

situation in which the arsenic was in "coke breeze" added to the plaster used in house walls.¹⁰

Lead arsenate, a common insecticide spray, presents an arsenic poisoning hazard for both tree sprayers and insecticide workers. However, the danger of plumbism probably exceeds that of arsenic intoxication, except where the exposure is brief but exceptionally severe.

Watrous and McCaughey, investigating the exposures of workers manufacturing and handling arspenamine and related arsenic compounds, found average concentrations of 0.2 mg of arsenic per cubic meter of air, and about 1.0 mg of arsenic per liter of urine of exposed persons. Thus 80 to 90% of the inhaled arsenic was found in the urine. Concentrations of arsenic in excess of 2 mg per liter of urine were considered high, and a few workers with urinary arsenic levels up to 3.7 mg per liter had symptoms suggestive of arsenic poisoning.¹¹

One of the most dangerous compounds of arsenic is the hydride, arsine (arseniuretted hydrogen), a gas formed by the action of nascent hydrogen on arsenic compounds.

ARSINE, AsH₃

Molecular weight: 77.9. Boiling point: -55° C.
Harmful effects: Blood changes, liver damage.
Degree: Serious, fatal.
Maximum allowable concentration: 0.05 ppm.
0.5 mg. As/l urine.

Evaluation: Air analysis.
Urine analysis.

Typical arsine poisonings follow single accidental exposures to the gas, but Bulmer and co-workers reported a group with exposures of up to 8 months' duration.¹² These occurred among employees of a gold extraction plant. Jaundice and anemia were the outstanding medical findings. The urines of the affected men contained 0.7 to 4 mg of arsenic per liter, within a few days after exposure had ceased. Assuming 50% of the absorbed arsine is excreted in the urine, 1 mg per liter (1 day's elimination) would correspond to an intake of 2 mg, or 0.4 mg per cubic meter of air, if we take 5 cubic meters of air as the average 8-hour inhalation. This corresponds to 0.12 ppm of arsine. As many of these men

were quite ill, a maximum allowable concentration of 0.05 ppm would not seem too drastic.

The writer investigated one serious, but non-fatal, case of acute or subacute arsine poisoning. Analysis of urine samples, taken shortly after the exposure which lasted only 2 or 3 days, showed about 1 mg of arsenic per liter. The urine was practically blood-red in color. Arsine was demonstrated coming off the calcium hydride and metal oxide mixture, with which the patient had worked, in concentrations averaging 0.5 ppm.

The great hazard from arsine lies in its selective volatility rather than its toxicity, extreme as that may be. Thus a dust of an inert compound containing 0.1% arsenic would be unlikely to produce poisoning; but, if the material were subjected to chemical or electrolytic reduction processes, the arsenic might be volatilized almost entirely as arsine, and a hazardous concentration could result from a relatively small amount of material.

5. Columbium

Columbium is a rare element, and no case of industrial poisoning from it has been reported.

6. Antimony, Sb

Atomic weight: 121.76. Melting point: 630° C. Boiling point: 1440° C.
Important compounds: Metallic antimony, Sb₂O₃, SbCl₃, Sb₂S₃, SbH₃.
Harmful effects: Dermatitis, gastrointestinal disturbances.
Degree: Usually mild.
Maximum allowable concentration: (1 mg/m³.)

Although antimony compounds are toxic and antimony finds considerable industrial application, occupational poisoning from this element is extremely rare. Dermatitis caused by contact with antimony salts has been well established, but it is not widespread. Occasionally workers exposed to the dust of antimony or its compounds exhibit symptoms of gastrointestinal upset, usually acute rather than chronic in character.

Little is known of the permissible concentration for antimony. Dernehl and others found that animals subjected to 45 mg of antimony trioxide per cubic meter of air for 3 hours daily suffered from pneumonitis and liver damage.¹³