduction of infectious agents by bioterrorists
- The increasing resistance of pathogens to current antimicrobial drugs
- Breakdowns in public health systems

Baylor College of Medicine, Department of Molecular Virology and Microbiology, www.bcm.edu/molvir/.

Using Cooperative Groups In The Classroom

Cooperative learning is a systematic way for students to work together in groups of two to four. It provides organized group interaction and enables students to share ideas and to learn from one another. Students in such an environment are more likely to take responsibility for their own learning. Cooperative groups enable the teacher to conduct hands-on investigations with fewer materials.

Organization is essential for cooperative learning to occur in a hands-on science classroom. Materials must be managed, investigations conducted, results recorded, and clean-up directed and carried out. Each student must have a specific role, or chaos may result.

The Teaming Up! model* provides an efficient system for cooperative learning. Four "jobs" entail specific duties. Students wear job badges that describe their duties. Tasks are rotated within each group for different activities so that each student has a chance to experience all roles. For groups with fewer than four students, job assignments can be combined.

Once a model for learning is established in the classroom, students are able to conduct science activities in an organized and effective manner. Suggested job titles and duties follow.

Principal Investigator
- Reads the directions
- Asks the questions
- Checks the work

Maintenance Director
- Follows the safety rules
- Directs the cleanup
- Asks others to help

Reporter
- Records observations and results
- Explains the results
- Tells the teacher when the group is finished

Materials Manager
- Picks up the materials
- Uses the equipment
- Returns the materials

* Jones, R.M. 1990. *Teaming Up!* LaPorte, Texas: ITGROUP.

Overview: Post-assessment

Students will share what they have learned over the course of the unit by revisiting their concept maps, presenting them to the class, and completing the same assessment they received at the beginning of the unit (see Answer Key, sidebar, p. 3).

AND NOW, WHAT DO YOU KNOW

About Microbes?

This activity is matched to the unit pre-assessment. It provides an opportunity for you, the teacher, to gauge students' learning over the course of the unit. It also allows students to evaluate their own learning by examining their concept maps and responses to the pre-assessment.

MATERIALS

Per Group of Students

- Group concept map
- Markers and writing materials

Per Student

- Completed pre-assessment (hold for distribution, see Session 2, item 2)
- Copy of *What About Microbes?* student sheet

SETUP

Make 24 copies of *What About Microbes?* Hold for distribution during Session 2.

For Session 1, have students work in groups of four. For Session 2, have students work individually to complete the post-assessment.

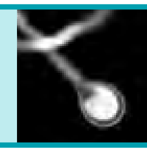
PROCEDURE

Session 1:

1. If you recorded questions from the pre-assessment at the beginning of this unit, review each question with the class. Ask, *Can you answer any of the questions now?* Discuss students' responses.
2. Next, have students work in their original groups to review the concept maps started in Activity 1 and used throughout the unit. Each group should discuss the additions made to its concept map and decide which findings were most important.
3. Ask each group to appoint a spokesperson. Call on each group and ask the spokesperson to explain one concept on the group's map. Do this two or more times, in round-robin fashion among the groups, until most major concepts have been covered.
4. Create a class concept map using the information presented.

Session 2:

1. On the following day, give each student a copy of the post-assessment. Students should complete it individually.
2. After students have completed the post-assessment, distribute the pre-assessments. Have students compare their answers on both assessments so they can see how much they have learned during the unit. Discuss any remaining student questions and collect the assessments, which can become part of students' portfolios or can be placed in their science notebooks.



Pseudallescheria boydii fungus. CDC\L. Ajello.

TIME

Activity Session 1: 45–60 minutes to review concept maps

Activity Session 2: 45 minutes to conduct and examine post-assessments

SCIENCE EDUCATION CONTENT STANDARDS

Grades 5–8

Inquiry

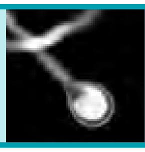
- Identify questions that can be answered through scientific investigations.
- Think critically and logically to make the relationships between evidence and explanations.
- Recognize and analyze alternative explanations and predictions.
- Communicate scientific procedures and explanations.

Life Science

- Living systems at all levels of organization demonstrate the complementary nature of structure and function.
- Disease is a breakdown in structures or functions of an organism. Some diseases are the result of intrinsic systems failures. Others are the result of damage from infection by other organisms.
- Millions of species of animals, plants and microorganisms are alive today. Although different species might look dissimilar, the unity among organisms becomes apparent from an analysis of internal structures, the similarity of chemical processes, and the evidence of common ancestry.

Science in Personal and Social Perspectives

- Students should understand the risks associated with natural hazards (fires, floods, tornadoes, hurricanes, earthquakes and volcanic eruptions), with chemical hazards (pollutants in air, water, soil and food), with biological hazards (pollen, viruses, bacteria and parasites), with social hazards (occupational safety and transportation), and with personal hazards (smoking, dieting and drinking).



Pseudallescheria boydii fungus. CDC\L. Ajello.

POST-ASSESSMENT

What About Microbes?

Name

Circle the best response to each question.

1. Microbes usually are
   a. germs.
   b. bad.
   c. good.
   d. microscopic.

2. A microbe does NOT cause
   a. polio.
   b. HIV/AIDS.
   c. asthma.
   d. malaria.

3. One way to prevent the spread of disease is to
   a. wash your hands with soap and water.
   b. not ever get sick.
   c. wear a jacket.
   d. take aspirin.

4. Diseases caused by viruses can be cured with
   a. antibiotics.
   b. anesthetics.
   c. vitamin C.
   d. none of the above.

5. Flu is caused by a
   a. virus.
   b. bacterium.
   c. fungus.
   d. protist.

6. Most bacteria are
   a. harmful.
   b. helpful.
   c. viral.
   d. disease-causing.

7. A paramecium is an example of a
   a. virus.
   b. bacterium.
   c. fungus.
   d. protist.

8. Microbes are an important part of the environment because they
   a. break down waste.
   b. cause the water cycle.
   c. protect the ozone layer.
   d. block global warming.

9. The incubation period of a disease is the length of time
   a. it takes to get over a disease.
   b. between being exposed and showing the symptoms of a disease.
   c. it takes for the eggs to hatch.
   d. between showing the symptoms of a disease and getting well.

10. In order for bacteria to grow, they need
   a. a source of energy.
   b. a source of young viruses.
   c. specialized equipment.
   d. someone to cough or sneeze.

11 Infectious diseases can spread
   a. from one person to another.
   b. by eating only fresh fruit.
   c. from washing your hands.
   d. by inheritance.

12. Most diseases caused by bacteria can be cured with
   a. antibiotics.
   b. anesthetics.
   c. vitamin C.
   d. none of the above.

13. One of the most common microbes used in food production is a
   a. fungus.
   b. protist.
   c. virus.
   d. micron.

14. Scientific advances depend on all of the following, EXCEPT
   a. being curious about what is observed.
   b. always being successful.
   c. appropriate tools and methods.
   d. work by other scientists.

15. The large structure you can often see inside of a cell is called
   a. protein.
   b. flagella.
   c. the cell wall.
   d. the nucleus.

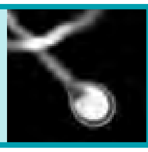
16. Antibiotic resistance is
   a. beneficial for most humans.
   b. caused, in part, by lack of antibiotics.
   c. caused, in part, by overuse of antibiotics.
   d. caused, in part, by overuse of vaccines.

17. A worldwide spread of infectious disease is called a/an
   a. anemic.
   b. epidemic.
   c. systemic.
   d. pandemic.

18. It is possible to catch HIV/AIDS from
   a. body piercing.
   b. saliva.
   c. sweat.
   d. mosquito bites.

19. A way to protect yourself from some diseases is called
   a. polarization.
   b. fertilization.
   c. constipation.
   d. vaccination.

20. Microorganisms often are measured in
   a. decimeters.
   b. centimeters.
   c. millimeters.
   d. micrometers.



Pseudallescheria boydii fungus. CDC\L. Ajello.

Answer Key

Answers to the Pre- and Post-Assessments are as follow.

1. d
2. c
3. a
4. d
5. a
6. b
7. d
8. a
9. b
10. a
11. a
12. a
13. a
14. b
15. d
16. c
17. d
18. a
19. d
20. d