

Bioaccessibility of heavy metals in soils and health risk assessment around an antimony smelting factory

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Large amount of heavy metals has been brought into soils, caused by mining and smelting activities. Soils enriched with heavy metals could pose potential threats to human health via different exposures like soil ingestion. Thus it is crucial to accurately assess the potential human health risks through the ingestion of contaminated soils for prevention and control of soil pollution. However, total concentrations of heavy metals are most often implemented to assess the human health risk, which could overestimate the risk, as only the bioaccessible part of heavy metals in soils is potentially adsorbed through gastrointestinal system for human.

In this study, tens of soil samples were collected from an active large Sb smelting factory, Guizhou, China, and two commonly used in vitro extraction methods, Simplified bioaccessibility Extraction Test (SBET) and Physiologically Based Extraction Test (PBET), were adopted to investigate the bioaccessibility and human health risks of heavy metals in soils. Results showed that soils around the Sb smelting factory were severely contaminated by Sb and As, and accompanied with Cd, Tl, Pb, Zn and Mn contamination. The bioaccessibility values of Sb and As were less than 12% and 6% for SBET, 53% and 21% for PBET, respectively. Based on the bioaccessibility data, The Hazard Quotient (HQ) values of Sb and As were both lower than 1, but the HQ values of Sb were higher than that of As, and the HQ values of Sb and As for children were also higher than that for adults. Moreover, the average Carcinogenic Risk (CR) values of As for Children and adults were both lower than 1.0E-04, with values of 1.38E-06 and 7.71E-07 for SBET, 3.84E-06 and 2.15E-06, respectively, suggesting that the health risk for children is much higher than that for adults in this study area.