Metal(loid)s quantification in different biological matrices and genotoxic effects in human populations exposed to mining contamination –Panasqueira Mine (Portugal)

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Mining activities cause several health impacts in miners and communities living near the mine site that may persist even when the mine is abandoned. During mining processes several toxic wastes are produced and released into the surrounding environment causing pollution of air, drinking water, rivers and soils. Existing studies point to several adverse effects on communities' health such as mesothelioma, and respiratory illness but most of the results are conflicting.

The choice of Panasqueira mine (Sn-W) in Central Portugal as object of study for this project was due to its past and current activity, giving rise to large tailings piles and mud dams. Also, the existence of small villages around the mine site, namely S. Francisco de Assis and Barroca do Zêzere, with a population strongly dependent of land use and water for agriculture, drinking and cattle breeding is an important factor driving such choice, as well as the importance of the main river flowing in the area (Zêzere river) which feeds the Castelo do Bode dam (located 90 Km downstream the mine), the main water supply of Lisbon. From the results achieved from a geochemical sampling campaign undertaken in the vicinity of Aldeia de S. Francisco de Assis, an anomalous distribution of metals and arsenic in soils was identified. Based on epidemiologic data, some of these elements have been classified as human carcinogens, namely arsenic and cadmium. The International Agency for Research on Cancer (IARC) ranked them first and seventh, respectively, on a list of top 20 hazard substances by the Agency for Toxic Substances and Disease Registry (ATSDR). Therefore it is essential to evaluate environmental and occupational exposure to these substances.

To evaluate the effects on human health caused by the conditions surrounding the mine site, groups of individuals from nearby villages environmentally and occupationally exposed, were tested for some biological endpoints. Several metal(loid)s were quantified in different biologic matrices, namely blood, urine, hair and nails (toe and finger) as well as biomarkers of genotoxicity. A non-exposed group with the same demographic characteristics and without

known exposure to genotoxic compounds was also studied and data obtained from the three groups were compared.

A greater understanding of the effects on human health caused by environmental exposure to metal(loid)s, arising from a multistage approach, integrating different biomarkers, will allow the development of preventive measures, leading to a reduction in cancer risks.

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