



Incidence of pharmaceuticals in soils, sediments and waters of Pego-Oliva Marsh by LC-MS/MS.

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The presence of pharmaceutical residues in the environmental compartments is a growing problem that could have unexpected consequences. In recent years, the number of pharmaceuticals detected in the environment had increased spectacularly, reaching a broad number of the most consumed drugs and including virtually all the existing therapeutic classes. These compounds come mainly from human excretions, waste effluents of manufacturing processes and animal farms. In Spain, obsolete sewage treatment plants, and even the absence of those, are the main problem to be solved.

Some pharmaceuticals have shown toxicity to bacteria, algae and invertebrates. Besides that reproductive problems in fishes have been observed in "in vitro" studies. By the other hand, synergistic effects of exposure to mixtures of drugs or toxic effects due to accumulation would be expected.

A method developed in our laboratory was utilized to monitor the occurrence of 16 relevant pharmaceuticals in the Pego-Oliva Marsh Natural Reserve (Valencian Community, Spain). A total 46 samples of soils (at two different depths), 15 sediments and 34 waters were collected in June 2009. Solid samples were concentrated by pressurized liquid extraction (ASE® 200) using water at 90°C as extracting solvent and three cycles of extraction of 7 minutes. The aqueous extract obtained was passed through two cartridges connected in series: to an Isolute® SAX cartridge (strong anion exchange) on the top and an Oasis® HLB cartridge below. Extraction was carried out with 6mL of methanol. Quantification was performed by a Quattro Micro LC-MS/MS with an ESI interface working in both positive and negative mode. Two transitions were utilized for each compound to obtain an unequivocal confirmation, with the exception of ibuprofen which only gave one transition with adequate sensitivity.

All water samples appeared contaminated with at least with two compounds. Ibuprofen and codeine were the compounds more frequently detected in concentrations between detection limit and a maximum of 59 ng/L and 63 ng/L respectively. In sediments, carbamazepine was detected in all samples, and acetaminophen in all except one. In soils, acetaminophen and ofloxacin were commonly detected in concentrations until maximum of 3.5 ng/g and 3.7 ng/g respectively. Diclofenac, clofibrate acid and oxytetracycline were not detected in any sample.

This study has corroborated the ubiquitous presence of these pollutants in the environment, reaching protected areas such as the Pego-Oliva marsh. A potential problem to maintain the richness of biodiversity of this protected area could appear as consequence of the toxicology of some of the discovered pharmaceuticals.

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