Monitoring of selected group of pharmaceutical compounds in outfalls from coastal waters of Gran Canaria island (Spain)

Cristina Afonso-Olivares, Mª Esther Torres-Padrón, Zoraida Sosa-Ferrera, José Juan Santana-Rodríguez

Departamento de Química, Universidad de Las Palmas de Gran Canaria, 35017, Las Palmas de G.C., Spain.

Abstract

Since decades, continuous and indiscriminate use of prescription or non-prescription human pharmaceuticals, illegal drugs as well as veterinary drugs has produced the preoccupation between the scientific communities. These pollutants are not included in the different regulations and, for this reason, they are considered emerging contaminant [1,2]. Continuous exposure of these potentially hazardous chemicals has led to many environmental problems that directly or indirectly affect the water cycle. Because they are dispersed through wastewater, whose customary purification systems are not designed to remove it, so that they are discharged in seawater and they can be introduced in trophic chain [3].

The principal aim of this study is to assess the presence of a selective group of pharmaceutical compounds from urban agglomerations in the coastal waters of Gran Canaria Island in order to predict environmental quality. Solid phase extraction (SPE) was used for the extraction and preconcentration of the samples and high performance liquid chromatography coupled to mass spectrometry detection (LC-MS/MS) was chosen for the determination. The developed method was applied to evaluate the presence of seven pharmaceutical compounds belonging to different commonly used therapeutic classes in seawater samples from four outfalls in Gran Canaria Island (Spain) during one year.

The target compounds include atenolol (antihypertensive), acetaminophen (analgesic), norfloxacin and ciprofloxacin (antibiotics), carbamazepine (antiepileptic) and ketoprofen and diclofenac (anti-inflammatory). All parameters involved in solid phase extraction were optimized and the process was validated. The recoveries obtained were in the range of 78.3% to 98.2%, and the relative standard deviations were less than 11.8%. The detection and quantification limits of the method were in the ranges of 0.1–2.8 and 0.3–9.3 ng L^{-1}, respectively.

During the monitoring time, some pharmaceutical compounds were found sporadically, such as diclofenac, acetaminophen and ketoprofen at very low concentrations. However, fluoroquinolones (ciprofloxacin and norfloxacin) were found in a large number of samples in a concentration range of 9.0-3551.7 ng L^{-1}.

References

1. Pal, A., Yew-Hoong, K., Yu-Chen, A., Reinhard, M., 2010: Impacts of emerging organic contaminants on freshwater resources: Review of recent occurrences, sources, fate and effects. Sci. Total Environ., 408, 6062–6069.

2. Kaplan, S., 2013: Review: Pharmacological Pollution in Water. Crit. Rev. Env. Sci. Tec., 43, 1074–1116.

3. Afonso-Olivares C., Torres-Padrón M.E., Sosa-Ferrera Z., Santana-Rodríguez J.J., 2013: Assessment of the Presence of Pharmaceutical Compounds in Seawater Samples from Coastal Area of Gran Canaria Island (Spain). Antibiotics, 2, 274-287.