



Occurrence of emerging contaminants in agricultural soils, sewage sludge and waters in Valencia (E Spain)

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In recent years, studies into the presence and distribution of emerging contaminants (ECs), like pharmaceutical products, some pesticides and mycotoxins in the natural environment, are receiving considerable attention. Thus, the presence of these compounds in waters, soils and wastes in different locations including agricultural systems has been stressed; very few studies into this matter are available in Spain. The main source of ECs in the environment is wastewater spillage from wastewater treatment plants (WTP), where these compounds arrive from the sewer system network. The objective of this study was to determine the levels of 35 ECs constituted by nine pharmaceutical products, 23 fungicides and three mycotoxins in soils, sewages sludge and waters adjacent to WTP from an agriculture area of Valencia (E Spain) influenced by intense urban and industrial activity. Seven samples from sludge, 13 soil samples and eight samples of waters from the area of influence of WTP were collected. The ECs extraction were performed using 5 g of fresh sample and a mixture of acetonitrile with 1% formic acid and water at the 3:1 ratio by shaking for 45 min and then centrifuging at 4,000 rpm for 5 min. The extract was filtered and determination was done by HPLC system connected to a 3200-Qtrap de triple quadrupole mass spectrometer with an electrospray ion source. The results showed that soil-ECs concentrations were 10 times lower that in sewage sludge. The smaller number of detections and detected compounds should also be stressed. As in previous cases, fungicides azole (tebuconazole and tricyclazole), along with boscalid, were the most detected compounds with concentrations of between 100 and 400 $\mu\text{g kg}^{-1}$ dw. In second place, propiconazole and azoxystrobin stood out, followed by carbendazim, dimetomorph, pyraclostrobin and propamocarb. The following drugs and mycotoxins were detected to have a higher to lower concentration (1-40 $\mu\text{g kg}^{-1}$): telmisartan, irbesartan, venlafaxine, citalopram, azithromycin, fluoxetine and deoxinivalenol. In our case, the presence of these compounds in soils suggests substantial persistence. It is also noteworthy that this presence varied according to soil use. The results also reveal the presence of the majority of these compounds mainly in WTP sludge and, to a lesser extent, in surface waters originating from irrigation channels. This fact demonstrates that we need to verify the effectiveness of wastewater treatment to study these aspects in order to design strategies that enhance and improve their effectiveness. We would like to thank Spanish Ministry of Education and Science, Project AGL2011-29382; we also wish to thank to CINFA laboratories for their help in obtaining the standards of pharmaceuticals.