

# Environmental Health Fact Sheet

## Barium

### What is Barium?

- Barium is a metal which exists in nature in ores containing a mixture of elements. It combines with other chemicals to form barium compounds.
- The two most prevalent naturally occurring barium compounds are barium sulfate and barium carbonate.

### Are there commercial uses for these compounds?

- Barium compounds are used to make paint, bricks, ceramics, glass, and rubber.
- Barium sulfate is used in medical settings for X-ray studies of the gastrointestinal tract (barium swallow or barium enema).
- Barium compounds are also used by the oil and gas industries as a component in drilling mud. Drilling mud makes it easier to drill through rock by keeping the drill bit lubricated.

### Is Barium present in the environment?

- Barium enters the environment through the weathering of rocks and minerals and through man-made releases.
- Barium enters the air during mining, refining, production of barium compounds, and from burning coal. Barium is generally present in air as a result of industrial emissions, particularly from combustion of coal and diesel oil and waste incineration.
- The length of time that barium lasts in the environment depends on the form of barium released.
- Barium sulfate and barium carbonate, which do not dissolve well in water, can last a long time in the environment.
- Barium chloride, barium nitrate, and barium hydroxide dissolve readily in water and usually do not last in these forms for a long time. The resulting barium combines quickly with sulfate or carbonate that is naturally found in water and becomes the longer lasting forms (barium sulfate and barium carbonate).
- Fish and other fresh water and marine life can accumulate barium.
- Barium has been found in at least 798 of the approximately 1700 National Priority List sites (Superfund hazardous waste sites) identified by the Environmental Protection Agency (EPA).

## **How are people exposed to Barium?**

- People are exposed to barium, usually at low levels, through drinking water, food, and beverages. Food is the primary source of barium exposure. However, when barium levels are high in groundwater, drinking water may contribute significantly to barium intake.
- The major dietary sources of barium are milk, potatoes, and flour. Bread is considered the largest source of dietary barium. Some cereal products (bran flakes) and some nuts (Brazil nuts & pecans) may also contain barium.
- People can be exposed to barium by breathing contaminated air.
- People can also be exposed by working in a job that involves barium production or use.
- People living or working near waste sites containing barium may be exposed to it.
- People can be exposed to barium during certain diagnostic medical procedures. Barium sulfate (poorly soluble) is used as an opaque contrast medium for X-ray studies of the gastrointestinal tract.

## **What happens to Barium once it enters the body?**

- In humans, the majority of absorbed barium leaves the body in the stool and a smaller amount is excreted in the urine.
- Absorbed barium that does not leave the body is deposited mainly in bone and teeth.
- Barium can be transferred to unborn babies through the placenta.

## **How harmful is exposure to Barium?**

- Exposure to barium in food and water above background levels for a short period of time may cause vomiting, diarrhea, difficulties in breathing, changes in blood pressure, numbness around the face, and muscle weakness.
- Barium has been found to cause stomach and intestinal problems and muscular weakness in people exposed to levels above EPA drinking water standards for short periods of time.
- Ingesting large amounts of barium can cause changes in heart rhythm, paralysis and possibly death.
- The health effects of different barium compounds depend on how well the compound dissolves in water or in stomach contents. Barium compounds that do not dissolve well, such as barium sulfate, are generally not harmful. Soluble barium compounds can be highly acutely toxic.

## **Can exposure to barium cause cancer?**

- The U.S. Department of Health and Human Services (DHHS), the International Agency for Research on Cancer (IARC), and the EPA have determined that barium is not likely to cause cancer in humans following ingestion.

### **Is there a medical test to show whether I've been exposed to Barium?**

- Barium can be measured in body tissues and fluids, such as bones, blood, urine and feces, but these measurements cannot be used to predict the extent of exposure or potential health effects. These tests are normally done only for cases of severe barium poisoning and for medical research.
- Results of these tests should be reviewed and carefully interpreted by physicians with a background in toxicology and environmental medicine.

### **What is the treatment for barium poisoning?**

- Emergency medical care should be sought in cases of suspected barium poisoning.
- Decreased blood potassium levels are commonly seen in cases of acute barium toxicity. Plasma potassium should be monitored and low potassium levels may be relieved by intravenous infusion of potassium.
- Hemodialysis is sometimes used to decrease levels of barium in the blood and improve clinical signs.

### **Has the federal government made recommendations to protect public health?**

- EPA has set a maximum concentration limit (MCL) of 2 milligrams per liter (mg/L) or 2000 parts per billion (ppb) of barium in drinking water.
- WHO has set a limit of 0.7 mg/L (700 ppb) of barium.
- The Occupational Safety and Health Administration (OSHA) has set Permissible Exposure Limits (PELs) of 0.5 milligrams of soluble barium compounds per cubic meter of workplace air ( $0.5 \text{ mg/m}^3$ ) for 8-hour shifts and 40 hour work weeks. The OSHA limits for barium sulfate dust are  $15 \text{ mg/m}^3$  of total dust and  $5 \text{ mg/m}^3$  for the respirable fraction of the airborne particulate.
- The National Institute for Occupational Safety and Health (NIOSH) has set Recommended Exposure Limits (RELs) of  $0.5 \text{ mg/m}^3$  for soluble barium compounds. The NIOSH has set RELs of  $10 \text{ mg/m}^3$  (total dust) for barium sulfate and  $5 \text{ mg/m}^3$  the respirable fraction of the airborne particulates.

### **What can I do to prevent exposure to Barium?**

- Food and drinking water are the greatest potential source for human exposure to barium compounds. People can limit exposure to foods and water known to contain barium. However, the amount of barium in foods and drinking water is usually too low to cause health concerns.
- Distillation or reverse osmosis filtration will remove barium from drinking water.

## **Where can I get more information?**

For more information, contact:

The Pennsylvania Department of Health, Division of Environmental Health Epidemiology, P.O. Box 90, Harrisburg, Pennsylvania, 17108. Telephone number: 717-787-1708 or visit the following websites:

Centers for Disease Control and Prevention, Agency for Toxic Substances and Disease Registry: <http://www.atsdr.cdc.gov>

U.S. Environmental Protection Agency: <http://www.epa.gov>

## **References**

Agency for Toxic Substances and Disease Registry (ATSDR), 2007. ToxFAQs for Barium and compounds. Atlanta, GA: U.S. Department of Public Health and Human Services, Public Health Service.

Agency for Toxic Substances and Disease Registry (ATSDR), 2007. Toxicological Profile for Barium and compounds (Update). Atlanta, GA: U.S. Department of Public Health and Human Services, Public Health Service.

U.S. Environmental Protection Agency, Toxicological Review of Barium and Compounds

Content last modified on 2/9/11