Geophysical Research Abstracts
Vol. 21, EGU2019-15762, 2019
EGU General Assembly 2019

Adsorption of drugs on a hydromorphic soil as affected by their chemical properties

Lili Szabó (1,2), Attila Csaba Kondor (1), Tibor Filep (1), Zoltán Szalai (1,2), Gergely Jakab (1,2), Anna Vancsik (1), Lilla Gáspár (1), and Marianna Ringer (1)

(1) Geographical Institute, Research Centre for Astronomy and Earth Sciences, MTA, Sopron, Hungary (szabo.lili@csfk.mta.hu), (2) Environmental and Landscape Geography, Faculty of science, ELTE, Budapest, Hungary

The presence of pharmaceuticals is constantly increasing in the environment. The pharmaceuticals are gone through metabolic processes and then excreted from humans or animals unchanged or as active metabolites. In this way, they are repeatedly discharged into domestic waste waters. Their solubility in water is different, therefore the persistence and bioavailability in the aquatic environment depend on their sorption on the solid phase. During the sewage treatment pharmaceuticals may be adsorbed onto the sludge or remained unchanged in the water phase. Furthermore, recycled water and wastewater sludge are often used in agriculture, so these materials can be appeared in the environment not only by direct release of effluents to waterways.

The extent of contamination risk depends on the behaviour of drug under various conditions, including how quickly it decomposes and how fast adsorbs to the soil particles. The chemical characteristics of the pharmaceuticals may influence how and to what extent these compounds accumulate in the environment. It is assumed that the chemical character of the pharmaceuticals such as water solubility, the dissociation constants and the n-octanol/water partition coefficient, has a substantial effect on the binding mechanism and consequently this, the extent of the sorption.

The present study focuses on the sorption of diclofenac, lidocaine, carbamazepine, 17-alpha-ethinyl-estradiol and lamotrigine on a hydromorphic soil. The adsorbent was contained small amounts of organic matter and smectite. Adsorption of pharmaceuticals on the soil was examined to estimate the effect of their intrinsic chemical properties on the sorption. Adsorption isotherms were applied using Langmuir and a Polanyi-based models in a batch technique experiment under ambient conditions. The concentration of pharmaceuticals were determined by high-performance liquid chromatography (HPLC) applying fluorescence and PDA detectors.

The higher n-octanol/water partition coefficient value of diclofenac and 17-alpha-ethinyl-estradiol would suggest that their hydrophobic interactions are more prominent. Our results provide further information on the fate of pharmaceuticals with different chemical properties in the environment.

This research was supported by Hungarian National Research and Innovation Office NKFIH (NVKP 16-1-2016-0003).