USING ELEMENTAL CONCENTRATIONS AND DUST LOADINGS AS METRICS OF HUMAN EXPOSURE TO POTENTIALLY TOXIC ELEMENTS IN KINDERGARTEN INDOOR DUST

Paula Marinho-Reis [1], Vojtěch Etler[2], Siobhan Cox[3], Martin Mihaljevič[2], Manus Carey[4], Marina CabraL-Pinto[5]

[1] *Instituto de Ciências da Terra, Polo Minho, Universidade do Minho, Campus de Gualtar 4710- 057 Braga, Portugal.*

[2] *Faculty of Science, Charles University, Prague, Czech Republic.*

[3] *School of the Natural and Built Environment, Queen's University Belfast, Belfast, UK.*

[4] *Institute for Global Food Security, Queen's University Belfast, Belfast, UK.*

[5] *Geobiotec, Universidade de Aveiro, Campus de Santiago, 3810-193 Aveiro, Portugal.*

Abstract. Due to the hand-to-mouth activities frequently observed among the youngest children, they are likely to ingest higher amounts of indoor dust than adults. Since pre-schoolers are prone to exposure to potentially toxic elements (PTEs) through the ingestion route, characterising human exposure within kindergarten microenvironments is paramount for children who spend considerable time in school. Ergo, a study encompassing five kindergartens in an industrial city was performed. Indoor dust samples were collected from the kindergartens. The present study reports dust metal concentrations and metal loadings to estimate indoor exposure to PTEs. Total concentrations of chromium (Cr), cobalt (Co), nickel (Ni), cadmium (Cd), arsenic (As) and lead (Pb) were determined by Inductively Coupled Plasma-Mass Spectrometry (ICP-MS) in the of the <63 μm and <250 μm particle size fractions of the indoor dust. The results show that the elemental loadings vary widely among the different kindergartens but are consistently higher in the finer dust size fraction. Non-parametric analysis (Spearman's rank-order correlation) shows strong and significant (p<0.001) positive correlations between total dust loading - dust elemental loading. Relatively strong correlations were also obtained between elemental loadings and elemental concentrations, but the relationship is only significant for Ni and Pb. The strong correlation (rs= 0.73) between Pb concentration and dust Pb loading suggests that total dust loading has a greater influence on dust Pb loading. The results suggest a negligible influence of dust mass over the dust elemental loading for elements such as Cd, Co, Cr and As.

Keywords; particle size, Portugal, lead, nickel, elemental dust loading

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