THE SCIENCE OF "FRINGE"

EXPLORING: FOOD FORTIFICATION

A SCIENCE OLYMPIAD THEMED LESSON PLAN
EPISODE 401: Neither Here Nor There

Overview:
Students will learn about food fortification.

Grade Level: 9-12

Episode Summary:
Lincoln's partner is killed during a chase by a strange person and the Fringe team is called in to investigate. Lincoln is quickly added to the Fringe team when he proves that he is able to provide unique insights on cases, such as noting that his partner took iron supplements. The team determines that all the victims have some sort of increased metal levels in their system due to various medical conditions. Once they track down the killers, they find that they are a new kind of shapeshifter previously not encountered.

Related Science Olympiad Event:
Chemistry Lab - Teams will demonstrate chemistry laboratory skills related to selected topics.

Learning Objectives:
Students will understand the following:
- Diets that lack variety can often also lack certain nutrients.
- Manufacturers often add certain trace elements and vitamins to food to ensure consumers don't have deficiencies.
- Common examples include iodine in salt and folic acid to flour.

Episode Scenes of Relevance:
- Broyles, Lincoln and Olivia viewing the victims (1:17:43 "first attacks" – 1:18:35 "iron pills")
- Walter discussing the test results with Lincoln and Olivia (1:22:15 "I believe it was" – 1:23:21 "seems he needs")

FOX CODE
FOR SMARTPHONES

Online Resources:

- Fringe "Neither Here Nor There" full episode: http://www.fox.com/fringe/full-episodes/
- Science Olympiad Chemistry Lab event: http://soinc.org/chemistry_lab_c
- Wikipedia page for Food Fortification: http://en.wikipedia.org/wiki/Food_fortification
- BASF Food Fortification: http://www.food-fortification.com/Home.aspx
- WHO guideline on Food Fortification: http://www.who.int/nutrition/publications/guide_food_fortification_micronutrients.

Procedures:

1. Tell your students that they are going to learn about food fortification and supplements.
2. Have your students research food fortification in resources such as health textbooks and websites and discuss what they have learned.
3. Have your class complete the following activity in small groups:
    a. Materials: iron fortified cereals (such as Total, Cheerios), water, blender, magnets, bowls, spoons, measuring cups, paper towels.
    b. Have the students use the measuring cups to measure out fixed volumes of cereal and water and mix together in a bowl.
    c. Use the blender to blender the mixture into a fine paste and return the mixture to the bowl.
    d. Put a magnet in the bowl and use a spoon to stir it thoroughly.
    e. Remove the magnet and wipe it off on a paper towel. Note the fine black powder that comes off, which is iron from the cereal.
4. Discuss with the class the results of the activity. Be sure to address:
    a. Did different cereal types yield different amounts of iron?
    b. Can you correlate the relative amounts of iron to the nutritional labels on the cereal boxes?

Additional Discussion Suggestions:

- Why are cereals fortified with iron? What purpose does it serve in the body?
- Salt is fortified with iodine. What test can you conduct to determine the presence of the iodine?

Extension to Other Subjects:

Health Science: Food fortification helps prevent deficiency diseases. Research some common deficiency diseases, their symptoms and what essential nutrients help prevent them.

Social Studies: Some types of food fortification, such as fluoride in water, are controversial to some people. Research the concerns they have and how different cultures have reacted to such programs.

Athletics: The use of certain nutrients and food supplements is banned by professional sporting leagues, while others are allowed. Research some of the banned substances and the reasoning behind the bans.

National Science Standards Alignment:

H.B.3 Chemical reactions

a. Chemical reactions occur all around us, for example in health care, cooking, cosmetics, and automobiles. Complex chemical reactions involving carbon-based molecules take place constantly in every cell in our bodies.

b. Chemical reactions may release or consume energy. Some reactions such as the burning of fossil fuels release large amounts of energy by losing heat and by emitting light. Light can initiate many chemical reactions such as photosynthesis and the evolution of urban smog.

c. A large number of important reactions involve the transfer of either electrons (oxidation/reduction reactions) or hydrogen ions (acid/base reactions) between reacting ions, molecules, or atoms. In other reactions, chemical bonds are broken by heat or light to form very reactive radicals with electrons ready to form new bonds. Radical reactions control many processes such as the presence of ozone and greenhouse gases in the atmosphere, burning and processing of fossil fuels, the formation of polymers, and explosions.

d. Chemical reactions can take place in time periods ranging from the few femtoseconds (10-15 seconds) required for an atom to move a fraction of a chemical bond distance to geologic time scales of billions of years. Reaction rates depend on how often the reacting atoms and molecules encounter one another, on the temperature, and on the properties– including shape–of the reacting species.

e. Catalysts, such as metal surfaces, accelerate chemical reactions. Chemical reactions in living systems are catalyzed by protein molecules called enzymes.