BIOLOGICAL MONITORING OF OCCUPATIONAL EXPOSURE TO POLYCYCLIC AROMATIC HYDROCARBONS IN AN ELECTRIC STEEL FOUNDRY IN TUNISIA

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Background and methods: The occupational exposure to polycyclic aromatic hydrocarbons (PAHs) was investigated in 94 male workers from an electric steel foundry in Tunisia. 16 unmetabolized 2-6 ring PAHs (U-PAHs) (from naphthalene to benzo[g,h,i]perylene) and 8 hydroxylated metabolites (OH-PAHs) were investigated by GC-MS-MS and LC-MS-MS, respectively. A self-administered questionnaire was used to obtain subject information including health status, smoking habit, and job history. Results: U-PAHs were above or equal to LOQ in 100% (naphthalene, acenaphthylene, acenaphthene, fluorene, phenanthrene, anthracene, and fluoranthene) to 30% (dibenzo[a,h]anthracene) of samples. Naphthalene was the most abundant compound (median level 643 ng/L), followed by phenanthrene (18.5 ng/L), benzo[a]pyrene level was <0.30 ng/L. OH-PAHs were above or equal to LOQ in 95% (1-OHpyrene and 2+3-OHphenanthrene) to 49% (4+9-OHphenanthrene) of samples. 2-OHnaphthalene was the most abundant metabolite (median level 2.27 µg/L). The median level of urinary 1-OHpyrene was 0.52 µg/L. Significant correlations among analytes were observed (0.178<p<0.628). A multiple linear regression model showed that OH-PAHs were significantly influenced by the job task and the smoking habit, 2-4-ring U-PAHs only by the smoking habit, and 5- and 6-ring U-PAHs only by the job task. Median levels of all analytes were in the same range of those found in other studies for this occupational exposure, but higher than the general population. Conclusions: This study shows that at this low occupational exposure smoking is a relevant source of PAHs and that U-PAHs may provide information about occupational exposure to specific toxic compounds.

Keywords: electric steel foundry, urinary PAHs, occupational exposure, biomonitoring