6-2014

Identification and Quantification of Phthalates in Polyethylene Terephthalate (PET) Water Bottles Produced In the UAE

Reem Mohamed Ismail Mohamed Ahmed

Follow this and additional works at: https://scholarworks.uaeu.ac.ae/all_theses

Part of the Civil and Environmental Engineering Commons

Identification and Quantification of Phthalates in Polyethylene Terephthalate (PET)
Water Bottles Produced In the UAE

By

Reem Mohamed Ismail Mohamed Ahmed

Abstract

This thesis highlights the criticality of phthalate esters (PEs), widely used in plastic molding and possessing carcinogenetic and toxicological effects. The thesis aims to assess the presence and abundance of these compounds in polyethylene terephthalate (PET) bottled water produced in the UAE.

The thesis tests for 6 types of PEs (dimethyl phthalate (DMP), diethyl phthalate (DEP), diisobutyl phthalate (DiBP), dibutyl phthalate (DBP), butylbenzyl phthalate (BBP) and Di(2-ethylhexyl) phthalate (DEHP) in widely used bottled water brands produced in the UAE. 126 bottled water samples were extracted by liquid-liquid extraction using petroleum ether, followed by analysis of the target compounds using Gas Chromatography-Mass Spectrometry, with a limit of detection that ranges between 0.07 and 0.55 μg/L.

The study examined the impact of several parameters on leaching of PEs to bottled water contents including bottle brand, elevated temperature, sunlight exposure, storage time and bottle reuse. It also underlined the harmfulness of the PEs concentration on human health, with details about the commonly enforced regulations on these compounds in bottled water, both worldwide and in the UAE.

The only found PE was DiBP with an average concentration ranging between 0.6 and 2.6 μg/L. Moreover, none of the tested parameters showed a clear effect on leaching of PEs

to water. Risk analysis was done based on the maximum detected DiBP (3.5 μg/L) and the limits of quantification for all other PEs. No substantial risk was observed. It is concluded that UAE bottled water is safe for drinking from PE leaching perspective. However, it is recommended that extra care should be given to PET bottle recycling; which was used for bottling products other than water as bottle source is suspected to be the reason behind any found PEs in PET bottled water all over the world, considering the fact that PEs are not used in the synthesis of PET plastic. It is also suggested to test water bottles during different steps of the bottling process, to identify the actual sources of PEs, which may not be the PET bottles. Finally, it is vital to do a comprehensive risk analysis to estimate the risk of cumulative exposure to PEs through different channels.