Title:	Optimized LC-MS/MS method for simultaneous determination of endocrine disruptors and PAHs bound to PM2.5: Sources and health risk in Indo-Gangetic Plain
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Abstract:	Airborne particulate matter (PM) is a serious health threat when it is bound to hazardous pollutants like phthalic acid esters (PAEs) (endocrine disruptors) and polycyclic aromatic hydrocarbons (PAHs). In this study, an optimized method was developed and validated for the simultaneous screening and quantification of PAEs (dimethyl phthalate (DMP), diethyl phthalate (DEP), benzyl butyl phthalate (BBP), dibutyl phthalate (DBP), bis (2-ethyl hexyl) phthalate (DEHP), bis(2-ethylhexyl) adipate (DEHA), di-n-octyl phthalate (DNOP)) and PAHs (benzo[a]anthracene (B[a]A), benzo[b]fluorenthene (B[b]F), benzo[k]fluorenthene (B[k]F), benzo[a]pyrene (B[a]P), dibenzo[ah]anthracene (D[ah]A), benzo[ghi]perylene (B[ghi]P), and indeno[1,2,3-cd]pyrene (IND)) bound to ambient PM2.5 using liquid chromatography coupled to electrospray ionization tandem mass spectrometer (LC-ESI-MS/MS). The developed method exhibited excellent linearity (r2 > 0.99), precision error less than 10%, good recovery percentages (90%–120%, except for DMP ≈ 65%). After the validation, this method was deployed to investigate the seasonal variation and source identification of targeted compounds bound to ambient PM2.5 at a measurement site in the North West Indo-Gangetic Plain (NWIGP). In this study, the most abundant PAE and PAH are DEHP (17.94 ng m−3) and B[b]F (36.13 ng m−3), respectively. Measured concentrations of B[a]P, Group 1 carcinogen (4.66 ng m−3) had exceeded the National Ambient Air Quality Standards, India (1 ng m−3). Diagnostic ratios (DRs) revealed that fossil fuel/diesel combustions are the major emission sources of PAHs in summer and monsoon while biomass/coal combustions in winter season at the sampling site. Further, incremental lifetime cancer risk (ILCR) for adults and children due to exposure to PM2.5 bound DEHP (adults: 0.3678 × 10−6 and children: 0.8792 × 10−6) and B[a]Peq (adults: 1.40 × 10−5 and children: 3.272 × 10−5) were estimated. Estimated ILCR values for B[a]Peq exceeded the threshold value (1 × 10−6) set by USEPA. Findings in this study reveal that the health risk due to exposure to PAEs and PAHs bound to PM2.5 should be of concern.
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