

Retention Mechanism of Metformin on Tennessee Soil: Investigating the Influence of Soil Properties.

Metformin is a glucose-lowering antidiabetic drug for type 2 diabetes treatment. It is a prescribed oral medicine being ingested daily by at least 120 million people worldwide to control diabetes (Abdelrahman et al., 2021; Viollet et al., 2012). However, the widespread use of metformin by humans leads to increased influent concentrations of metformin entering wastewater and sewage treatment plants from human excretion. As a result, metformin is released into the environment through the discharge of wastewater effluent and sewage sludge, posing serious threats as an emerging contaminant to the soil and water environment. Adsorption is one of the major mechanisms in environmental chemistry that determines the fate and transport behavior of contaminants in terrestrial and aquatic environments. Several factors influence the adsorption mechanism in soil including the various physicochemical properties of soil such as pH, cation exchange capacity, ionic strength, electrostatic differences, mineral components of different soil fractions, and surface complexes in the soil. Therefore, determination of the metformin sorption mechanism in the soil is required to assess the potential risk and identify the effective strategy to reduce its release into the environment. However, no study has been performed yet to characterize the adsorption mechanism of metformin in soil considering specific soil properties. This study will assess the underlying surface interaction mechanisms of metformin with different soil fractions (sand, silt, and clay) that influence the mobility of the contaminant. We will conduct macroscopic and *in situ* ATR-FTIR adsorption experiments under various environmentally relevant solution properties to evaluate and characterize the retention mechanism of metformin in soil. This study will yield critical insight into the influence of soil properties on the fate of metformin in soil and significantly advance our understanding of its environmental chemistry.