

Transport of platinum-based pharmaceuticals in soil

N. GOYKHMAN, I. DROR, AND B. BERKOWITZ

Department of Earth and Planetary Sciences, Weizmann

Institute of Science, 7610001, Rehovot, Israel

Pharmaceuticals are considered emerging pollutants and have thus received considerable attention. However, investigations of the mobility of organometallic pharmaceuticals in saturated porous media are rare. In a recent study, the transport of one organo-platinum complex (oxaliplatin) – an anticancer drug – in soil was reported [1]. The study raises the question of whether oxaliplatin behavior is characteristic of all Pt-based pharmaceuticals in soil-water environments. Here, we address this question by comparing the mobility and fate of 2 other organo-Pt complexes – carboplatin and cisplatin. We examine their transport in sand and in soil columns under unamended and acetate-amended conditions. Unlike oxaliplatin behavior, carboplatin species exhibited very low affinity to both sand and soil surfaces: the retention of carboplatin in sand and soil was 3% and <6%, respectively. No differences were found for carboplatin species under different redox conditions. In general, carboplatin affinity to sand and soil surfaces was much smaller than oxaliplatin affinity under similar conditions. Cisplatin mobility resembled that of oxaliplatin in soil, including some sensitivity to redox conditions (e.g., higher retention under acetate-amended conditions). Retention of 64-70% of the injected cisplatin species was found in soil column experiments. A similar retention of 45-53% cisplatin species was found in sand columns, which is different than the behavior of carboplatin and oxaliplatin in the same conditions. Based on these results, it is clear that similarly structured organo-Pt complexes can exhibit diverse transport characteristic in porous media, and should therefore be studied and assessed individually.

[1] - Goykhman, et al. (2018). *Chemosphere* **208**, 829–837