

## Human oral bioaccessibility of Zn, As and Pb in street dusts of Estarreja, Portugal

<sup>a</sup>Patinha C, <sup>a</sup>Reis A P, <sup>a</sup>Dias A C, <sup>b</sup>Amaral J, <sup>c</sup>Abduljelil A A, <sup>d,e</sup>Noack Y, <sup>f,g</sup>Robert S

Estarreja is a vulnerable region since is heavily contaminated (soils, sediments, air and water) and is characterized by a mixed agriculture/urban land use. Unlike other Portuguese cities, besides the typical urban anthropogenic metal sources, Estarreja is also under the strong influence of the Chemical Complex, which includes several chemical industries, particularly a chlor-alkali plant.

In the environment, potentially toxic substances (PTS) can be emitted from numerous anthropogenic sources and are primarily released via atmospheric emissions. Upon emission, they tend to adhere to particulate matter to form fine particulates and dust.

Incidental ingestion of soil and airborne dust results from normal hand-to mouth activities and represents the principal direct pathway for exposure to non dietary sources of PTS in contaminated areas. Most risk from metals is associated with the metal forms that are biologically available for absorption into systemic circulation or bioaccessible to humans. Bioaccessibility is driven by the physical and chemical composition of the solid in which the inorganic

contaminant is contained.

21 street dust samples were collected in Estarreja; 9 samples were collected in front of schools, 4 samples were collected at playgrounds, 2 samples at public sport facilities, 5 samples were collected in public areas used by the population like hospital, church, health centre and train station and 1 sample was collected in a street near of Estarreja chemical park. Children are especially vulnerable to the exposure to environmental chemical agents, due to their physiological characteristics: they drink more water, eat more, and breathe in a greater amount of air per kg than adults do.

Determination of As, Zn and Pb oral bioavailability in street dusts of Estarreja was carried out using the UBM (Unified Bioaccessibility Method) BARGE method.

The results show that: Zn concentration ranges from 146-2196 mg/kg and bioaccessible Zn from 89-1448 mg/kg ; As concentration ranges from 59-120 mg/kg and bioaccessible As from 1-37 mg/kg;

Pb concentration ranges from 14-533 mg/kg and bioaccessible Pb from 6-447 mg/kg; The spatial distribution of total and bioaccessible Zn, As and Pb is site-specific; Zn, As and Pb in street dusts of Estarreja raise some health concern due to the high concentrations that are bioaccessible and to the fact that exposure is likely to occur.

The aim of this work was to determine the bioaccessibility of Zn, As and Pb at the site and to provide an additional line of evidence to ascertain whether ingestion/inhalation of dust from the site represents a significant risk to human health.

<sup>a</sup>GEOBIOTEC. Geoscience Department, Aveiro University. 3810-193 Aveiro, Portugal (cpatinha@ua.pt)

<sup>b</sup>Graduation student. Geoscience Department, Aveiro University. 3810-193 Aveiro, Portugal

<sup>c</sup>MSc Student International Master for Advanced Clay Science

<sup>d</sup>CNRS, CEREGE, UMR 7330, 13545 Aix en Provence Cedex 4, France

<sup>e</sup>Aix-Marseille Université, CEREGE, UMR 7330, 13545 Aix en Provence Cedex 4, France

<sup>f</sup>CNRS, ESPACE, UMR 6012, MMSH, BP 647, 13094, Aix en Provence, France

<sup>g</sup>Aix-Marseille Université, ESPACE, UMR 6012, MMSH, BP 647, 13094, Aix en Provence, France