

An aerial photograph of a city, likely Belgrade, showing a river and a bridge. The image is oriented vertically on the left side of the page.

WeBIOPATR2013

THE FOURTH INTERNATIONAL WeBIOPATR
WORKSHOP & CONFERENCE
PARTICULATE MATTER: RESEARCH AND
MANAGEMENT

ABSTRACTS OF KEYNOTE INVITED LECTURES AND CONTRIBUTED PAPERS

Editors

Alena Bartonova and Milena Jovašević-Stojanović

Public Health Institute of Belgrade

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ORAL PRESENTATIONS

HEALTH RISK ASSESSMENT OF POLLUTANTS (PAHS AND HEAVY METALS) ASSOCIATED WITH PM₁₀ IN URBAN PARKING GARAGES

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Urban particulate matter (PM) is highly chemically complex mixture, consisting of various organic and inorganic compounds. Some toxic elements and PAHs, adsorbed on the PM surface, determine its toxicological characteristics and have been associated with adverse effects on human health. Concentration of these pollutants is expected to be elevated in parking garages due to intensive traffic flow and poor air conditions. In this study, twenty-four hour air samples of PM₁₀ were collected in two Belgrade parking garages (Masarikova-M and Pionirski park-PP) for ten weeks during the autumn of 2012. PM₁₀ mass concentrations were measured by gravimetric method; concentrations of 16 US EPA priority PAHs were measured by GC-MS and concentrations of Al, Ba, Ca, Cd, Co, Cr, Cu, Fe, K, Mg, Mn, Na, Ni, Pb, Sr and Zn were determined by ICP-OES. The carcinogenic health risk of employees' occupational exposure to four heavy metals (Cd, Cr, Ni and Pb) and six PAHs (B[a]A, Cry, B[b]F, B[k]F, B[a]P and DB[ah]A) was estimated according to US EPA health risk assessment model, using toxicity information from Risk Assessment Information System database. It was assumed that the exposure time of employees is 8 hours per day with the exposure frequency of 235 days per year and the exposure duration of 30 years. The average PM₁₀ mass concentrations were about 117 and 104 $\mu\text{g m}^{-3}$ in M and PP, respectively, which is above the daily air quality value of 50 $\mu\text{g m}^{-3}$ set by EU Directive 2004/107/EC. Although the prescribed value is related to outdoor air quality, it could also be applicable to indoor spaces. Cumulative cancer risk obtained as sum of incremental lifetime cancer risk (ILCR) values for individual chemicals – $4.51 \cdot 10^{-5}$ and $3.75 \cdot 10^{-5}$ in M and PP, respectively, are higher than acceptable limit of 10^{-6} . Heavy metals can be considered as the major contributors to assessed cancer risks (about 98% in both M and PP). ILCR values obtained for Cd, Cr, Ni and Pb indicate that heavy metals originated from vehicle emissions are those with higher cancer risk. On the other side, ILRC values of studied PAHs are below the acceptable limit. Comparing the results from both garages, it becomes apparent that cumulative cancer risk values are quite similar, but lower in PP. Although PP is completely underground garage as opposed to M, the lack of appropriate ventilation system with filters in M is a possible cause of this result. The obtained results indicate the need for health risk impact evaluation and setting indoor air quality guidelines.