

Health Risk Assessments of Polycyclic Aromatic Hydrocarbons in Five-Size Particulate Matter at Bangkok, Thailand

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Abstract : In this study, five particulate matter (5-PM) samples from Bangkok, Thailand, were used to measure the concentrations and evaluate the health hazards of 12 different forms of probably carcinogenic PAHs, which are known to be the cause of Bangkok's atmospheric air quality problems, which are caused by heavy traffic pollution. The combustion of fuels and petroleum products is another cause of the release of aromatic polycyclic compounds (PAHs) into the atmosphere. PAHs are complex organic compounds with the formation of two or more benzene rings and have been found to be contaminated in the environment by more than 200 species. PAHs also result in health problems such as liver damage, reproductive diseases, lung dysfunction, and endocrine system disorders. The Environmental Protection Agency (USEPA) has designated PAH16 as the top pollutant due to its high toxicity. Sampling of 5 sizes of particulate matter (0.1, 0.5, 1, 2.5, and 10 microns) at Bangkok was performed in the Bang Sue district (13°49'05.7"N 100°30'45.1"E), which is located near Rajamangala University of Technology Phra Nakhon and King Mongkut's University of Technology North Bangkok, located in the center of Thailand. It has an altitude of about 1.50-2 meters above sea level. Samples are collected using the Nano-sampler II with a vacuum pump, which has a flow rate of 40 L/min. Sampling was carried out from December 1, 2024, to December 30, 2024, using a 55 mm Whatman quartz fiber filter, and then we wrapped samples in aluminum foil and kept them frozen at -4°C until analysis. According to the Norwegian Standard (NS 9815: S-4008-100-T), a standard mixture of 15 PAHs was established for PAH analysis. High-performance liquid chromatography (HPLC) grade organic solvents were employed, and they were all acquired from Fisher Scientific. Soxhlet extraction was used to extract the PAHs for eight hours, and the resultant materials were subsequently concentrated in an evaporator. The material goes through fractionation, clean-up, and blowing-down processes. PMs have been analyzed by a gas chromatograph mass spectrometer (Shimadzu GCMS-QP, 2010 Ultra) in the selective ion monitoring used to identify 15 PAHs. According to the Human Health Evaluation Manual, we looked at health risk assessments. The danger of exposure to PAHs in the environment was calculated quantitatively using the increased lifetime cancer risk (ILCR), which is covered identically for the 3 main pathways of exposure included: ingestion, dermal contact, and inhalation when evaluating ILCR using the model. ILCR values below 10⁻⁶ are considered safe levels, while values between 10⁻⁶ and 10⁻⁴ indicate a low-risk level, and an ILCR value exceeding 10⁻⁴ is considered a serious health problem. The findings demonstrated that all PM had lower ILCRs for 3 main pathways of exposure for both adults and children than the standard values. As a result, it can be used to manage human health risks to develop air pollution management plans to reduce PAH from the source, along with prior research from many research projects about the source's appointment, to prepare comprehensive cancer prevention and control strategies in Bangkok, Thailand.

Keywords : polycyclic aromatic hydrocarbons, health risk assessments, five-size particulate matter, Bangkok

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