

A PRELIMINARY SURVEY OF HEAVY ELEMENTS IN INDOOR DUST COLLECTED FROM DIFFERENT SERBIAN MICROENVIRONMENTS

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ABSTRACT

The quality of the indoor microenvironment is a concern for environmental health because people spend up to 90% of their time indoors such as in homes, workplaces, and schools. Indoor dust contains various pollutants, including heavy elements, which adversely affect human health, and the concentration of the studied elements in the settled dust has been shown to be higher than those found in outdoor dust. Studies examining indoor settled dust are limited, especially in developing countries such as Serbia, and knowledge of the occurrence, potential sources, and risks of such regions are rare. Thus, this study was conducted to determine the occurrence and levels of heavy elements (Pb, Cd, Cu, Cr, and Ni) in indoor dust collected in 45 Serbian households, offering the first insight into the current pollution status of the investigated Serbian indoor microenvironments. Geo-accumulation (I_{geo}), pollution (PI), integrated pollution (IPI) and pollution load (PLI) indexes were used to determine the heavy elements contamination and USEPA models were employed to assess non-carcinogenic and carcinogenic risks for the Serbian population. In all analyzed indoor dust samples, Cu was detected with the highest mean concentration (39 mg/kg) followed by Pb (11 mg/kg), Cr (9.1 mg/kg), Cd (2.8 mg/kg) and Ni (2.5 mg/kg). Average concentrations of Cu, Cr and Cd found in indoor dust samples were 4.4, 3.5, and 4.4 times higher, respectively, than the soil background values, which may be used as a reference in the absence of the relevant criteria for assessing the permissible and tolerable levels of heavy metals in indoor dust. The results showed that the current state of indoor dust ranged from unpolluted to polluted, depending on the analyzed elements and the applied index. The health risk assessment model revealed negligible non-cancerous risk for Serbian children and adults, because estimated hazard index values ($1.30E-01$ and $1.40E-02$, respectively) were considerably below the safe limit (<1). Total carcinogenic risk (TCR) estimated via ingestion, inhalation and dermal exposure for Serbian children was $5.58E-04$, exceeding the tolerable risk ($>1.00E-4$), while TCR assessed for Serbian adult population ($8.18E-05$) was in the range of the acceptable/tolerable values (from $1.00E-6$ to $1.00E-4$). To the best of our knowledge, occurrence of these heavy metals are reported for the first time in the indoor dust of Serbian households.

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