

Environmental Risk of Pharmaceuticals, Drugs of Abuse and Stimulant Caffeine in Marine Water: A Case Study in the North-Western of Spain

Authors : Raquel Dafouz Neus Cáceres, Javier Fernandez-Rubio, Belinda Huerta José Luis Rodríguez-Gil, Nicola Mastroianni, Miren López de Alda, Damià Barceló, Yolanda Valcárcel

Abstract : The region of Galicia, found in north-western (NW) Spain, is a national and world leader in shellfish, especially mussel production, and recognized for its fishing industry. Few studies have evaluated the presence of emerging contaminants in NW Spain, with those published mainly concerning the continental aquatic environment. The objective of this study was to identify the environmental risk posed by the presence of pharmaceuticals and drugs of abuse in this important coastal region. The presence of sixteen pharmaceuticals (benzodiazepines, anxiolytics, and caffeine), and 19 drugs of abuse (cocainics, amphetamine-like compounds, opiates and opioids, lysergic compounds, and cannabinoids) was assessed in 23 sites located in the Rías (Coastal inlets) of Muros, Arousa, and Pontevedra (NW Spain). Twenty-two of these locations were affected by wastewater treatment plant (WWTP) effluents, and one represented the effluent of one of these WWTPs. Venlafaxine was the pharmaceutical compound detected at higher concentration in the three Rías, with a maximum value of 291 ng/L at the site Porto do Son (Ría de Muros). Total concentration in the three Rías was 819,26 ng/L. Next, citalopram and lorazepam were the most prevalent compounds detected. Metabolite of cocaine benzoylecgonine was the drug of abuse with the highest concentration, measured at 972 ng/L in the Ría of Noia WWTP (no dilution). This compound was also detected at 142 ng/L in the site La Isla de Aros, Ría of Pontevedra. Total concentration for the three Rías was 1210 ng/L. Ephedrine was also detected at high level in the three Rías, with a total concentration of 579,28 ng/L. The results obtained for caffeine show maximum and average concentrations of 857 ng/L Isla de Arosa, Ría de Pontevedra the highest measured in seawater in Spain. A preliminary hazard assessment was carried out by comparing these measured environmental concentrations (MEC) to predicted no-effect concentrations (PNECs) for aquatic organisms. Six out of the 22 seawater samples resulted in a Hazard Quotient (HQ) from chronic exposure higher than 1 with the highest being 17.14, indicating a high probability of adverse effects in the aquatic environment. In addition, the risk was assessed on the basis of persistence, bioaccumulation, and toxicity (PBT). This work was financially supported by the Spanish Ministry of Economy and Competitiveness through the Carlos III Health Institute and the program 'Proyectos de Investigación en Salud 2015-2017' FIS (PI14/00516), the European Regional Development Fund (ERDF), the Catalan Government (Consolidated Research Groups '2014 SGR 418 - Water and Soil Quality Unit' and 2014 SGR 291 - ICRA), and the European Union's Seventh Framework Programme for research, technological development and demonstration under grant agreement no. 603437. The poster entitled 'Environmental Risk of Pharmaceuticals, Drugs of Abuse and Stimulant Caffeine in Marine Water: A Case Study in the North-Western of Spain'.

Keywords : drug of abuse, pharmaceuticals, caffeine, environmental risk, seawater

Conference Title : ICFTRA 2018 : International Conference on Food Toxicology and Risk Assessment

Conference Location : London, United Kingdom

Conference Dates : April 24-25, 2018