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Category: Postdoc
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Title: Methods for Identifying Respirable Microplastic Particulate in Indoor Dust and Air.
Abstract: Humans spend 70-90% of their time indoors, however, there is a significant lack of knowledge regarding human exposure to microplastic particles and fibers within the indoor environment. Studies have shown that nylon fibers inhibited the growth of human lung organoids, suggesting that exposure to these microplastic fibers could harm human lung development. Studies have also identified microplastic particles >50 um in indoor dust, but these are unlikely to be respirable and little information is available regarding smaller airborne particles. Therefore, we are currently developing methods to identify respirable (<4 um in aerodynamic diameter) microplastic particles and fibers in indoor dust and air. Dust and air were collected from two different locations: an office, and a machine shop. Dust samples were sampled from surfaces; air samples were collected using cascade impactors and, for the first time, via silicon nitride nanomembrane technology. Surface dust was suspended in an ethanol solution prior to filtration through a nanomembrane and Nile red stained plastics were identified using an epifluorescence microscope. The nanomembrane technology concentrates particulate samples on a small, optically transparent, plastic-free filter for microscopic examination. Alongside cascade impactor collection, we can obtain characteristics of microplastic particles such as size, mass, number, type of polymer, and shape (particle vs fiber). Microplastic particles and fibers were identified in dust samples at both locations and in air collected from the shop. A lack of material collection in the office limited our ability to identify particulate in air. A bi-modal mass median aerodynamic diameter for air collected in the shop was determined to be centered at 1.5 and 8.9 um, with a total particle mass concentration of 26 ug/m3, indicating possible exposure to respirable microplastics. Methods are currently underway to isolate and characterize microplastic particles and fibers in indoor dust and air. Future directions include testing air and dust from households and laundromats as carpet, textiles, and furniture upholstery contribute the most to microplastics found in indoor dust and air.