# DETERMINATION OF PPCPs AND ENDOCRINE DISRUPTORS IN THE GUANDU RIVER BASIN BY UPLC-ESI-MS/MS

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## ABSTRACT

Pharmaceutical and personal care products (PPCPs) and endocrine disrupters (EDs) are micropollutants found in concentrations ranging from ng $L^{-1}$ to μg $L^{-1}$ and are potentially hazardous to the environment as well as to human beings. Among the most widely used pharmaceutical drugs one can mention: Trimethoprim (antibiotic), Bromazepam, Clonazepam and Diazepam (benzodiazepines psychoactive drugs), Ibuprofen (anti-inflammatory) and Benzophenone (UV radiation blocker). EDs, in turn, are substances that impair the normal functioning of endocrine systems. Among them, it can be mentioned 4-Nonylphenol (surfactant), Bisphenol-A and Diethyl-phthalate (plasticizers). The development of analytical methods with increasing reduction of limits of detection and quantification, capable of detecting micropollutants at concentrations in the range of ng $L^{-1}$ has been essential mostly for drinking water quality control and assessment of surface water quality. The objective of this work was to develop analytical procedure susing solid phase extraction (SPE) and ultraperformance liquid chromatography coupled to mass spectrometry (UPLC-MS/MS) with electrospray ionization (ESI) for the determination of Trimethoprim, Bromazepam, Clonazepam, Diazepam, Ibuprofen, 4-Nonylphenol, Bisphenol A and Diethyl phthalate in surface water of Guandú River, which has the highest national priority due to the water supplied in Rio de Janeiro State. For concentration and extraction of the analytes from the matrix, solid phase extraction (C18 stationary phase cartridge and 500 mg) was used. The separation was done using a BEH C18 (2.1 mm ID x 50 mm, 1.7 μm) chromatographic column, with a running time of 8 min, and mobile phase of methanol and ultrapure water, both with 0.01% ammonium hydroxide in gradient mode with a flow rate of 0.4 mL $min^{-1}$. The recovery rate of all analytes ranged from 57% for Clonazepam to 99% for Benzophenone; the accuracy of all analytes was adequate (RSD <20%), the uncertainty lower than 20% with acceptable standard error (less than 7.88). The limits of quantification (LQ) of the method ranged from 10.0 ng $L^{-1}$ for Bromazepam, Clonazepam, Diazepam and Trimethoprim to 100.0 ng $L^{-1}$ for Diethyl phthalate. The first four sampling campaigns (April, May, June, July 2018) of a monitoring program in a segment of Guandu River with focus has already shown the presence of some of these pollutants.

**KEYWORDS**: benzodiazepine drugs; method validation chromatography in liquid phase; water quality

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