

Submitted by: GENERATION CURES

TITLE: PATHOGENS

SUBJECT: Science

GRADE: 5th

RECOMMENDED TIME: 30 minutes

GENERATION CURES CONTENT: Caduceus Puzzle 1-Microbes

LEARNING GOALS:

Students will review cell characteristics, observe the effects of microorganisms upon other organisms, and observe the human body's protective barriers against harmful microorganisms.

RESOURCES/MATERIALS NEEDED:

- Computer / Internet / Projector
- Caduceus Puzzle 1-Microbes (www.kids.generationcures.org)
- Apples, pins, Ziplock bags
- Dictionary: Define terms
 - Caduceus- a Caduceus is a symbol for physicians: a staff with two intertwined snakes.
 - Alchemist- a person who studies alchemy, the medieval precursor to chemistry, which studied the transformation of base metals and finding chemical cures for human illness. The hero/healer of Alterica meets an Alchemist along his journey and apprenticeship.
 - Microbe- from the Greek words *mikros*, meaning 'small' and *bios*, meaning 'life,' a microbe is a tiny life form that can only be seen using the magnification of a microscope.
 - Deduction- the act of reasoning by reducing or subtracting from possibilities to reach a conclusion.

BACKGROUND:

In the first chapter of Caduceus, after learning of a plague that is spreading through Alterica, the hero, an apprentice healer, is sent to do research in Alfonso Tidewater's lab. Tidewater sets the young apprentice to work, examining saliva samples of plague victims to find potential causes of the disease. Before students play the game, the story reveals that the inspection of thousands of samples has brought no results. A late-night accident in the lab inspires the hero to check blood samples, and the quest begins! As the students play the puzzle, they are looking for a disease marker in blood cells, using deductive reasoning, methods of eliminating possibilities, in order to find the one unique microbe under the microscope.

LESSON STEPS:

- **Connections:** After students have played the first puzzle in Caduceus, review the steps of scientific inquiry the students needed to solve the puzzle. Discuss the process of logical deductive reasoning and eliminating matching microbes in order to uncover one unique microbe as a model for determining the plague outbreak:
 - Observing
 - Classifying/sequencing
 - Communicating
 - Predicting
 - Hypothesizing
 - Inferring
 - Defining, designing, constructing and interpreting models
 - Interpreting, analyzing, and evaluating data
- **Real Life Applications:** Most microorganisms are neither plant nor animal. Viruses (which cause flu, polio, e.g.), amoebas, bacteria (which cause strep, whooping cough, meningitis, e.g.), algae and fungi (which cause ringworm and athlete's foot, e.g.) all belong to kingdoms Protista, Monera, and Fungi. Discuss with students the signifying characteristics in the microbes:
 - Nucleus shape
 - Nucleus color
 - Cytoplasm pattern
 - Cell Membrane color
- Discuss with the students that organisms have natural protective barriers to prevent harmful microorganisms from spreading communicable diseases.
 - Skin
 - Nose hair
 - Enzymes
- Tell students they will observe how skin can prevent infection in an organism
- Place students in groups of four or five and provide them with the following materials for the lab: apples, ziplock bags, pins.
- Instruct students to puncture the first apple so that the skin breaks, and then rub it on the ground. With the second apple, the students should NOT puncture the skin of the apple but rub it gently along the ground. Place both apples in separate ziplock bags.

EXTENSIONS:

- Ask students to continue playing the first game in Caduceus through three levels of play until they have isolated the one unique microbe
- In exactly one week, ask the students to return to their apples and note the effects of their work the previous week, noting how the skin protected the second apple.