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A risk assessment of human exposure to mercury-contaminated soil and household dust in the town of Idrija (Slovenia)

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Abstract

Exposure to soil and dust derived mercury (Hg), associated with a historical legacy of Hg mining in the city of Idrija in Slovenia, is evaluated using results from an earlier geochemical survey. An assessment of adverse health effects with regard to tolerable daily intake of inorganic Hg species is included. Analytical results of aqua regia soluble Hg concentrations, Hg binding forms (cinnabar and non-cinnabar) and Hg gastric bioaccessibility in topsoil and household dust were used to assess the potential adverse health effects of the exposure to Hg. Daily inhalation and ingestion doses were calculated using exposure parameters of different age groups: babies, general population of children, children who exhibit soil pica behaviour, pre-adults, adults and adult gardeners.

The results of the risk assessment indicate that risk of increased Hg uptake is limited to the general population of children, and especially children who exhibit soil-pica behaviour, associated with ingestion of topsoil particles. The latter is the exposure pathway of most concern, so extra caution is recommended during outdoor activities in the urban green spaces of Idrija.

Keywords

URGE; Urban area; Industrial contamination; Risk model; Population at risk; Daily ingestion dose; Daily inhalation dose

1. Introduction

1.1. Study Area

The Idrijan urban area (approximately 3 km²) and Hg mine have been described previously in detail in this journal (Bavec et al., 2015). Idrija is located in the western part of Slovenia, and is approximately 50 km west of the capital city of Ljubljana (Fig. 1). The town has approximately 6000 inhabitants and 2300 households (STAT, 2002). A small densely populated centre with a highly developed urban infrastructure along the Nikova and Idrijca Rivers quickly passes into steep, sparsely populated rural areas, where there are mostly individual houses with gardens. In the urban area, it is a common practice for residents to own small gardens for production of their

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