EXTRACTING IRON FROM CEREAL

David A. Katz
Chemist, Educator, Science Communicator, and Consultant
1621 Briar Hill Road, Gladwyne, PA 19035, USA
Voice/fax: 610-642-5231 Email: katzdavid@hslc.org

Materials Needed

Iron fortified breakfast cereal such as Total, Special K, etc..., instant breakfast cereal packets such as Instant Cream of Wheat or instant oatmeal. Read the list of ingredients on the label looking for *iron* or *reduced iron*. This procedure will not work unless iron is present in the cereal as a mineral supplement.
water.
magnetic stir bar, Teflon coated, or a magnet painted white
beaker, 2000 mL or other large container (glass or clear plastic preferred)
magnetic stirrer or wood spoon
plastic bag (1 gallon size)

Safety

Wear safety goggles or glasses at all times in the laboratory.

There are no hazards associated with materials in this experiment.

Disposal

All materials in this experiment can be disposed of in the trash or down the drain.

Procedure

A. Iron in Processed Cereals

Place one to two cups of an iron enriched breakfast cereal, such as Total, Special K, etc..., in a plastic bag and crush the cereal.

Obtain a large beaker (about 2 Liters). Add between 1 and 1.5 liters of water to the beaker and place it on a magnetic stirrer.

Obtain a teflon coated magnetic stirring bar (or a magnet painted white). Inspect the stirring bar to insure that it is clean. Place the stirring bar into the beaker of water and start the magnetic stirrer.

Slowly, pour the crushed cereal into the large beaker of water. Stir the mixture for about 15 minutes. (If the magnetic stirrer is not available, use a wood spoon.) If

the mixture gets too thick, the stirring bar will not operate. If that occurs, add additional water to the beaker and restart the stirrer.

Use a stir bar retriever or pour the solution into a second large beaker or into waste container, taking care not to pour out the stir bar, and retrieve the stir bar. Examine the stir bar. What do you observe?

B. Iron in Instant Cereal

Obtain a package of instant oatmeal or other instant breakfast cereal and a Teflon coated stir bar (or a magnet pained white).

Open the package of instant cereal and place the magnet into the cereal. Stir the cereal with the magnet or hold the top closed and shake the package. Retrieve the magnet. Examine the stir bar. What do you observe?

C. Additional Activities

Repeat this experiment using weighed amounts of different brands of cereals to compare iron content.

Does the iron effectively dissolve in stomach acid? Place some of the iron extracted from the cereal into a beaker. Add some 0.1 M hydrochloric acid, HCl, cover with a watch glass, and let the mixture stand overnight. If iron dissolves, the solution will be a light green in color is the iron is in the form of iron(II) chloride and yellow if it is iron(III) chloride. What do you observe?

EXPLANATION

Iron is often added to fortified cereals in the form of powdered iron (often listed as reduced iron in the ingredients. Powdered iron is easy to measure, has no stability problems, and does not affect the taste or color of the cereal in this form.

Upon ingesting the cereal, it is expected that some of the iron is dissolved in the stomach acid and will be absorbed into the system as it passes through the intestines. Not all the iron (as well as the other ingredients) will be absorbed. Remember, a single serving *contains* the daily adult requirement of vitamins and minerals.

Iron is added to the instant oatmeal or similar product packages along with the cereal. It is not cooked or processed into the cereal mix. (Note: As a result of this experiment being published and inquiries being made to the manufacturers, some companies have replace the metallic iron in their products with an iron compound.)

Reference

Katz, David A., **CHEMECOLOGY, 21**, No. 2, 7, March 1992.

Acknowledgment

The author wishes to thank Dr. Babu George, Sacred Heart University, for the experiment with the instant breakfast cereal.

EXTRACTING IRON FROM CEREAL

Teacher Notes

This experiment can be used as a classroom demonstration.

This experiment can be used in a discussion of the elements and their use or in a discussion of food and nutrition.

It is suggested that the experiment using Total, or other brand of cereal, be done first. The impact of the instant oatmeal is greater after the iron has been discovered in the processed cereal.

Have students call the Consumer Departments of the cereal companies for additional information.

In a letter from General Mills, regarding the iron in Total cereal, they stated that the absorption of iron is not completely understood and that sufficient iron is added to the cereal to insure that the required daily amount of iron is processed by the body.