Effects of pH and Ionic Strength on Sulfamethoxazole and Ciprofloxacin Transport in Saturated Porous Media

Hao Chen[1], Bin Gao[2], and Lena Q Ma[1]*
[1] Soil and Water Science Department
[2] Agricultural and Biological Engineering Department

Antibiotics can be released into soils as emerging groundwater contaminants because many of them show toxic effects to the ecosystems; however, their fate and transport in soils are largely unknown. The present work examined the fate and transport of two antibiotics, Sulfamethoxazole (SMZ) and ciprofloxacin (CIP), in saturated porous media. Laboratory columns packed with quartz sand was used to test the effects of solution pH and ionic strength on the retention and transport of the two antibiotics. Our results showed that the two antibiotics behaved differently in the saturated sand column. In general, SMZ had much higher mobility than CIP in the saturated porous media for all experimental conditions tested. Almost all SMZ (100%) transported through the column under deionized water conditions, but no CIP was detected in the effluents under the same condition even after extended column flushing. Perturbations in solution pH and ionic strength showed no effects on the retention and transport of SMZ in the saturated columns. Solution pH, however, played an important role in controlling the transport of CIP. A mathematical model based on advection-dispersion equation coupled with equilibrium and kinetic reactions successfully simulated the transport of the antibiotics in water-saturated porous media.