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EG-09

NEUROPSYCHOLOGICAL ASSESSMENT AND TRACE METAL CONTENT
IN URINE, HAIR AND FINGERNAILS SAMPLES FROM INHABITANTS
OF A CHEMICAL INDUSTRIAL REGION (NW PORTUGAL)

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area whose population historically relies on groundwater as a source of water supply for human and agricultural uses. Several rehabilitation actions were taken during the 1990's and 2000's, resulting in an important reduction of the negative environmental legacy. Hazard (non-cancer) and cancer risks due to exposure to potentially-toxic elements (PTEs) by the ECC-surrounding population where calculated considering groundwater ingestion, inhalation and dermal contact as exposure pathways. ECC-surrounding groundwater shows concentrations of Al, As, Cd, Fe, Hg, Mn, Ni, Cr and Zn several orders of magnitude higher than admissible values according to Portuguese and International legislations. Hazard indexes (HI) were calculated for exposure to these metal(loid)s by children and adults. For children and adults HI are higher than 1 for As (HI=39, HI=5, respectively), indicating a potential non-cancer risk for both age categories. The other elements showed no potential non-cancer risk, i.e. HI<1. Cancer risk was calculated for As, Cd, Cr and Ni exposures, for adults and children, and the results show cancer risk above 1×10^{-6} for As and Cd for both age categories, which indicates cancer risk. Cr and Ni showed no potential cancer risk.

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The surroundings of the Estarreja Chemical Complex (NW Portugal) have an intense industrial activity with negative impact on soil, surface water and groundwater since the early 1950's, and its population historically relies on groundwater as a source of water supply for human and agricultural uses. This industrial activity produced a large volume of toxic waste solids and liquid effluents, which were disposed in areas that were not prepared for such purpose. During the 1990's, several rehabilitation actions resulted in an important reduction of the negative environmental legacy. However, we found concentrations (µg/l) of Al, Cu, Fe, Hg, Mn, Pb and Zn in groundwater well above the international and Portuguese recommended values. Less than ~10% of neurologic diseases have a strict genetic aetiology, while the majority have an unknown origin. Occupational and environmental exposures to several metals (e.g., Hg, Al, Mn, Cu, Pb, Fe and Zn) appear to be a risk factor for neurodegenerative pathologies, such as Alzheimer's disease, Parkinson dementia, etc. The neuropsychological assessment of a pre-selected population in the studied area is being performed and correlated with the content of selected metals on human biological samples. The experimental sample of this study to date has proved to consist mainly of normal subjects (40 %), followed by the condition of dementia (37 %) and the condition Mild Cognitive Impairment (18 %). This study combined trace element profile in urine, hair and nails with survey information from 100 Estarreja inhabitants to assess the extent to which the biomarkers provide exposure to metals information. Urinary levels of metal(loid)s for the participants exceed those reported in the literature for healthy people. However, the median values fall within the range of values. The exceptions are Al, Cd, Mn, and Zn. Median hair and fingernails levels (µg/g) were also elevated, particularly for Al, Pb, Hg, and Zn.

EG-10

LINKS BETWEEN CHRONIC EXPOSURE TO MANGANESE AND THE OCCURRENCE OF DEMENTIA IN MINING AREAS OF THE SOUTHERN PART OF PORTUGAL

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Occupational and environmental exposure to manganese (Mn) are suggested as a possible cause of neurodegenerative disorders. The inhalation and ingestion of Mn affects the central nervous system of mammals. Several studies reported neurological pathologies, and even deaths, induced by chronic consumption of water containing moderate to high levels of Mn. In Baixo Alentejo region (South Portugal) there are several abandoned Mn mines, related with the Fe-Cu-Zn-Pb massive sulphides deposits. Nearby these mines there are abandoned tailings deposits enriched in Mn as well as in metal(loid)s such as Cu, Pb, Zn, As, Sb, Ag, Hg and Cd, freely exposed to weathering. The concentration of these metal(loid)s in human biological samples (nails, hair, blood and urine) was determined for target and

control groups. The neuropsychological condition of the individuals participating in this study was been evaluated using cognitive screening tests, for early detection of dementia. The following instruments was been administered to each participant: (1) a complete socio-demographic questionnaire; (2) general health questionnaire; (3) mini mental state examination; (4) Montreal cognitive assessment; (5) clinical dementia rating scale; (6) geriatric depression scale; (7) recall selective free and guided test. Relationships between the cognitive conditions of the individuals and Mn contents in the biomarkers were investigated using several statistical techniques. Further investigation was carried out on the exposure-biomarker association for other metal(loid)s. The exposed group has proved to comprise mainly subjects with Mild Cognitive Impairment (MCI) (36%), followed by normal subjects (34%) and subjects with dementia (30%). The analysis of RSFGT results indicate that 30% of subjects with MCI will be more likely to convert to PD or AD. Maximum fingernails Mn level (1.43 µg g^{-1}) was found in a subject with Parkinson dementia while the maximum toenails Mn level (1.38 µg g^{-1}) was found in a subject with MCI. Median fingernails levels (µg g^{-1}) were elevated for Hg, particularly in subjects with dementia (0.8), and also in MCI (0.6).

EG-11

LINKING VOLCANIC SOIL COMPOSITION AND CANCER RISK IN SANTIAGO ISLAND (CAPE VERDE)

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The topsoil of Santiago Island is enriched in Co, Cr, Cu, Ni, V, Zn, Mn and Cd relative to upper crust values. The hazard and the carcinogenic risks due to the exposure to some potentially toxic elements (PTEs) by the Santiago Island (Cape Verde) population were calculated, considering soil ingestion, inhalation and dermal contact as exposure pathways. Hazard indices (HI) were calculated for these metal exposures of the Santiago Island population for children and adults. For children HI are higher than 1 for Co, Cr and Mn. So there is indication of potential non-carcinogenic risk for children, due to the high Co (HI=2.995), Cr (HI=1.329) and Mn (HI=1.126) values in soils. For the other elements and for adults there is no potential non-carcinogenic risk. Cancer risk was calculated for Cd, Cr and Ni exposures and the results were higher than the carcinogenic target risk of 1×10^{-6} for Cr. A realistic assessment of actual health risks associated with PTEs in soils requires evaluation of bioaccessible metal fractions. The estimation of bioaccessibility of PTEs in Santiago soils was done using the UBM method. It is necessary to characterize the health risks of PTEs in soils through multi-pathways (ingestion, inhalation, dermal) incorporating bioaccessibility adjustments. Bioaccessibility provides an upper boundary value—that is, the most conservative value for human protection—as to what could potentially become available to the human systemic circulation and thus available for uptake.

EG-12

ECOSYSTEMIC APPROACH TO HUMAN HEALTH: A TOOL FOR ENVIRONMENTAL STUDIES

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Introduction Our Century has the task of promoting human Health in healthy communities that are environmentally sustainable as well. The Ecohealth approach is facing the challenge of improving the quality of life of men and women in countries of low income and vulnerable societies, through a new way of research, education and practice that aims at the construction of healthier communities and environments. Objective The objective of this presentation is to show briefly the work methodology in Ecohealth. Development In an Ecosystemic approach to Health, humans are placed in the center of the considerations regarding development, at the same time seeking the durability of the ecosystem of which they are an integral part. There can be no sustainable development unless all the interventions take into account the well-being of humans the same as the protection of the ecosystems. Ecohealth makes an holistic approach to the health problems of the population, because they go beyond the sole competence of the Health sector. These studies include the way societies are structured and the relations between social actors. Environmental and social factors are integrated in order to study the illnesses and to manage solutions in a participation scheme. Therefore the dynamic interaction between the different components of the ecosystems and the well-being and human health, are emphasized. Furthermore, this approach considers transdisciplinary projects (with gender analysis and participative methodology) to result in better research and improvement of human health and the environment. Accordingly, well-being and human health are part of the impact evaluation. Conclusion Ecohealth proposes a research and action approach aimed at sustainability and social and gender equity, through the decision making at various levels by politicians and social actors. With the participants of this Symposium we will share a deeper insight into the pillars of this new methodology, mainly transdiscipline, gender, research methods with concept maps, and a practical case study of Mercury in Latin America.