

## **Interactions Between Microplastics, Biofilms, and Antimicrobials in Freshwater Streams**

Microplastics (MPs) are ubiquitous contaminants in freshwater ecosystems that could be hotspots for the interaction of antimicrobial compounds and surface-attached microbial biofilm communities. MPs and antimicrobials are both common in wastewater and urban freshwaters and MPs can adsorb contaminants like antimicrobials to their surface. Within aquatic habitats, MPs also support colonization by microbial biofilms. Therefore, we hypothesized that the adsorption of antimicrobials to MP surfaces would affect microbial communities colonizing MPs, altering their diversity, composition, and antimicrobial resistance. We investigated the effects of these interactions across two studies. The first study used a microcosm approach to assess the potential for acrylic, nylon, and polyester MP fibers to adsorb the antimicrobial compound triclosan and alter bacterial and algal communities. We found that triclosan adsorption varied between polymer types and that triclosan significantly impacted the diversity and composition of bacteria and algae within MP-associated biofilms and in the surrounding water. We conducted the second study to further examine these interactions in artificial stream mesocosms containing environmentally relevant concentrations of polyester MP fibers and a cocktail of eight commonly prescribed antimicrobial compounds. Concentrations of antimicrobials representative of untreated wastewater influent significantly impacted taxonomic abundance and community composition on MPs and in water, and selected for taxa associated with plastic degradation, multidrug resistance, and human pathogenicity. The class 1 integrase gene *intI1*, a proxy for general antimicrobial resistance, was also significantly less abundant at high antimicrobial concentrations. Results from both studies suggest that widespread MP and antimicrobial contamination could potentially alter natural bacterial and algal communities in freshwater habitats.