Bispehnol A concentrations in indoor and outdoor PM2.5 samples

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Bisphenol A [2,2-bis(4-hydroxyphenyl)propane] (BPA) is a likely endocrine-disrupting compound (EDCs) (vom Saal, 2005; Ashby, 2004). BPA is an industrial chemical, a monomer of the polycarbonate plastics and a precursor for a variety of epoxide resins.

Consideration of exposure to EDCs is critical in study of health effects, particularly in relation to indoor environment, which have been identified as an important source of chemical exposures (Colt et al, 1998). People spend a large fraction of their time indoor, and indoor sources of chemicals, coupled with limited ventilation and slow chemical degradation processes, cause increased pollutant concentrations indoor.

The atmospheric occurrence of particle-bound BPA in the indoor and outdoor atmosphere at an urban site (Milan, Italy) has been investigated.

Daily (24 h) PM2.5 samples have been collected (low volume gravimetric sampling: 38.3 l min^{-1}, PTFE filters; according to EN-14907) from September 2007 to March 2008, and sampling took place simultaneously in an indoor and outdoor site. Indoor site was a non-smoking office, and outdoor site was located in the yard of the building where the office was set. To assess the BPA concentration in PM2.5 samples, filters were ultrasonically extracted in methanol (0.4 ml) and analysed by HPLC/(-)ESI-MS/MS (liquid chromatography /negative ion electrospray ionization – tandem mass spectrometry). In this work IDMS method has been used and the analytical procedure was validated: the accuracy, precision and recovery have been evaluated.

	INDOOR			OUTDOOR			IN/OUT	
	PM2.5	BPA		PM2.5	BPA		PM2.5	BPA
	$\mu g\ m^{-3}$	$ng\ m^{-3}$	$ng\ \mu g^{-1}$	$\mu g\ m^{-3}$	$\mu g\ m^{-3}$	$ng\ \mu g^{-1}$	$\mu g\ m^{-3}$ IN/OUT	$ng\ m^{-3}$ IN/OUT
MEAN	16.9	0.30	18	29.0	0.18	5	0.62	3.3
SD	1.8	0.04	1	3.6	0.05	1	0.05	0.8

Table 1. Comparison between indoor and outdoor concentrations for PM2.5 and BPA. Mean ± SD (standard deviation)

PM2.5 concentrations indoor were lower than outdoor, but higher BPA concentrations were measured in indoor than outdoor. (Table 1). Averaged BPA concentration was 0.30 (± 0.04) ng m^{-3} indoor and 0.18 (± 0.05) ng m^{-3} outdoor. BPA content of PM2.5 was 18 (± 1) ng μg^{-1} indoor and 5(± 1) ng μg^{-1} outdoor.

Indoor air pollution levels are influenced by indoor pollution source and by infiltration of outdoor air. In an indoor environment there are many potential source of BPA from epoxide resins and polycarbonate plastics, but the major source could be the polycarbonate elements of the lamps that, when switch on, warm up by joule effect.

Daily indoor BPA concentration was correlated to daily outdoor BPA (R^2= 0.88) (Fig.1), thus indicating as indoor is strictly influenced by infiltration of outdoor air. The slope of the linear correlation between indoor and outdoor BPA is less than 1 (0.82), suggesting that about 80% of outdoor BPA is transported in the indoor environment.

Nevertheless, the y-intercept of the linear relationship between indoor and outdoor daily concentrations indicate that another source of indoor BPA, not related to the exchange with outdoor, occurred. The level of indoor BPA attributed to indoor pollution source was estimated equal to 0.15 ng m^{-3}, and it contributed to 19% up to 94% of the indoor BPA level we measured.

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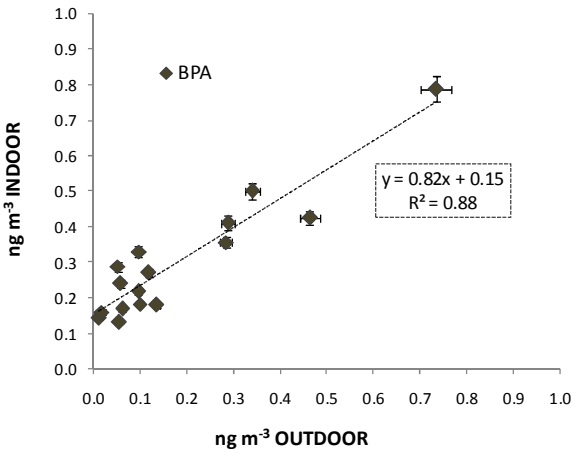

Figure 1. Daily BPA concentration (ng m^{-3}) in PM2.5 samples indoor (offices) versus outdoor.

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