Wastewater Based Epidemiology for the Assessment of Phthalate Health Risk in Ireland

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Introduction

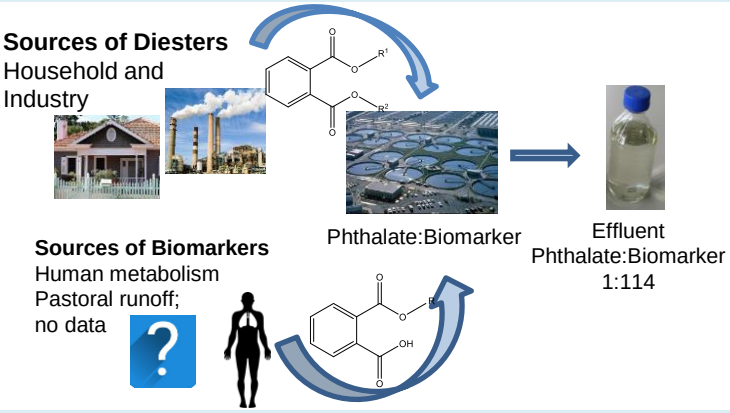
Phthalates are synthetic organic chemicals commonly used as plasticisers in PVC and additives in personal care products. Phthalates are ubiquitous within the environment, giving wide-range exposure to the public, and have been classed as endocrine disruptors, leading to a range of detrimental health effects (birth defects, decreased neurological development, association with some cancers and insulin resistance). This project will pioneer in using sewage epidemiology to determine phthalate exposure in Irish population. Risk assessment data will be used to relate the level of exposure to an associated health risk.

Wastewater Epidemiology Objectives

- Monitor 5 priority phthalate biomarkers in wastewater influent
- Relate levels to human exposure values and health risk assessment
- Results in affordable, readily accessible health data generalized for an “average” inhabitant

Sample:

- 1 small scale Waste Water Treatment Plant (WWTP)
- 1 medium scale WWTP
- 1 large scale WWTP



Methodologies

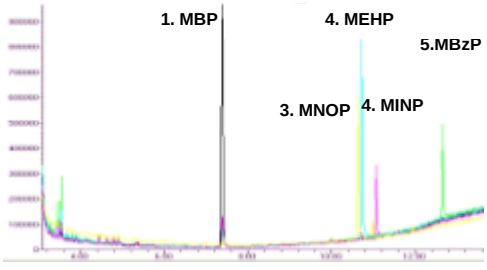
Sample Extraction:
Influent/effluent: SPE
-Strata-X teflon giga-tubes
Bio-solids: Ultrasonication

Sample Derivatization (GC-MS):
BFTSA:TMS (75 µL, 99:1) is added to 75 µL phthalate residue and heated for 16 h @ 60 ºC

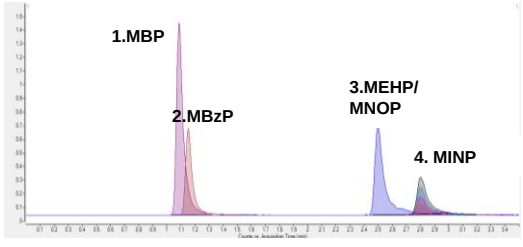
Exposure Assessment :

$$EDI = \left(\frac{\text{Concentration} \times \text{Flow Rate} \times \text{Correction Factor}}{\text{Population}}\right)$$

GC-MS
Column: Phenominex ZB 50 Injection port temperature: 130 ˚ C, injection volume: 5 µL Mobile Phase: 130 ºC to 200 ºC @ 25 ºC/min for 5 min, 200 ºC to 270 ºC @ 10 ºC/min for 5 min Flow rate: 1 mL/min



LC-MS
Column: Agilent Eclipse Plus C18 1.8 um, 2.1 x 50 mm
Flow rate: 0.5 mL/mi n Injection Volume: 5 µL
Mobile Phase: A: Water, B: Methanol w/0.1% Formic Acid
Gradient Elution: 0 min 30%B to 35%B @0.1min to 40%B @0.4min to 45%B @0.6min to 55%B @1min to 60%B @1.5min



This project represents an important collaboration between the EPA and three research centers (DCU, ASU, & NIVA) with support from local Irish utilities, to assess sources, environmental fate and health impact of phthalates in the Irish population.

Follow our progress and updates on twitter and online: https://sites.google.com/site/phthalatesireland/ @phthalatesDCU

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