

Levels of persistent organic pollutants by polyurethane foam passive samplers in indoor and outdoor air in the Mexico City Metropolitan Area

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Introduction

Exposure to persistent organic pollutants (POPs) such as PAHs, PCBs, brominated flame retardants, and organochlorine pesticides is regarded as an important environmental risk factor for humans. It is often believed that the main route of exposure to POPs is via the diet, but exposure to indoor air and dusts at home and in the workplace is also important. Specific air quality standards and exposure limits for POPs will be approved in future and once this is approved, there will be a requirement for local authorities to check for compliance with legislative actions to reduce risk to humans. This will require air sampling methods which routinely can be applied as monitors of POPs to check for personal exposure of the general and worker population. The most common method to measure POPs today is with an active sampler but this method has several artefacts for a routine usage in occupational and indoor studies. A passive sampler is therefore a better choice since they are cheap, easy to handle, small and light. In this study, a passive air sampling methodology was used to measure indoor and outdoor levels of PAHs, and other POPs at three different sites (T0, T1, T2) of Mexico City Metropolitan Area (MCMA) during the MILAGRO campaign. The results were compared to urban sites in Sweden and United Kingdom.

Methods

Polyurethane foam (PUF) disks were used as passive air samplers. The sampling sites were T0 – within MCMA situated Iztapalapa, T1 – at the Universidad Tecnológica de Tecamac in the state of Mexico and T2 – in Rancho La Bisnaga y San Pedro, in the State of Hidalgo. The PUF disks were placed in specially designed shelters to protect them from rain, wind and sunlight (outdoors) and deposition of coarse particles (indoors). The PUF disks were deployed simultaneously as stationary samplers inside and outside people's homes for approximately 6 weeks during March to May 2006. The samplers were solvent extracted, cleaned and PAHs were analysed on a high performance liquid chromatograph (HPLC) with a fluorescence detector and all other POPs were detected by a gas chromatograph coupled to a mass spectrometry detector (GC/MS).

Results

The outdoor levels of Σ PAHs in the three sampling sites (T0-T2) were similar although somewhat higher levels were found at the T1 and T2 sites. The sampling sites in Mexico showed somewhat higher levels compared to the urban sites in Sweden. The highest levels found in this study (ca. 300 ng day⁻¹) were in the same range as those found at some urban sites in Poland, the Czech Republic, Slovakia, Thailand, and an area in Sweden where wood burning is commonly used for heating. Using published uptake rates, the concentration in this study ranged ca. 30-90 ng m⁻³. The indoor levels were in general lower than the outdoor levels for all sites in Mexico.