11 January 2018
Issue 500

Subscribe to free weekly News Alert

Source: González-Mariño, I., Rodil, R., Barrio, I., *et al.* (2017). Wastewater-Based Epidemiology as a New Tool for Estimating Population Exposure to Phthalate Plasticizers. *Environmental Science & Technology*, 51(7): 3902–3910. DOI: 10.1021/acs.est.6b05612.

Contact:
iria.gonzalez@usc.es

Read more about:
Chemicals, Environment and health, Innovation and new technologies, Risk assessment

1. e.g. Katsikantami, I.; Sifakis, S.; Tzatzarakis, M. N.; Vakonaki, E.; Kalantzi, O. I.; Tsatsakis, A. M.; Rizos, A. K. A global assessment of phthalates burden and related links to health effects. *Environment Int.* 2016, 97, 212–236.

2. EU Directive (2005/84/EC) http://data.europa.eu/eli/dir/2005/84/oj

European Commission

Science for Environment Policy

Waste-water analysis highlights exposure to endocrine-disrupting phthalate plasticisers

Researchers in Spain have analysed waste water to calculate levels of exposure to phthalates in individuals. The calculations showed that levels of four types of phthalate exceeded safe daily limits in some of the sites studied, with levels of exposure in children being of particular concern. Using the results of waste-water analysis in this way can identify areas where action may need to be taken to lower exposure.

Phthalates, used for many decades in a wide range of plastics and products, from furnishings to packaging and toys, are known endocrine disruptors. They are not chemically bound to the plastic and, therefore, easily migrate into the environment. Humans could be exposed, for example, via contaminated food, toys, or even inhaled dust. There is a suspected link between phthalates and learning and developmental problems in children and also a suspected link to negative effects on reproductive health[1]. As such, phthalates are included in priority lists of hazardous substances in most industrialised countries. In Europe, some are banned in toys and childcare products[2], while tolerable daily intakes (TDIs) per kilogram of bodyweight have been set by the European Food Safety Authority[3].

Once digested, phthalates are excreted as broken-down molecules (metabolites). The researchers note that a number of studies have looked at these metabolites in urine samples to determine phthalate intake[4], but this type of study is limited by sample size. Instead, the researchers propose that the analysis of raw waste water, which can be considered as a highly diluted urine sample of an entire community, can give indications regarding phthalate exposure on a much wider scale. This methodology, called waste-water-based epidemiology, has been used to identify consumption of other substances in communities, such as pharmaceuticals and pesticides; however this is the first such study on phthalates.

The researchers took samples from six treatment plants in north-west Spain that mostly treat domestic waste water. Under laboratory conditions, the samples were analysed for evidence of phthalate metabolites, focusing on six common phthalates: dimethyl phthalate (DMP), diethyl phthalate (DEP), dinbutyl phthalate (DnBP), diisobutyl phthalate (DIBP), benzyl butyl phthalate (BzBP) and diethylhexyl phthalate (DEHP). Concentrations of up to 1.6 micrograms (µg) per litre were found in raw waste water and up to 1 µg in treated waste water.

Using data on waste-water daily flow rates (litres passing through the system in a day) and local population size, the researchers calculated the average individual exposure to each of the six phthalates studied. They compared this estimated value, based on a daily urine volume of 1.57 litres per person, to average safe reference levels (TDI x entire bodyweight), based on an average bodyweight of 70.8 kg for adults and 11.5 kg for toddlers. They also considered reference daily intakes (RfDs) set by the US Environmental Protection Agency (EPA), where standards are different from those in Europe.

The highest exposure was to DEP in all but one of the sample sites. DEP also has the highest TDI of the phthalates studied, at 800 µg per kg of bodyweight. Levels of exposure in all sites were far below the safe reference levels of 56 640 µg (adults) and 9 200 µg (toddlers).

Continued on next page.

European Commission

Science for Environment Policy

Waste-water analysis highlights exposure to endocrine-disrupting phthalate plasticisers *(continued)*

11 January 2018
Issue 500

Subscribe to free weekly News Alert

Source: González-Mariño, I., Rodil, R., Barrio, I., *et al.* (2017). Wastewater-Based Epidemiology as a New Tool for Estimating Population Exposure to Phthalate Plasticizers. *Environmental Science & Technology*, 51(7): 3902–3910. DOI: 10.1021/acs.est.6b05612.

Contact:
iria.gonzalez@usc.es

Read more about:
Chemicals, Environment and health, Innovation and new technologies, Risk assessment

To cite this article/service: "Science for Environment Policy": European Commission DG Environment News Alert Service, edited by SCU, The University of the West of England, Bristol.

Levels of BzBP were also far below the safe reference values of 35 400 µg (adults) and 5750 µg (toddlers) in the sites studied, but exposure to DEHP exceeded the safe value for toddlers based on US RfDs (230 µg) in two sites, where levels of 321 µg and 395 µg were found. The European safe reference level, 575 µg for toddlers, was not exceeded. Meanwhile, according to the European TDI, safe exposure levels for toddlers of 115 µg were exceeded approximately threefold for DiBP and DnBP in three sites.

The researchers observe that their findings highlight the significance of phthalate exposure in children, which could cause chronic effects. The methodology could, therefore, serve as an early warning, prompting further investigation in specific communities. This study demonstrates that waste-water-based epidemiology can provide a useful, economical tool for studying phthalate exposure at population level, allowing comparison of regional trends and locating areas where people are most at risk. Separate studies could work on identifying the cause of exposure in order to reduce the risk.

3. e.g. European Food Safety Authority. (2005). Opinion of the Scientific Panel on Food Additives, Flavourings, Processing Aids and Material in Contact with Food (AFC) on a request from the Commission related to Di-Butylphthalate (DBP) for use in food contact materials. *EFSA Journal*, 242: 1–17.

4. e.g. Fromme, H., Bolte, G., Koch, H.M., Angerer, J., Boehmer, S., Drexler, H., Mayer, R. & Liebl, B. (2007). Occurrence and daily variation of phthalate metabolites in the urine of an adult population. *International Journal of Hygiene and Environmental Health*, 210(1): 21–33.