

Laboratory – Are you eating nails for breakfast?

Introduction:

The next time you're eating a bowl of cereal, take a close look at the ingredients. You'll find that your cereal contains ingredients like the metal iron, which is also used to make nails! The following experiment will help you to determine if there really is metallic iron in your breakfast cereal.

Materials:

Strong magnet painted white (e.g. magnetic stir bar magnet) or neodymium magnet
Re-sealable clear sandwich bags
Approximately 1 cup of cereal high in iron or fortified with iron
Water
Bowls

Procedure:

1. Open the box of cereal and pour a small pile of flakes on the plate. Crush them into tiny pieces and spread out the pile so it forms a single layer of crumbs on the plate.
2. Bring the magnet close to the layer of crumbs (but don't touch any) and see if you can get any of the pieces to move. If you get a piece to move without touching it, that piece may contain some metallic iron.
3. Press the magnet directly onto the crumbs but don't move it. Lift the magnet up and look underneath to see if anything is clinging to the magnet. Several little pieces may be stuck there. It could be the iron. Throw away the small pile of cereal and clean off your magnet in order to move on to the next step.
4. Pour a little water onto the plate and float a few large flakes on the surface. Hold the magnet close to (but not touching) a flake and see if the flake moves toward the magnet. (The movement may be very slight, so be patient and look carefully.) With practice, you can pull the flakes across the water, spin them, and even link them together in a chain.

5. Now, you need to open a quart-size zipper-lock bag and measure 1 cup of cereal (equal to one serving according to the nutritional information on the side of the cereal box) into the empty bag.
6. Fill the bag half-full with warm water and carefully seal it, leaving an air pocket inside.
7. Give the cereal and water a good mixing by shaking the bag around for a minute or so. The warm water will start to dissolve the flakes of cereal and the liquid will turn into a brown, soupy mixture. Allow the mixture to sit for at least 20 minutes before moving on to the next step.
8. Make sure the bag is tightly sealed and hold it flat in your hand. Place the strong magnet on top of the bag. Put your other palm on top of the magnet and flip your hands over so that the magnet is underneath the bag. Slowly slosh the contents of the bag in a circular motion for 15 or 20 seconds. This way you will attract any free-moving bits of metallic iron in the cereal to the magnet.
9. Now, flip the bag and magnet over so the magnet is on top. Gently squeeze the bag to raise the magnet a little above the cereal soup. Don't move the magnet just yet. Look closely at the edges of the magnet where it's touching the bag. You should be able to see tiny black specks on the inside of the bag around the edges of the magnet. That's the iron!
10. Keep one end of the magnet touching the bag and move it in little circles. As you do this, the iron will gather into a bigger clump and become much easier to see.

Discussion Questions:

1. Why do we put iron in food? What are the harms and benefits of doing this?
2. After having conducted this experiment, what are you wondering? For example, if you could re-do this experiment, what other variables would you test? List at least 3 other variables.
3. Once you have listed your variables, choose one to focus on and use your Smarter Steps to Inquiry framework to re-create your laboratory making sure to test for your chosen variable.