Deriving a health-based guidance value for antimony to support development of UK Drinking Water Standards

Properties of antimony

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5. Antimony (Sb, CAS number: 7440-36-0) is a silvery white metal with atomic number 51. Antimony and its compounds are naturally present in the Earth's crust and are released into the environment by natural discharges such as windblown dust, volcanic eruptions, sea spray, forest fires and biogenic sources (Sundar, S., & Chakravarty, J., 2010).

6. Antimony compounds can exist in two valency states: trivalent (Sb^{3+}) and pentavalent (Sb^{5+}). Trivalent compounds include antimony trioxide (Sb2O3), antimony trisulfide (Sb2S3) and antimony trichloride (Sb2Cl3), while pentavalent compounds include antimony pentoxide (Sb2O5), antimony pentasulfide (Sb2S5),

and antimony potassium tartrate ($K_2Sb_2(C_4H_2O_6)_2$. The most important antimony compounds from the context of potential exposure to humans are antimony trioxide and antimony pentoxide, due to their widespread use in industrial applications.

7. The toxicity of antimony is a function of the water solubility and the oxidation state of the antimony species under consideration (Elinder & Friberg, 1986). In general, trivalent antimony is more toxic than pentavalent antimony, and the inorganic compounds are more toxic than the organic compounds.

8. Elemental antimony exhibits no solubility in water, while antimony trioxide is slightly soluble, and antimony pentoxide is very slightly soluble. In contrast, antimony potassium tartrate is highly water-soluble, and sodium hexahydroxyantimonate demonstrates moderate solubility (Health Canada (2024), ATSDR (2019)).

9. Occupational exposure to antimony occurs mainly in workers involved in industries producing antimony and antimony trioxide, metal mining, smelting and refining, coal-fired power plants, refuse incineration, or those working in indoor firing ranges. The most common source of antimony in drinking-water appears to be dissolution from metal plumbing and fittings. Antimony is not removed from water by conventional treatment processes and control would therefore be by source selection or dilution (WHO, 2003).