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Human biomonitoring of polycyclic aromatic hydrocarbonsand metals in the general population residing near the municipal solid waste incinerator of Modena, Italy

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ACCEPTED MANUSCRIPT

HUMAN BIOMONITORING OF POLYCYCLIC AROMATIC HYDROCARBONSAND METALS IN THE GENERAL POPULATION RESIDING NEAR THE MUNICIPAL SOLID WASTE INCINERATOR OF MODENA, ITALY

Abstract

Background and objectives: A cross-sectional biomonitoring study was carried out to investigate exposure to incinerator emission in relation to the body burden of selected biomarkers in the population living around the plant.

Methods: Approximately 500 people, aged 18-69 yrs., living within 4 km from the incinerator were randomly selected form the population register. Exposure was measured through fall-out maps of particulate matter (PM), used as tracer for incinerator emissions. Ten metabolized polycyclic aromatic hydrocarbons (PAHs), from naphthalene to chrysene, 1-hydroxypyrene and twelve metals (Cd, Cr, Cu, Hg, Ni, Pb, Ni, Zn, V, Tl, As, Sn) were measured in spot urine samples. Confounders, such as diet, smoking, traffic, occupation and personal characteristics were assessed by questionnaires and objective measurements, and included into multivariate linear regression models.

Results: Metal concentrations in urine where in line with or higher than Italian reference limits, besides Cr and V with more than twofold concentrations. Metal levels did not show clear association to exposure categories. Most abundant PAHs were naphthalene (median 26.2 ng/L) and phenanthrene (7.4 ng/L). All PAHs, but benz[a]anthracene and 1-hydroxypyrene, were found in more than 52% of samples, and included in regression models. Significant associations between urinary PAHs and exposure were found, strong for fluorene, and weaker for naphthalene, fluoranthene and pyrene. Results were confirmed by sensitivity analyses. Correlation with variables reported in literature were observed.

Conclusions: The study indicates that the emissions were very low and highlights that specific urinary PAHs provided useful information about the internal dose arising from incinerator emission.

Keywords: municipal solid waste incinerator; general population; human biomonitoring; exposure assessment; polycyclic aromatic hydrocarbons; metals

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