The Summer Undergraduate Research Fellowship (SURF) Symposium
3 August 2017
Purdue University, West Lafayette, Indiana, USA

Mobility Characteristics of Azithromycin in Soil

Ryan Minter [1], Jihyun Kim [2,3], Linda Lee [3,4]
[1] Natural Resources and Environmental Science, [2] Lyles School of Civil Engineering, [3] Ecological Sciences and Engineering, and [4] Department of Agronomy, Purdue University

ABSTRACT

The presence of pharmaceutical and personal care products (PPCPs) in the environment has become a widespread problem in recent decades. Azithromycin, a macrolide antibiotic commonly prescribed for infections in humans, has been detected in waste treatment plant discharge and surface waters across the world. Data on the mobility characteristics of azithromycin in soil is scarce, and further studies must be performed to explore the potential for azithromycin leaching to groundwater or becoming available for plant uptake. In this study, azithromycin sorption isotherms were measured on eight soils varying in pH, organic carbon content, and clay content. Soil was equilibrated with multiple concentrations (0 and 90 to 600 µg/L) of azithromycin in aqueous 0.01 N $CaCaCl_2$ solutions on an end-over-end rotator at 22 $\pm$ 2 °C. Concentrations were determined liquid chromatography and a triple quadrapole mass spectrometer. lsotherm data were fitted to a nonlinear Freundlich sorption model. Sorption coefficients show that azithromycin sorbs to soil more strongly than expected compared to data reported for other macrolides. Sorption was best correlated to cation exchange capacity, consistent with azithromycin's high pK_a values causing the cation to dominate at environmentally relevant pH values. Because of high sorption, azithromycin mobility in soil and availability to plants, animals, and microorganisms are expected to be limited.

KEYWORDS

Antibiotics, macrolides, Freundlich sorption model, cation exchange capacity, cation sorption