Potential Sources and Environmental Fates of Certain Phthalates

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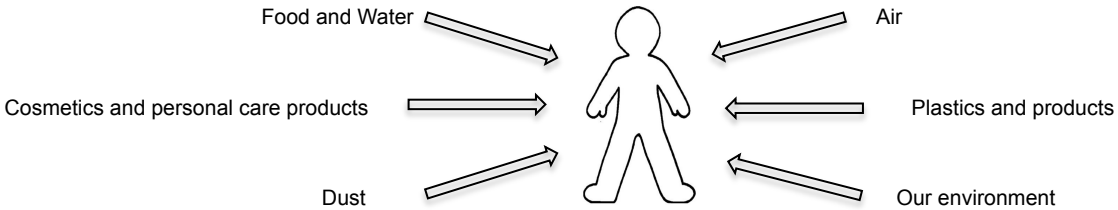
Background

Phthalate esters are a group of synthetic organic chemicals that are most commonly used as plasticizers in polyvinyl chloride (PVC) materials. Common end uses for PVC, and therefore phthalates, include tubing, blood bags, medical devices, clothing, flooring, packaging, toys, automobile parts, flooring, and roofing. Phthalates have been found to be recalcitrant, ubiquitous within the environment, and in many cases, detrimental to human and animal health. This project represents an important collaboration between three research centers (DCU, ASU, & NIVA) with support from local Irish utilities, to assess the potential sources and environmental fates of priority phthalates in Ireland.

Routes of Exposure



Sampling Sites

- 1 small scale WWTP
- 1 medium scale WWTP
- 1 large scale WWTP
- 3-4 surface water catchment sites
- 3-4 soil catchment sites
- 1 landfill site
- 1 recycling plant

Typical methods for phthalate detection involves grab sampling and liquid-liquid or liquid-solid extraction (US EPA Methods 506, 606 and 8061A). We will also take passive samples.

Aims/Objectives

- Monitoring and analysis of 11 priority phthalates;
- assess the potential sources and environmental fate
- Passive sampling (PS) and standard sampling techniques to evaluate these compounds;
- Surface water, wastewater, treated wastewater, municipal solid waste, compostable waste and dry recyclables, sludge, landfill leachate, and soil;
- Sewage as a biomarker for human health;
- Investigate potential sources, environmental fate, sampling and analysis of these compounds;
- Investigate potential for incorporating PS, grab sampling and sewage biomarker monitoring in future compliance, monitoring and exposure/risks for human health.

Methodologies

- SPE/SPME/Soxhlet extraction
- - Strata-X teflon giga-tubes
- LC-MS
- - Kinetex 2.6 um EVO C18 column
- GC-MS
- - Zebron ZB-50 column
- Passive Samplling

Some frequently used techniques, with standardized methods (e.g. US EPA Methods 6062 and 8106A3 and the Chinese HJ/T 72-2001, GB/T 20388-2006 and GB/T 21911-2008).





The phthalates proposed for investigation are Benzylbutylphthalate (BBP), Dibutylphthalate (DBP), Dipentylphthalate (DPP), Diisopentylphthalate (DIPP), Diethylhexylphthalate (DEHP), Dihexylphthalate (DHP), Diisobutylphthalate (DIBP), Di-n-octylphthalate (DNOP), Diisononylphthalate (DINP), Diisodecylphthalate (DIDP) and Dimethylphthalate (DMP). Research into the human health effects of phthalates is far from complete, and while phthalates including DBP, BBP, and DEHP have been banned or limited in manufacturing (in particular for items such as children's toys), new research is emerging which indicates that substitute plasticizers have similar deleterious health effects. This research is timely as the extent of phthalate contamination within Ireland, and the impacts on human health, are unknown.

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