Sources of Exposure

General Populations

- The general population is exposed to low levels of antimony from ingestion of food and drinking water and by inhalation of dust. Dermal exposure may also occur through skin contact with soil, water, or other substances containing antimony.
- The general population may also be exposed to antimony in polyethylene terephthalate (PET) water bottles.
- Antimony compounds are used medically to treat parasitic diseases such as leishmaniasis.

Occupational Populations

- Occupational exposure may occur at facilities that produce antimony alloys or antimony containing products.
- Occupational exposure can also occur at smelters, coal-fired plants, and refuse incinerators that process or release antimony.

Toxicokinetics and Normal Human Levels

Toxicokinetics

- Antimony is poorly absorbed and its absorption is strongly influenced by the antimony compound.
- Poorly soluble compounds such as antimony trioxide are slowly cleared from the lungs (measured in weeks) compared to more soluble compounds, such as antimony trichloride, which are cleared from the lungs in days.
- Absorption through the gastrointestinal tract is estimated at approximately 1% for antimony trioxide and 10% for antimony potassium tartrate.
- Studies suggest that antimony may be absorbed through the skin.
- Absorbed antimony is widely distributed with the highest concentrations in the liver, kidneys, and skeleton.
- Antimony is excreted in the urine and feces. Trivalent antimony is predominantly excreted in the feces, with smaller amounts in the urine; pentavalent antimony is primarily excreted in the urine.

Normal Human Levels

- The National Health and Nutrition Examination Survey [NHANES] 2015–2016) reported a 50th percentile urinary antimony concentration of 0.046 µg/L.

Biomarkers/Environmental Levels

Biomarkers

- Antimony can be measured in blood, hair, urine and feces.

Environmental Levels

Air

- Background levels in ambient air are about 1 ng/m^3 but can be higher in urban areas.

Sediment and Soil

- Antimony is naturally present in the earth's crust at levels of about 0.2–0.3 µg/g (ppm).
- A survey of soils conducted by the USGS showed concentrations ranging from <1 to 8.8 ppm (µg/g); average concentration of 0.48 ppm (µg/g).

Water

- In groundwater, median concentrations across the United States from 1992–2003 were <1 µg/L (ppb).
- Antimony levels can be much higher in geothermal water.

Reference

Agency for Toxic Substances and Disease Registry (ATSDR). 2019. Toxicological Profile for Antimony and Compounds. Atlanta, GA: U.S. Department of Health and Human Services, Public Health Services.

ToxGuide™ for Antimony

Sb

CAS# 7440-36-0

October 2019

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

ATSDR
AGENCY FOR TOXIC SUBSTANCES AND DISEASE REGISTRY

Chemical and Physical Information

Antimony is a Naturally Occurring Metal

- Antimony metal is stable under ordinary conditions.
- It displays 4 oxidation states, the most common are Sb(III) and Sb(V).
- Stibine (SbH_3) is a gaseous antimony compound.
- Antimony forms stable complex ions with organic and inorganic acids
- Antimony lead alloys are used in small arms ammunition, cable sheathing and lead pipe, and terminals of lead-acid batteries.
- Antimony is used as an opacifer for ceramic glaze and polymerization catalyst to manufacture polyester fibers.
- Antimony salts are used in certain pesticides, ammunition primers, flares, tracer shells, fireworks and in the manufacture of disk brake pads and cutting disks.

Routes of Exposure

- Inhalation – Minor route of exposure for the general population. Predominant route of occupational exposure.
- Oral – Predominant route of exposure for the general population through ingestion of antimony in food and to a lesser extent through drinking water.
- Dermal – Not likely exposure route of concern for the general population.

Antimony in the Environment

- Antimony is a natural constituent of soil.
- It is transported into streams and waterways from natural weathering of soil, as well as from anthropogenic sources.
- It is retained in the soil through adsorption and can sorb onto clay minerals, oxides, and hydroxides in the soil and aquatic sediment.
- Antimony can be reduced and methylated by microorganisms in anaerobic sediment, releasing volatile methylated antimony compounds into the water.
- Multiple microorganisms have been found to methylate antimony in the soil and water.

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

- An acute-duration (≤14 days) inhalation MRL of 0.001 mg Sb/m^3 was derived for antimony.
- The acute-duration inhalation MRL was adopted for the intermediate-duration (15-364 days) inhalation MRL.
- A chronic-duration (≥365 days) inhalation MRL of 0.0003 mg/m^3 was derived for antimony.

Oral

- An acute-duration (≤14 days) oral MRL of 1 mg Sb/kg/day was derived for antimony.
- An intermediate-duration (15-364 days) oral MRL of 0.0006 mg Sb/kg/day was derived for antimony.
- No chronic duration oral MRL was derived for antimony.

Health Effects

- Most of the available health effects data are for trivalent antimony compounds which appear to be more toxic than pentavalent antimony compounds.
- Exposure to antimony dust can cause skin and eye irritation.

Health Effects

- In antimony workers, pneumoconiosis and clinical signs such as coughing and laryngitis have been reported.
- In animals, accumulation of antimony particles in the lungs caused increases in alveolar/intra-alveolar macrophages, decreases in antimony lung clearance times, chronic interstitial inflammation, and interstitial fibrosis.
- Myocardial damage and alterations in EKGs have been observed in humans and animals.
- Abdominal pain, vomiting, nausea, diarrhea and stomach ulcers have been observed following inhalation and oral exposure.
- The Department of Health and Human Services (HHS) has determined that antimony trioxide is a reasonably anticipated human carcinogen. International Agency for Research on Cancer (IARC) has determined that antimony trioxide is possibly carcinogenic to humans and antimony trisulfide is not classifiable as to its carcinogenicity.

Children's Health

- It is not known if children are more sensitive to antimony exposure than adults.
- Studies in workers and rats have shown that antimony can decrease infant growth. There is also limited information suggesting that antimony can damage the developing cardiovascular system in rats.