



## ANTIMONY AND COMPOUNDS

Please Note: The main sources of information for this fact sheet are EPA's Integrated Risk Information System (IRIS), which contains information on oral chronic toxicity and the RfD, and the Agency for Toxic Substances and Disease Registry's (ATSDR's) *Toxicological Profile for Antimony*. Other secondary sources include the Hazardous Substances Data Bank (HSDB), a database of summaries of peer-reviewed literature, and the Registry of Toxic Effects of Chemical Substances (RTECS), a database of toxic effects that are not peer reviewed.

### Environmental/Occupational Exposure

- \* Antimony is found at very low levels throughout the environment. (1)
  - \* The concentration of antimony in ambient air ranges from less than 1 ng/m<sup>3</sup>\* to about 170 ng/m<sup>3</sup>. However, near factories that convert antimony ores into metal, or make antimony oxide, concentrations may be greater than 1,000 ng/m<sup>3</sup>. (1)
  - \* Soil usually contains very low concentrations of antimony (less than 1 ppm). However, higher concentrations have been detected at hazardous waste sites and at antimony-processing sites. (1)
  - \* Food contains small amounts of antimony: the average concentration of antimony in meats, vegetables, and seafood is 0.2 to 1.1 ppb. (1)
  - \* Persons who work in industries that process antimony ore and metal, or make antimony oxide, may be exposed to antimony by breathing dust or by skin contact. (1)

### Assessing Personal Exposure

- \* Antimony can be measured in the urine, feces, and blood. (1)

### Health Hazard Information

#### *Acute Effects:*

- - \* The only effects reported from acute (short-term) exposure to antimony by inhalation in humans are effects on the skin and eyes. Skin effects consist of a condition known as antimony spots, which is a rash consisting of pustules around sweat and sebaceous glands, while effects on the eye include ocular conjunctivitis. Oral exposure to antimony in humans has resulted in gastrointestinal effects. (1,2)
  - \* Animal studies have reported effects on the lungs, cardiovascular system, and liver from acute exposure to high levels of antimony by inhalation. (1)
  - \* Antimony is considered to have high acute toxicity based on short-term tests such as the LD<sub>50</sub> test in rats, mice, and guinea pigs. (3)
  - \* EPA's Office of Air Quality Planning and Standards, for a hazard ranking under Section 112(g) of the Clean Air Act Amendments, considers antimony pentafluoride to be a "high concern" pollutant based on severe acute toxicity. (4)

### ***Chronic Effects (Noncancer):***

- - \* The primary effects from chronic (long-term) exposure to antimony in humans are respiratory effects that include antimony pneumoconiosis (inflammation of the lungs due to irritation caused by the inhalation of dust), alterations in pulmonary function, chronic bronchitis, chronic emphysema, inactive tuberculosis, pleural adhesions, and irritation. (1,2)
  - \* Other effects noted in humans chronically exposed to antimony by inhalation are cardiovascular effects (increased blood pressure, altered EKG readings and heart muscle damage) and gastrointestinal disorders. (1,2)
  - \* Animal studies have reported effects on the respiratory and cardiovascular systems and kidney from chronic inhalation exposure. Oral animal studies have reported effects on the blood, liver, central nervous system (CNS), and gastrointestinal effects. (1)
  - \* EPA has not established an RfC for antimony. (5)
  - \* The RfD for antimony is 0.0004 mg/kg/d based on longevity, blood glucose, and cholesterol in rats. (5)
  - \* EPA has low confidence in the study on which the RfD was based because only one species was used, only one dose level was used, no no-observed-adverse-effect level (NOAEL) was determined, and gross pathology and histopathology were not well described; low confidence in the database due to lack of adequate oral exposure investigations; and, consequently, low confidence in the RfD. (5)
  - \* EPA's Office of Air Quality Planning and Standards, for a hazard ranking under Section 112(g) of the Clean Air Act Amendments, has evaluated antimony potassium tartrate and antimony trisulfide for chronic toxicity and has given them composite scores of 38 and 46, respectively (scores range from 1 to 100, with 100 being the most toxic). These scores are nonlinear and are the product of two ratings: a rating based on the minimal-effect-dose and a rating based on the type of effect. (4)

\* EPA's Office of Air Quality Planning and Standards, for a hazard ranking under Section 112(g) of the Clean Air Act Amendments, considers antimony trisulfide to be a "high concern" pollutant based on severe chronic toxicity. (4)

### ***Reproductive/Developmental Effects:***

- - \* An increased incidence of spontaneous abortions, as compared with a control group, was reported in women working at an antimony plant. Disturbances in the menstrual cycle were reported in women exposed to various antimony compounds in a metallurgical plant. However, the study that reported these findings was unclear about concurrent exposure to other chemicals, nor did it provide the characteristics of the controls used. (1,2)
  - \* Animal studies have reported a decrease in the number of offspring born to rats exposed to antimony prior to conception and throughout gestation. Reproductive effects, including metaplasia in the uterus and disturbances in the ovum-maturing process, were reported in a rat study, following inhalation exposure. (1)

### ***Cancer Risk:***

- - \* In one human study, inhalation exposure to antimony did not affect the incidence of cancer in workers employed for 9 to 31 years. (1)
  - \* Lung tumors have been observed in rats exposed to antimony trioxide by inhalation. (1,2,5)
  - \* Two oral studies reported no change in the incidence of cancer in rats fed antimony for a lifetime. However, the usefulness of these studies is limited because only one dose was used. (1)
  - \* EPA has not classified antimony for carcinogenicity. (5)

### **Physical Properties**

- \* Antimony is a silvery-white metal that is found in the earth's crust. Antimony ores are mined and then either changed to antimony metal or combined with oxygen to form antimony oxide. (1)
- \* Antimony oxide is a white powder that is insoluble in water. (1)
- \* Antimony metal is a very brittle, moderately hard metal. (1)
- \* The chemical symbol for antimony is Sb, and it has an atomic weight of 121.75 g/mol. (1)

### **Uses**

- \* Antimony is alloyed with other metals such as lead to increase its hardness and strength; its primary use is in antimonial lead, which is used in grid metal for lead acid storage batteries. (1)
- \* Other uses of antimony alloys are for solder, sheet and pipe, bearing metals, castings, and type metal. (1)
- \* Antimony oxides (primarily antimony trioxide) are used as fire retardants for plastics, textiles, rubber, adhesives, pigments, and paper. (1)

### Health Data from Inhalation Exposure

Concentration (mg/m <sup>3</sup> )	Health numbers <sup>a</sup>	Regulatory, advisory numbers <sup>b</sup>	Reference
1,000.0			
— — — — 100.0			
— — — — 10.0			
— — — — 1.0			
— — — —		<ul style="list-style-type: none"> <li>* OSHA PEL, ACGIH TLV, and NIOSH REL (0.5 mg/m<sup>3</sup>)</li> </ul>	6

0.1

- ACGIH TLV American Conference of Governmental and Industrial Hygienists' threshold limit value expressed as a time-weighted average; the concentration of a substance to which most workers can be exposed without adverse effects.

NIOSH REL National Institute of Occupational Safety and Health's recommended exposure limit; NIOSH-recommended exposure limit for an 8- or 10-h time-weighted-average exposure and/or ceiling.

OSHA PEL Occupational Safety and Health Administration's permissible exposure limit expressed as a time-weighted average; the concentration of a substance to which most workers can be exposed without adverse effect averaged over a normal 8-h workday or a 40-h workweek.

<sup>a</sup> Health numbers are toxicological numbers from animal testing or risk assessment values developed by EPA.

<sup>b</sup> Regulatory numbers are values that have been incorporated in Government regulations, while advisory numbers are nonregulatory values provided by the Government or other groups as advice.

## References

- 1. Agency for Toxic Substances and Disease Registry (ATSDR). *Toxicological Profile for Antimony* (Draft). U.S. Public Health Service, U.S. Department of Health and Human Services, Atlanta, GA. 1992.
- 2. U.S. Department of Health and Human Services. Hazardous Substances Data Bank (HSDB, online database). National Toxicology Information Program, National Library of Medicine, Bethesda, MD. 1993.
- 3. U.S. Department of Health and Human Services. Registry of Toxic Effects of Chemical Substances (RTECS, online database). National Toxicology Information Program, National Library of Medicine, Bethesda, MD. 1993.
- 4. U.S. Environmental Protection Agency. *Technical Background Document to Support Rulemaking Pursuant to the Clean Air Act Section 112(g). Ranking of Pollutants with Respect to Hazard to Human Health*. EPAB450/3-92-010. Emissions Standards Division, Office of Air Quality Planning and Standards, Research Triangle Park, NC. 1994.
- 5. U.S. Environmental Protection Agency. *Integrated Risk Information System (IRIS) on Antimony*. Environmental Criteria and Assessment Office, Office of Health and Environmental Assessment, Office of Research and Development, Cincinnati, OH. 1993.
- 6. E.J. Calabrese and E.M. Kenyon. *Air Toxics and Risk Assessment*. Lewis Publishers, Chelsea, MI. 1991.



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