



Occurrence and environmental implications of the presence of drugs of abuse in wastewater treatment plants of Valencia (Spain)

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Drugs of abuse are continuously discharged into wastewaters due to human excretion as parent compounds and/or secondary metabolites after consumption or accidental disposal into the toilets. (Boles and Wells, 2010). Incomplete removal of these compounds during wastewater treatment results in their release to the environment. Pollution by illicit drug residues at very low concentrations is generalized in populated areas, with potential risks for human health and the environment. The impact of treated wastewater effluent on the quality of receiving waters can be evaluated performing an investigated performing an ecotoxicological risk assessment calculating the risk quotient (RQ) of the drugs of abuse level observed. In addition, back-calculation from the concentration of illicit drug in the influents of wastewater treatment plants (WWTPs) provides an important tool for estimating its local consumption (Daughton 2001).

Sampling campaigns were in three years, 2011 (March 9th to 15th), 2012 (April 17th to May 1st) and 2013 (March 6th to 12th) in influents and effluents from 3 Wastewater Treatment Plants (WWTPs), Pinedo I, Pinedo II and Quart-Benàger, that treats most of the wastewater of Valencia City and its surrounding towns. Cocaine (COC), amphetamine (AMP), methamphetamine (MAMP), ecstasy (MDMA) and ketamine (KET), Benzoyllecgonine (BE), 6-acetylmorphine (6-MAM), and 11-nor-9-carboxy-delta9-tetrahydrocannabinol (THC-COOH) were analyzed using mass spectrometry techniques such as liquid chromatography triple quadrupole mass spectrometry (LC-QqQ-MS/MS) Illicit drugs were extracted using solid phase extraction (SPE) and determined by liquid chromatography tandem mass spectrometry (LC-MS/MS) in positive ionization with an electrospray ionization source (ESI).

The determination of drugs of abuse in the influent of the selected WWTP shows that all compounds were detected in 100% of influents from Pinedo I, Pinedo II and Quart-Benàger in samples analyzed during three years of monitoring period, with the exception of 6-ACMOR. Regarding the determination of drugs of abuse in the effluent, the compounds with the highest removals (100%) were AMP, MAMP, THC-COOH and COC. BECG values of removal efficiency ranged from 93.4% in Quart-Benàger to 98.5% in Pinedo II. MDMA removal efficiency is variable depending on the WWTPs while ketamine removal efficiency was negligible. Ecotoxicological risk were calculated for drugs of abuse founded in the effluents of the WWTPs. MDMA could pose a medium risk, KET could pose low risk to the aquatic organisms while BECG couldn't pose environmental risk.

Acknowledgements

This work has been supported by the Spanish Ministry of Economy and Competitiveness trough the project SCARCE-CDS 2009-0065, CGL 2011-29703-C02-01 and GCL CGL 2011-29703-C02-02. MJ Andrés Costa also acknowledges to this Ministry the FPI grant to perform her PhD.

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