

## THE SCIENCE OF “FRINGE”

### EXPLORING: INFLUENZA

A SCIENCE OLYMPIAD THEMED LESSON PLAN  
EPISODE 313: **IMMORTALITY**

**Overview:**

Students will learn about the influenza virus and how it spreads and impacts its host.

**Grade Level:** 9-12

**Episode Summary:**

The alternate universe Fringe team investigates a bioterrorist armed with an insect that has a taste for human flesh. With the help of the CDC, they quickly discover that the insect was thought to be extinct and that a key researcher who previously devoted his life to the bug hasn't been seen in years. The researcher's goal was to create a universal vaccine for the flu virus based upon an enzyme extracted from the insect.

**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:

- Influenza is caused by a family of viruses that spread from host to host via airborne aerosols.
- Influenza spreads seasonally around that world and causes hundreds of thousands of deaths each year
- New strains of influenza often appear when an existing virus picks up new genes from viruses in other animal species such as birds or pigs.

**Episode Scenes of Relevance:**

- Bolivia and Frank discussing the possible flu vaccine (24:17 'called Atlanta' – 25:05 'human hosts')
- Bolivia and Dr. Silva discussing his quest for a vaccine (30:50 'they'll thank me' – 31:50 'nearly complete')



## Online Resources:

- Fringe “Immortality” full episode: <http://www.fox.com/watch/fringe>
- Science Olympiad Microbe Mission event: [http://soinc.org/microbe\\_mission\\_c](http://soinc.org/microbe_mission_c)
- Centers for Disease Control and Prevention Flu page: <http://www.cdc.gov/flu/>
- Flu.gov: <http://www.pandemicflu.gov/>
- NCBI Influenza Virus Resource: <http://www.ncbi.nlm.nih.gov/genomes/FLU/flubiology.html>

## Procedures:

1. Tell your students that they are going to learn about influenza and how it spreads.
2. Have your students research influenza in resources such as biology textbooks and websites and discuss what they have learned.
3. Have your class complete the following activity:
  - a. Materials: paper cups, water, hydrogen peroxide, bleach, pipette / dropper
  - b. Prefill most of the cups about 1/3 of the way with water.
  - c. Fill 2 or 3 (depending on class size) cups 1/3 of the way with hydrogen peroxide.
  - d. Pass the cups out to the students and be sure to warn them not to drink or smell the liquid.
  - e. Have the students pair up.
  - f. One partner should carefully pour their cup contents into the other.
  - g. Then the other partner should pour half the volume back into the empty cup, resulting in equal amounts of mixed liquid.
  - h. Have the pair record the person they mixed liquid with.
  - i. Repeat the pairing / pouring process 2 more times, and ensure the students don't pair up with the same person.
  - j. Put a few drops of bleach in each student's cup. If it 'fizzes', the cup is 'infected'.
  - k. Create a table of who had infected cups and who didn't.
4. Discuss with the class the results of the activity. Be sure to address:
  - a. With only 3 interactions each, how quickly did the 'infection' spread?
  - b. By analyzing who the infected students interacted with, can you determine who had the original 'infected' cups?
  - c. How does this relate to the actual spread of a virus within a population?

## Additional Discussion Suggestions:

- Could a 'vaccinated' person somehow have been simulated during the activity? What impact would that have had on the spread of the infection?
- Some people are more susceptible to infection than others. What are some causes of that?
- Typically, once you've been infected by a strain of influenza, you can't be infected again. What causes that effect?

## Extension to Other Subjects:

Health Sciences: Antibiotics don't help treat a viral infection. Research why that is and why there is a common misconception that they do help.

History: Pandemic influenza infections have happened several times throughout history. Research some of the occurrences and the impact it had on society.

Literature: Devastating viruses are a common theme in science fiction novels and films. Research some of the more popular stories and discuss whether the mechanism and rate of spread depicted are scientifically realistic.

**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.