



Colloid-Mediated Transport of PPCPs through Porous Media

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Pharmaceutical and personal care products (PPCPs) enter the soil through reclaimed water irrigation and biosolid land application. Colloids, such as clays that are present in soil, may interact with PPCPs to affect their fate and transport in the subsurface environment. This study addresses how soil colloids mediate the sorption and transport behaviors of PPCPs through laboratory column experiments. The affinities of PPCPs for colloids as well as the influence factors were investigated.

For PPCPs that have high sorption (e.g., ciprofloxacin with $K_d \sim 10^{4-5}$ L/kg) on soil colloids, the transport is dominantly controlled by colloids, with a higher extent of colloid-facilitated effect at lower ionic strength. For PPCPs that have intermediate sorption (e.g., tetracycline with $K_d \sim 10^{3-4}$ L/kg) on soil colloids, the mobility of dissolved and colloid-bound PPCPs respond oppositely to the effect of changes in solution ionic strength, making the net effect of soil colloids on PPCP transport variable with soil solution chemistry. For PPCPs with low sorption (e.g., ibuprofen with $K_d \sim 10^{2-3}$ L/kg) on soil colloids, other measures (such as pre-filtration) must be taken. This study suggested that colloids are significant carriers of PPCPs in the subsurface environment and could affect their off-site environmental risks.