Risk Assessment of Potentially Toxic Metal(Loid)S in Urban Soils From Former Industrial Cities of Northeastern Hungary

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Salgótarján and Ózd are two former industrial cities located at the northeastern part of Hungary with approx.. 170 years heavy industrial history, where their urban areas were exposed to pollution from anthropogenic activities. In total, 39 urban soils samples were collected from Salgótarján and 60 from Ózd. The samples were collected at kindergartens, playgrounds, parks, roadsides, former industrial areas. Also, brown forest soil sample as geochemical background was also collected far from the residential areas. Concentration of 17 metal(loid)s (Mo, Cu, Zn, Ag, Ni, Co, Mn, Fe, As, Cd, Sb, V, Cr, Ti, Hg, Sn and Pb) were analyzed in all samples by ICP-MS. Most of these elements are potential toxic metal(loid)s related to heavy industry, which contributed to urban pollution.

The major goal of the present study is to assess the cumulative non-carcinogenic health risk for children recommended by USEPA (2011) through 3 exposure pathways (oral, inhalation and dermal). We used a probabilistic health risk modeling to determine the hazard index non-carcinogenic (HI) and a deterministic approach for each element.

The mean HI value of 17 metal(loid)s is 8.3E-1 showing (HI)<1 and indicating no risk level for children, however 95th percentile HI value is 1.9E+00 with 30.5% of HI values exceeded 1, suggesting non-negligible risk in Salgótarján. The mean HI in Ózd is 8.31E-1, 95th percentile 1.8E+00 and 32.3% of HI values above 1. Deterministic results for Salgótarján: 7.7% As and 5.1% Pb of the samples show risk (HI)>1, and in Ózd: 6.7% Cr, 6.7% Fe, 5.0% Mn, 5.0% As, 3.3% Pb and 1.7% Cd samples show risk (HI)>1.

The probabilistic health risk model suggests a non-negligible risk in Salgótarján and Ózd for 17 metal(loid)s. However, sampling sites nearby to former industrial facilities show health risk mainly for As, Cr and Pb in both cities.