Toxicokinetics and Toxicity

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Toxicokinetics

10. Antimony is poorly absorbed, and its absorption is largely dependent on the solubility and its oxidation state, of the specific antimony compound. Absorption through the gastrointestinal tract is estimated at approximately 1% for antimony trioxide and 10% for antimony potassium tartrate (ICRP, 1981).

11. The highest concentrations of antimony are found in the gastrointestinal tract, red blood cells, liver, kidney, bone, lung, spleen, and thyroid of laboratory animals exposed via oral exposure (NTP, 1992). In the blood, pentavalent antimony is mainly found in the serum, whereas trivalent antimony is found in the haemoglobin of red blood cells; both forms can enter red blood cells, with

pentavalent antimony shown to do so via protein channels. Antimony can also transfer across the placenta and through breast milk, indicating potential exposure to the developing foetus and infants (Miranda et al. 2006).

12. Antimony is not metabolised. However, there are data suggesting the interconversion of pentavalent antimony and trivalent antimony. In mammals, in vitro studies indicate that ingested antimony undergoes intracellular interconversion between its trivalent and pentavalent states (NTP, 2018). The reduction of pentavalent to trivalent antimony occurs in a dose-dependent manner and is facilitated by acidic pH and higher temperatures. Once reduced to trivalent antimony, the compound conjugates with reduced glutathione (GSH), which is then followed by enterohepatic recycling of the trivalent antimony-GSH complex.

13. Antimony is excreted in the urine and faeces. Trivalent antimony is predominantly excreted in the faeces, with smaller amounts in the urine and pentavalent antimony is primarily excreted in the urine (Goodwin and Page, 1943).

Toxicity

14. The toxicity of antimony has been reviewed by WHO (2003), ATSDR (2019), and Health Canada (2024). The primary targets of toxicity appear to the heart (alterations in ECG readings), gastrointestinal tract (nausea, abdominal pain, vomiting, diarrhoea, anorexia), musculoskeletal system (myalgia, arthralgia), liver (increases in alanine and aspartate aminotransferases), pancreas (increases in serum amylase levels) and nervous system (headache, dizziness).

15. This section focusses on the Poon et al. (1998) study, and the subsequent commentaries by Lynch et al. (1999) and Valli et al. (2000), as these form the basis of the HBGVs proposed by WHO, ATSDR and Health Canada. A summary of additional toxicity studies identified from ATSDR and Health Canada is also provided.