THE SCIENCE OF FRINGE

EXPLORING: CANCER

A SCIENCE OLYMPIAD THEMED LESSON PLAN

SEASON 2 - EPISODE 17: OLIVIA. IN THE LAB. WITH THE REVOLVER

Overview:

Students will learn about the science behind cancer, with a focus on the causes and prevention of skin cancer.

Grade Level: 9–12

Episode Summary:

A perfectly healthy woman suddenly dies from what Walter concludes is an extreme case of cancer. More victims are discovered, leading him to conclude that someone is transferring their disease to them deliberately. While Walter tries to recover forensic evidence regarding the killer from the first victim, Olivia pieces together what all the victims have in common, and discovers that she too is part of the special group.

Related Science Olympiad Event:

Cell Biology - Students will demonstrate their understanding of cell biology and biochemistry.

Learning Objectives:

Students will understand the following:

- Cancer is a disease caused by genetic abnormalities in cells, which results in uncontrollable growth.
- Some cancers, such as skin cancer, have effective prevention, detection, and treatment techniques.
- Specific lifestyle choices can dramatically reduce a person's chances of developing certain cancers.

Episode Scenes of Relevance:

- Walter and Dr. Potesh examining Miranda Green's body and discussing the cause of her death.
- Walter and Astrid dissecting Miranda Green's body and discussing the cause of the cancer.
- View the above scenes: http://www.fox.com/fringe/fringe-science

Online Resources:

- Fringe "Olivia. In The Lab. With The Revolver." full episode: http://www.fox.com/watch/fringe
- Science Olympiad Cell Biology event: http://soinc.org/cell_biology_c
- American Cancer Society: http://www.cancer.org
- Centers for Disease Control skin cancer page: http://www.cdc.gov/cancer/skin/
- National Cancer Institute melanoma page: http://www.cancer.gov/cancertopics/types/melanoma
- Skin Cancer Foundation: http://www.skincancer.org/

Procedures:

1. Tell your students that they are going to learn about skin cancer and what they can do to help prevent developing it.
2. Have your students research skin cancer causes, prevention methods, and treatments in textbooks and other re sources and discuss what they have learned.
3. Divide your class into groups. Have each group complete the following activity:
    a. Materials: small clear plastic bags, bottles of sunscreen with a range of SPF levels, color changing UV sensitive beads (available online or at craft stores, for a few cents each).
    b. Label one bag per sunscreen SPF number available, as well as a control bag.
    c. Place a few UV beads in each bag.
    d. Apply the appropriate numbered sunscreen to the outside of each respective bag. Do not apply anything to the out side of the control bag.
    e. Place the bags in the sun, either by an open window or outside. Note the time.
    f. Record how long it takes the beads in each bag to change color.
    g. Produce a graph of the SPF number versus time to color change.
4. Lead the class in a discussion comparing their results. Discuss the relationship between higher SPF numbers and less UV exposure. Relate this experiment back to the causes of skin cancer and prevention techniques they can individually implement.
5. Provide each student with a few beads to attach to a bracelet or their backpacks in order to remind them of their exposure to the sun throughout the day.

Additional Discussion Suggestions:

- Why do the UV beads change color even on cloudy days?
- How much energy does it take to cause a macroscopic bead to change color versus a microscopic DNA fragment to be altered?
- What are the standard warning signs of skin cancer they should regularly look for on their own skin?

Extension to Other Subjects:

Social Studies: Compare skin cancer incidence rates to geographic locations and determine if there is any correlation.

Mathematics: Using published statistics, calculate the chances of a typical person developing cancer during their lifetime.

Language Arts: Create public service announcements regarding the prevention of skin cancer, targeted at other students.

National Science Standards Alignment:

H.C.1 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.

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.