The ToxGuide™ is developed to be used as a pocket guide. Tear off at perforation and fold along lines.

Sources of Exposure

General Populations

- The general population is exposed to barium through consumption of drinking water and food, usually at low levels.
- Barium sulfate is frequently utilized as a benign, radiopaque aid to x-ray diagnosis in colorectal and some upper gastrointestinal examinations.
- Barium and compounds are used in oil and gas drilling muds, automotive paints, stabilizers for plastics, case hardening steels, bricks, tiles, lubricating oils, and jet fuel as well as in various types of pesticides.

Occupational Populations

- Occupational exposure to barium primarily occurs in barium mining or processing industries.

Toxicokinetics and Normal Human Levels

Toxicokinetics

- Approximately 50–75% of inhaled barium chloride or barium sulfate is absorbed from the respiratory tract.
- Approximately <5–30% of acid-soluble barium compounds, such as barium chloride and barium carbonate are absorbed.
- Barium sulfate is extremely insoluble and very little, if any, is absorbed through the gastrointestinal tract.
- Approximately 90% of the body burden of barium is contained in the bones and teeth.
- The primary route of excretion from the body is the feces.

Normal Human Levels

- In the United States, the geometric mean concentration of barium in the urine is approximately 1.5 µg/L.

Biomarkers/Environmental Levels

Biomarkers

- Barium can be measured in bone, blood, urine, and feces. However, there are no data correlating barium levels in these tissues with specific exposure levels.
- Gastrointestinal disturbances followed by hypokalemia, hypertension, and heart rhythm abnormalities are frequently reported following acute oral exposure to high doses of barium.

Environmental Levels

Air

- The concentration of barium in ambient air is estimated to be <0.05 µg/m^3.

Sediment and Soil

- Barium is found in most soils at concentrations ranging from about 15 to 3,500 ppm and mean values ranging between 265 and 835 ppm, depending on soil type.

Water

- Barium concentrations in drinking water typically average 30 µg/L, but can average as high as 302 µg/L.

Reference

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

ToxGuide™ for Barium

Ba

CAS# 7440-39-3

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U.S. Department of Health and Human Services
Public Health Service
Agency for Toxic Substances and Disease Registry
www.atsdr.cdc.gov

Contact Information:
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www.atsdr.cdc.gov/toxpro2.html

ATSDR
AGENCY FOR TOXIC SUBSTANCES AND DISEASE REGISTRY

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Chemical and Physical Information

Barium is an alkaline earth metal

- Barium is a silvery-white metal that primarily occurs in nature as barite (barium sulfate) and witherite (barium carbonate) ores.
- Barium compounds are solids, existing as powder or crystals.

Routes of Exposure

- Inhalation – generally limited to occupational exposure.
- Oral – Primary route of exposure for general population. Some foods, such as Brazil nuts, seaweed, fish, and certain plants, may contain high amounts of barium.
- Dermal – minor route of exposure.

Barium in the Environment

- Barium enters the environment naturally through the weathering of rocks and minerals. Anthropogenic releases are primarily associated with industrial processes.
- In the atmosphere, barium is likely to present in particulate form and is primarily removed by wet and dry deposition.
- In aquatic media, barium is likely to precipitate out of solution as an insoluble salt.
- Barium is not very mobile in most soil systems due to the formation of water-insoluble salts and the inability of barium to form soluble complexes with fulvic and humic acids.
- Barium has the potential to bioconcentrate in marine animals and plants and in some terrestrial plants such as legumes, forage plants, Brazil nuts, and mushrooms.

Relevance to Public Health (Health Effects)

Health effects are determined by the dose (how much), the duration (how long), and the route of exposure.

Minimal Risk Levels (MRLs)

Inhalation

- No acute-, intermediate- or chronic-duration inhalation MRLs were derived for barium.

Oral

- No acute-duration oral MRL was derived for barium.
- An MRL of 0.2 mg barium/kg/day has been derived for intermediate-duration oral exposure (15–364 days).
- An MRL of 0.2 mg barium/kg/day has been derived for chronic-duration oral exposure (≥1 year).

Health Effects

- Based on limited human and animal data, the respiratory tract is the most sensitive target following inhalation exposure.
- The solubility of the barium compound in the gastrointestinal tract is an important factor affecting the development of adverse health effects. Compounds such as barium chloride and barium carbonate are generally expected to be of greater health concern than insoluble barium compounds (notable barium sulfate) which are generally nontoxic to humans.
- The predominant effect following ingestion of high doses of barium is hypokalemia which can result in ventricular tachycardia, hypertension and/or hypotension, muscle weakness, and paralysis.
- Animal studies suggest that the kidney is a sensitive target following long-term exposure to low levels of soluble barium compounds.

Children's Health

- The available data are insufficient to determine whether children may be more susceptible to barium toxicity than adults.
- There are some data suggesting that children may absorb more barium than adults.