



# Invasive Disease

## Science, Social Studies, Health and Language Arts

### Brief Description:

Invasive diseases can be caused by a number of infectious agents. Global trade and travel have enabled serious invasive species to create epidemics that led to pandemics beginning in the middle ages and continuing to today. This lesson focuses on the infective agents, how they act and the methods we use to prevent and control them. It provides insight into diseases that affect plants, animals, and affect the food supply in addition to those that have a direct impact on people.

### Objectives:

By the end of this unit the students will be able to:

1. Identify agents that cause disease;
2. Describe how global trade and travel, both yesterday and today, introduces invasive species such as diseases; and
3. Explain how an epidemic becomes a pandemic and give an example of one;
4. Explain methods to control, contain, and/or treat infectious diseases.

### Getting Started

1. Prior to conducting this lesson print out the notes pages from the two PowerPoint presentations *Place Invaders: Invasive Disease* and *Place Invaders: Disease Travels*.
2. Review each PowerPoint program and its notes to become familiar with the content.
3. Make copies of the *Invasive Diseases* cards on card stock – one for each group of five students. Make the blank cards the same color as the game board and the completed version as game pieces in another color. Cut apart the completed version as a set of game pieces.

### Materials:

- Copies of the *Invasive Diseases* Blank Cards and Activity pieces

## **Background**

### **Agents of Infection**

Diseases are caused by an array of agents that includes viruses, bacteria, parasites, fungi, protozoa and prions. As part of health education, every student needs to understand these causative agents, their mode of transmission, control methods, prevention methods and current technologies used to protect the public. The public's understanding of this information is important to prevent epidemics that may morph into pandemics, reduce transmission, participate in vaccination programs, reduce the use of antibiotics for diseases they do not cure (e.g. using antibiotics on colds and flu that are caused by viruses), support the use of appropriate technologies and cooperate in prevention or eradication programs. The PowerPoint program *Place Invaders: Invasive Disease* provides an overview of infectious agents and the noted sections of the slides provide a script.

### **Disease Travels**

Deadly diseases have spread throughout the ages and continue to do so today. The PowerPoint presentation *Place Invaders: Disease Travels* has a series of diseases that have traveled the globe and the notes pages provides a detailed script with further background information.

### **Exploration, Colonization and Deadly Diseases**

The soldiers and explorers and later the settlers and slaves not only brought plants and animals with them from Europe and Africa, they also brought diseases. Unfortunately for the native American tribes, many of these diseases were deadly. While exact numbers of indigenous Americans prior to exploration and colonization of Europeans will never be known, millions died from infectious diseases that were non-lethal to their carriers. Other infectious diseases that may have also killed Europeans and Africans were spread to American Indian tribes. Smallpox, typhus, measles, influenza, bubonic plague, cholera, malaria, tuberculosis, mumps, yellow fever, pertussis (whooping cough) may have killed up to 90 percent of the native Americans. Why? Some of these are considered survivable childhood diseases. The American landmass was isolated from the European landmass and as a result the Indians were isolated from these diseases and so, had no immunity. Oftentimes, disease epidemics occurred concurrently and having two or more unknown diseases proved lethal. Or, tribes would survive one disease only to have an epidemic of a second right on its heels when people were weak and the second epidemic would be fatal. Couple this with other invasive species such as mice and rats and transmission came in vectors unknown and unexpected. Rats and mice and the fleas that live with them transmit diseases to and from human populations. Bubonic plague still exists and is still spread in this manner.

However, invasions occur in both directions. Scientists believe that two deadly diseases traveled back to Europe and Africa to cause disease and death. A new and deadly strain of tuberculosis and syphilis (a deadly sexually-transmitted disease) were transmitted back to the old world to wreak havoc there.

### Activity One – Place Invaders: Infectious Diseases

1. Use the PowerPoint presentation *Place Invaders: Invasive Diseases* to teach students about what causes infectious diseases, methods of transmission, how they are treated, if treatment is available and effective, who is affected, and how they are prevented.
2. Divide the class into small groups of students and give each group a game board and set of game pieces.
3. Ask the students to place the statement under the appropriate category and fill up the game board. Make the PowerPoint available for students to review the information.
4. Review the correct answers and discuss the places of commonality versus surprise information. (Many diseases are transmitted by insect vectors. Fecal contamination is frequently involved in disease transmission. Antibiotics do not work on most methods of disease transmission only bacteria. Etc.)
5. Discuss lessons learned from this information.



### Activity Two – Diseases as Invasive Species

1. Use the PowerPoint presentation *Place Invaders: Disease Travels* to teach students why diseases can be considered an invasive species.
2. Review the additional background information as appropriate.
3. Discuss the impact of Late Blight (*Phytophthora infestans*) a fungal disease on the Irish in the 19<sup>th</sup> century. Explain that:
  - a. while most of us think of infectious disease as it directly impacts humans and makes us or our pets sick, we seldom consider the impact that diseases can have on our food supply.
  - b. during the later years of the Irish potato famine copper sulfate was introduced as a synthetic pesticide to control the fungus. It was somewhat effective and helped to end the blight.
  - c. this plant fungus is back and in a very virulent form. Today, copper sulfate is considered an organic pesticide and in use in organic production. More effective fungicides have been developed and are in use in conventional farming production to control this deadly disease.

4. Have students discuss what life would be like if there were no potatoes as it was during the Irish Potato Famine.
  - a. If we did not have fungicides to control the disease we would have very limited availability of potatoes. (*We would not starve because we have other foods. However, this fungus can also affect other plants in the Solanaceae family that potatoes belongs to. This includes tomatoes.* )
  - b. Add loss of tomatoes to the discussion. This would mean the elimination of pizza sauce, spaghetti, ketchup, salsa, etc.

### Activity Three- Research and Report

1. Have students select one of these diseases, research it and write a report about the disease and its deadly impact: Smallpox, typhus, measles, influenza, bubonic plague, cholera, malaria, tuberculosis, mumps, yellow fever, or pertussis (whooping cough). Or select a recent disease that threatened to become a pandemic – SARS, Avian Influenza, H1N1, etc.
2. Remind students that diseases do not just affect people. They affect pets, farm animals, zoo animals, insects, fish, trees, food plants and ornamental plants. Show students the *Citrus Greening* episode of America’s Heartland available at [http://www.americasheartland.org/episodes/episode\\_504/citrus\\_concerns.htm](http://www.americasheartland.org/episodes/episode_504/citrus_concerns.htm).
3. Discuss the impact that this disease could have on Florida’s Citrus industry as well as the availability of oranges and other citrus for everyone in the United States.

### Review and Evaluation

1. Analyze and assess student accuracy in the *Invasive Disease* activity.
2. Set up the infectious disease activity as a game on a smart board and conduct the activity as a test.
3. Evaluate student effort, accuracy, and research and writing effort from activity three.
4. Use the quizzes provided.

