



THE SCIENCE OF “FRINGE”

EXPLORING: FUNGI

A SCIENCE OLYMPIAD THEMED LESSON PLAN
EPISODE 403: Alone in the World

Overview:

Students will learn about fungi, with a focus on a particular type called yeast.

Grade Level: 9-12

Episode Summary:

Two boys are found dead in a tunnel and their bodies have deteriorated significantly in only a few hours, ending up covered in fungi. As the Fringe team examines the bodies, they quickly discover that the fungi is feeding on the bodies and still growing. Returning to the tunnel, they find that the fungi have developed a form of intelligence and have spread out throughout the sewer system of the city. As they work to destroy it, their efforts are complicated by the fact that it has established a unique connection to another young boy.

Related Science Olympiad Event:

Microbe Mission - Teams will answer questions, solve problems and analyze data pertaining to microbes.

Learning Objectives:

Students will understand the following:

- Fungi are classified by biologists as a kingdom, separate from plants, animals, and bacteria.
- Common types of fungi are mushrooms, molds, and yeasts.
- Fungi extract nutrients from the substrate they are on or in in order to grow and reproduce.

Episode Scenes of Relevance:

- Walter and Astrid discovering the fungi growing on the body (1:15:35 “what is it” – 1:16:48 “killed the boys”)
- The Fringe team examining the fungi in the morgue (1:18:22 “Dr. Bishop” – 1:19:40 “understood”)



Online Resources:

- Fringe “Alone in the World” full episode: <http://www.fox.com/fringe/full-episodes>
- Science Olympiad Microbe Mission event: http://soinc.org/microbe_mission_c
- Wikipedia page for Fungi: <http://en.wikipedia.org/wiki/Fungi>
- Tree of Life: Fungi: <http://tolweb.org/fungi>
- Explore Yeast: <http://www.exploreyeast.com/index.php>

Procedures:

1. Tell your students that they are going to learn about fungi and in particular yeast, and what nutrients it needs to grow.
2. Have your students research fungi in resources such as biology textbooks and websites and discuss what they have learned.
3. Have your class complete the following activity in small groups:
 - a. Materials: 5 dry yeast packets (available at grocery stores), 5 cleaned plastic drink bottles, water, sugar, salt, baking soda, vinegar, vegetable oil, balloons, tablespoons for measuring, flexible tape measure
 - b. Fill each bottle about 1/3 full of water
 - c. Add a tablespoon of sugar to 4 of the bottles (the 5th is a control)
 - d. In one of the sugar bottles add a tablespoon of salt, in another baking soda, and in a third vinegar
 - e. Dump a full packet of yeast into each bottle and gently swirl them to mix the contents
 - f. Add a few drops of vegetable oil to each bottle
 - g. Stretch a balloon over the mouth of each bottle so that any gas generated will fill the balloon
 - h. Let the bottles sit for about 1 hour
 - i. Measure the circumference of each balloon with the flexible tape measure and record the results
4. Discuss with the class the results of the activity. Be sure to address:
 - a. Why did the balloons fill up? What is the gas in the balloons?
 - b. Which bottles resulted in larger balloons?
 - c. What qualitative impact did each of the substances added to the bottles have on the contents of the bottle?

Additional Discussion Suggestions:

- Yeast is commonly used by bakers. What is the purpose of adding the yeast to recipes such as bread?
- Yeast is a living organism, yet the yeast packets didn't require any special storage conditions. Why is that?
- Yeast is also used in the alcoholic brewing process, but for a different reason than in the baking process. What is its purpose?

Extension to Other Subjects:

Health Science: The Penicillium fungi is the source of the antibiotic penicillin. This and many other medically important compounds are naturally produced by fungi. Research some of these medicines and why the fungi evolved to produce them.

History: Yeast has been used for thousands of years, particularly in the production of food and alcohol. Yet it wasn't until only the 19th century that the microbiology of yeast was understood. How did earlier bakers and brewers effectively utilize yeast without understanding it?

Literature: The effects of certain types of fungi are often used as plot devices in literature. One famous example is the mushroom Alice eats in *Adventures in Wonderland*. Research other examples from popular literature.

National Science Standards Alignment:

C. Life Science - Life science focuses on science facts, concepts, principles, theories, and models that are important for all students to know, understand, and use.

H.C.1 The cell

- a. Cells have particular structures that underlie their functions. Every cell is surrounded by a membrane that separates it from the outside world. Inside the cell is a concentrated mixture of thousands of different molecules which form a variety of specialized structures that carry out such cell functions as energy production, transport of molecules, waste disposal, synthesis of new molecules, and the storage of genetic material.
- b. Most cell functions involve chemical reactions. Food molecules taken into cells react to provide the chemical constituents needed to synthesize other molecules. Both breakdown and synthesis are made possible by a large set of protein catalysts, called enzymes. The breakdown of some of the food molecules enables the cell to store energy in specific chemicals that are used to carry out the many functions of the cell.
- c. Cells store and use information to guide their functions. The genetic information stored in DNA is used to direct the synthesis of the thousands of proteins that each cell requires.
- d. Cell functions are regulated. Regulation occurs both through changes in the activity of the functions performed by proteins and through the selective expression of individual genes. This regulation allows cells to respond to their environment and to control and coordinate cell growth and division.
- e. Plant cells contain chloroplasts, the site of photosynthesis. Plants and many microorganisms use solar energy to combine molecules of carbon dioxide and water into complex, energy rich organic compounds and release oxygen to the environment. This process of photosynthesis provides a vital connection between the sun and the energy needs of living systems.
- f. Cells can differentiate, and complex multicellular organisms are formed as a highly organized arrangement of differentiated cells. In the development of these multicellular organisms, the progeny from a single cell form an embryo in which the cells multiply and differentiate to form the many specialized cells, tissues and organs that comprise the final organism. This differentiation is regulated through the expression of different genes.