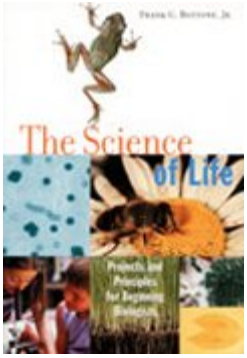


This week's LabZone activity

Oct. 20, 2004

Iron in Your Food

Iron, nickel, and cobalt are magnetic elements commonly found in soil. Unlike cobalt and nickel, iron is a micronutrient required by most plants, animals, and other organisms. Plants can absorb iron from the soil. However, animals have to obtain iron as well as other trace nutrients from their diet. In animals, iron is primarily found in cytochromes, which are proteins found in energy-producing mitochondria (parts within cells) of animal cells, and hemoglobin, a pigment that gives blood its characteristic red color. Iron is a component of several plant proteins, such as cytochromes, and ferredoxin, which are pigments used during respiration. Although iron is not a component of chlorophyll, it plays a vital role in its *synthesis* (the production of a substance).

Objective

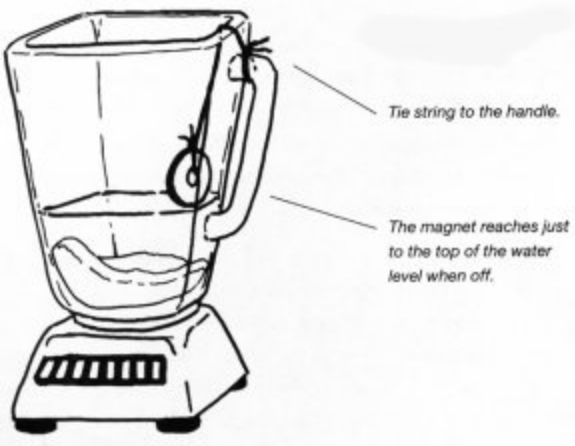
Learn how to properly set up a biology science experiment designed to compare the amount of iron that can be extracted from two different food items.

Materials

- Measuring cup
- 2 cups (500 grams) fresh beef liver
- Blender
- 9 cups (2.25 liters) water, plus additional water for rinsing tweezers
- String
- 2 round magnets, 1 inch (2.5 centimeters) in diameter with a hole in the center
- Tweezers
- White paper
- Magnifying glass
- 2 cups (500 grams) fresh fish
- *Adult supervision recommended*

Method

Place the liver in a blender containing 3 cups (750 milliliters) of water. Attach a piece of string to one of the magnets by placing it through the hole in the center of the magnet. Tie both ends of the string onto the handle of the blender using a double knot so that the magnet is suspended from the top of the blender and will not fall into the bottom of the blender.



Dangle the magnet into the blender so that it just reaches the top of the water. Secure the lid onto the blender so that the magnet will not slip down into the blades.

Once you are certain that the magnet is safe and secure, carefully turn the blender on low while visually checking that the magnet does not interfere with the blades of the blender. If it does, unplug it at once, shorten the string, and begin again. Blend the solution on low for 15 minutes. Do not leave the blender unattended.

Turn off the blender, grab the string, and then remove the lid. Carefully dip the magnet into a cup of water to rinse off any excess liver. Place the magnet onto a piece of white paper. Draw a circle 1 inch (2.5 centimeters) in diameter in the upper right hand corner of the paper. Write the word *liver* underneath this circle.

Can you see any of the iron (and some other metals) accumulated on the magnet? Allow the two magnets to stick together and then pull the two magnets apart so that the second magnet is just above the surface of the first. Slide the top magnet back and forth. This will make the flakes of iron stand on end. For this to work, you must hold the magnets together so that the sides that are magnetically attracted to each other are closest. The iron will appear like tiny, brownish-red blades of grass.

Place the magnet on the piece of a paper. With a magnifying glass in one hand and a pair of tweezers in the other, try to remove as many of the iron flakes as you can and place them in the circle for liver you drew on the corner of the paper. If you cannot see the iron, let the magnets dry on a windowsill for 10 minutes and try again. Rinse out the blender and the magnets, and then repeat the experiment first with water alone (as a control) and then again with the same amount of fish and fresh water (for comparison).

Compare the amount of iron you extracted from each item. Liver and fish both contain enough iron so that you should be able to see it easily with a magnifying glass. Try to determine which of equal amounts of fish and liver contains more iron by visually comparing circles on the page.

Results

Which substance, fish or liver, appears to contain more iron in the same amount of tissue? Liver is high in iron because it uses iron to filter red blood cells, which contain hemoglobin bound to iron. Did you notice any iron in the control (water) experiment? If so, do you think water has enough iron in it for you to see or would it be better explained as carryover from the liver?

Variations

What other foods do you think might be high in iron? Determine if cereal is high in iron. Compare different types of cereal to see if they contain different amounts of iron. Try one cereal made from wheat, another made from rice, and a third made from corn. Measure equal amounts of the different kinds of cereal by weight so that you can compare them more accurately. Alternatively, you could measure them by volume by crushing the cereal into a cup using a spoon and repeating the process using the same volume with other cereals. Compare your results using a magnifying glass.

On average, humans contain about 4.5 grams of iron, mainly in their hemoglobin. Not all animals use iron and hemoglobin to carry their oxygen. Some invertebrates (animals without a spinal column) make a protein called hemocyanin, which contains copper instead of iron as its oxygen-binding compound. These invertebrates have blue blood instead of red. Some annelid worms have green blood due to the presence of a pigment called chlorocruorin, while others contain the pigment hemoglobin, just like humans.

As appeared in sciencenews for kids:
http://www.sciencenewsforkids.org/articles/20041020/LZActivity.asp