Distribution of Micro-plastics in the Estuarine Waters around the New York Metropolitan Area and Assessment of Their Role as Potential Vectors of Toxic Compounds

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Micro-plastic particles and microbeads are plastic polymers that usually range in size from 5 μm to 1 mm. They are used in many body and household cleansing products, cosmetics and even toothpaste, and are washed down drains into wastewater treatment plants, where they come in contact with a wide range of organic pollutants such as polycyclic aromatic hydrocarbons (PAHs), polychlorinated biphenyls (PCBs) and even pharmaceuticals. Because of their small size, they usually escape waste water treatment plant filtration systems and find their way into inland waterways, estuaries, coastal oceans and eventually into the open ocean, where they can pose a threat to estuarine and marine resources, either directly through impacts on internal tissue or indirectly via the toxic compounds that adsorb on to them. In this study, we present, perhaps the first assessment of microbeads and micro-plastics in the estuarine waters around the New York metropolitan area and their potential toxicity. Several stations that we obtained samples from were located primarily around waste water discharge points in the Hudson, East and Harlem Rivers. Our sampling also included a less impacted location close to the tip of Manhattan. Because the study of micro-plastics in seawater is fairly new, this study first involved the development of protocols to detect and quantify microbeads and micro-plastics followed by methods to assess their potential toxicity. A wide range of micro-plastic particles from microbeads, micro-plastic fibers and microbeads were detected at all 7 sites, with the most being in the Newtown Creek sample. Density separation of micro-plastics from animal and plant tissue, followed by extraction, and liquid chromatography-mass spectrometry (LC-MS) allowed us to identify organics adsorbed onto micro-plastics/microbeads. Preliminary data on the Newtown Creek sample shows that atenolol, a popular blood pressure drug, is one of the adsorbed organics. Further study may allow identification of more organics and analysis of more samples.