

# Detection of pharmaceuticals in soils

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This research explores the detection of pharmaceuticals in soils that are exposed to wastewater irrigation. Treated wastewater may contain a variety of emerging environmental contaminants including pharmaceuticals (antibiotics, prescription) and illicit drugs. Currently, many wastewater treatment plants are not required to remove pharmaceuticals, allowing for export of parent compounds and/or metabolites into the natural environment. There is increasing concern that the continuous discharge of these compounds may negatively impact the surrounding environment, decrease biological diversity in soils and waters, and increase the occurrence of bacterial antibiotic resistance.

In this work soils from a productive agricultural area with an extensive history (over 50 years) of being irrigated with tertiary treated sewage effluent from municipal waste have been sampled and tested for the presence of a variety of pharmaceuticals using high performance liquid chromatography (HPLC) and nuclear magnetic resonance (NMR) techniques on waters and soil extracts. Scanning electron microscopy (SEM) and x-ray diffraction (XRD) were used to perform analysis on solid-phases.

The results indicate that traces of pharmaceuticals persist in the natural environment over extended periods of time. These potential environmental contaminants adsorb and adsorb to soil particles. The consistent application of tertiary-treated wastewater results in a build up of antibiotic resistant bacteria in soil, contaminating the soil.