



CIVIL & ENVIRONMENTAL ENGINEERING SEMINAR SERIES

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The impact of plastic and bioplastic films on agricultural soil resistome

The use of plastic films for agricultural mulching is widespread and continuously increasing and was shown to improve crop yield, decrease pesticide inputs to the field, save irrigation water, and serve as a barrier to treated wastewater irrigation. Yet, plastic mulching was shown to form plastic residues that contaminate agricultural soils and potentially the crops with plastic pollution. We have shown that the plastic residues of the films, or microplastic, bind antibiotics and thus may augment the soil resistome. We hypothesize that plastic mulching would affect microplastic pollution and the dissemination of antibiotic resistance in agricultural soil and crops. We further hypothesize that the use of biodegradable mulch (BDM) film could mitigate plastic pollution and the spread of antibiotic resistance. To test our hypothesis, we investigated the abundance of antimicrobial resistance-promoting elements, heavy metals, and microbial inhabitants in agricultural soil covered with plastic mulch. We further hypothesized that the use of BDM could mitigate plastic pollution and the spread of antibiotic resistance of soil bacteria. To that end, a promising biodegradable composite was comprised of polybutylene adipate co-terephthalate (PBAT), polylactic acid (PLA), microcrystalline cellulose (MCC), and nanohydroxyapatite (n-HA). The optimum composite is further characterized for water absorption, antibiotic adsorption, and in the future for soil degradation. The results of this study will provide potential alternative films that would retain the benefits of plastic mulching while mitigating soil contamination and moderating the dissemination of antibiotic resistance.

My research is focused on the interactions of microorganisms with their environment, their host, and each other. I am studying microbial mediated processes, in natural and engineered environments that shape the ecosystem structure and function. I use various methods in an attempt to understand the role of microorganisms in their environment, using molecular methods, bacteriology, bioinformatics and biogeochemistry.