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"Gheorghe Asachi" Technical University of Iasi, Romania

HEALTH RISK ASSESSMENT OF STOCHASTIC EXPOSURE TO ARSENIC, CADMIUM AND COPPER IN WATER DISTRIBUTION NETWORK. A CASE STUDY OF ROBAT KARIM, TEHRAN, IRAN

Mohammad Rafiee[1,2], Mahsa Jahangiri-rad[3,4*], Elham Razmi[4]

[1]Environmental and Occupational Hazards Control Research Center, Shahid Beheshti University of Medical Sciences, Tehran, Iran
[2]Department of Environmental Health Engineering, School of Public Health, Shahid Beheshti University of Medical Sciences, Tehran, Iran
[3]Department of Environmental Health Engineering, Faculty of Public Health and Medical Engineering, Tehran Medical Sciences, Tehran, Iran
[4]Water Purification Research Center, Tehran Medical Sciences, Islamic Azad University, Tehran, Iran

Abstract

An investigation of three heavy metals concentration in water distribution network was carried out. A total of 33 samples were taken from 11 villages and the concentration of heavy metals was measured by ICP-MS. The related health risks via ingestion and dermal pathways were assessed for residents of Robat Karim county, Iran, using hazard quotient (HQ), hazard index (HI), and lifetime cancer risk (CR). Uncertainty analysis for the most susceptible groups (infants and children) were carried out using Monte Carlo Simulation technique. The findings revealed that heavy metals concentrations were below their respective national and international guideline values. The mean As, Cd and Cu concentrations ranged from 0.1-2.6, 1-5 and 0.1-192 μg/L, respectively. Copper showed appreciable variable levels in sampling locations but below the safe limit. The results of the HI values of tested heavy metals through combined pathways were below the safety level (HI < 1) for all groups. Simulation of cancer risk probability distribution for Cd through exposure to drinking water for adults, children and infants were in the range of 4.56 E-4 to 1.25 E-3, 1.15 E-3 to 3.8 E-3 and 1.23 E-3 to 4.04 E-3, respectively. The cancer risks resulting from exposure to Cd were higher than those of arsenic. The carcinogenic risk for three studied groups were in the order of adults > children > infants. Overall, the calculated carcinogenic risk effect for Cd indicated that the ingestion of the drinking water would cause cancer risk due to lifetime consumption.

Key words: health risk assessment, heavy metals, probability analysis, water distribution network

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[*]Author to whom all correspondence should be addressed: e-mail: m.jahangiri@iautmu.ac.ir