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Sorption of Contaminants in Treatment Wetlands

Pharmaceuticals enter the environment through human and animal use and are present in a significant amount of surface water in the United States. Treatment wetlands are an alternative method of water treatment that offer many benefits including low energy and operational costs. The behavior of pharmaceuticals in treatment wetlands needs to be understood for effective treatment. This study looked into the adsorption of triclosan and sulfamethoxazole, two commonly occurring pharmaceuticals in surface water, onto the gravel bed of a treatment wetland. Adsorption of these compounds must be first understood to evaluate the contribution of other mechanisms such as plant uptake and degradation in the wetlands. A PVC column was filled with gravel with or without plant biomass to model a treatment wetland. Separate tests were run for both contaminants, during which media containing the contaminant was fed into the column and ran as a batch test for one week. The concentration of the contaminants in each sample were then determined using high pressure liquid chromatography. Over the course of a week, the concentration of triclosan was reduced by 94%, showing that it adsorbed readily to the gravel. The concentration of sulfamethoxazole did not change from the initial concentration throughout the experiment. Triclosan can be removed in significant quantities through adsorption to the gravel bed of treatment wetlands. However, sulfamethoxazole showed no ability to adsorb to the gravel. The ability of treatment wetlands to remove pharmaceuticals through sorption can contribute to overall removal in treatment wetlands, in addition to degradation.