Abstract:
Antimony (Sb) is a silvery-white metal found in the earth’s crust and is typically used in industrial applications, as well as in the treatment of two parasitic diseases, leishmaniasis and schistosomiasis. The general public is exposed to low levels of Sb through average food and water consumption, though Sb has been shown to be poorly absorbed from the gastrointestinal tract. Elevated human exposure to Sb has been associated with chronic respiratory, cardiovascular system, kidney, blood, liver, central nervous system, gastrointestinal, and reproductive/developmental non-cancer health effects. In 1987, the U.S. EPA published a chronic oral reference dose (RfD) of 0.0004 mg/kg bw/day for Sb based on a LOAEL of 0.35 mg/kg bw/day from a chronic rat drinking water study conducted by Schroeder et al. (1970). However, there were several limitations to the study and the U.S. EPA’s overall confidence in this study is classified as “low.” Our assessment was designed to identify and propose an updated chronic oral RfD for Sb. A comprehensive literature review was conducted to identify relevant animal studies that have been published on Sb toxicity since Schroeder et al. (1970). In 2003, the World Health Organization (WHO) based their drinking water guideline for Sb on a NOAEL of 6.0 mg/kg bw/day, which was estimated from a subchronic rat drinking water study of potassium antimony tartrate (APT) published in 1998. The WHO calculated their tolerable daily intake (TDI) dose of 0.006 mg/kg bw/day by applying an uncertainty factor (UF) of 1000. After reviewing more recent Sb toxicity data, the WHO re-confirmed the use of a NOAEL of 6.0 mg/kg bw/day in 2017. As part of our review, we evaluated one fairly recent subchronic rat drinking water study published in 2013, which was not referenced in the 2017 WHO assessment. This study described structural and functional renal toxicity in rats treated with antimony trisulfide at a dose of 6 mg/kg bw/day for 8 and 12 weeks. However, this study suffers from a number of limitations and ultimately was deemed inappropriate for establishing an RfD. Therefore, we agree with the approach taken by the WHO for establishing their TDI. It is our opinion that for the general population for a lifetime of daily Sb exposure, an updated chronic RfD for Sb of 0.006 mg/kg bw/day would be a conservative value that is protective of non-cancer health effects.