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The Challenge: Microplastics in the aquatic environment – Perspectives on the scope of the problem

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Almost fifty years ago, in the classic film “The Graduate”, the main character Ben (played by Dustin Hoffman) was advised that his future should be in “Plastics”. That future may be coming back to haunt all of us now. It is estimated that 5 –13 million metric tons of plastics enter the oceans annually and that amount is projected to increase by an order of magnitude in 10 years if mitigation measures are not taken [1]. Freshwaters are also impacted with nearly 50,000 plastic particles found per square kilometer, on average, in the water column of the Great Lakes in North America [2, 3]. Through degradation processes these plastics become progressively smaller until they approach the microplastic size of approximately 5000 μm to 1 μm and smaller (i.e., nanoplastics). In addition, microplastics included as components of many personal care and consumer products, like hand soaps and fleece clothing, enter directly into aquatic environments via wastewater [4]. Microplastics are present in the water column, sediments and aquatic organisms which depend upon waterways for their survival. As microplastics continue to be released and distributed through-out the aquatic environment, they leave a trail of questions: how much and what types of microplastics are most commonly found in the water column, in sediments, and in organisms? How much is too much? Is there a lower threshold? Do microplastics cause adverse ecological or human health effects? Do the chemicals they contain cause adverse ecological or human health effects? Do microplastics serve as a vector for conventional organic contaminants like PCBs? What methods should be used to collect, extract/isolate, and identify microplastics in aquatic environments? What is the ecological and human health risk, if any, of microplastics in aquatic systems? Are regulations needed to control their release and mandate their clean-up? While some of these questions have been addressed as scientists, politicians and society continue to recognize the magnitude of the problem microplastic may represent [5], others of these questions still remain unaddressed at this time. Here, we bring together four perspectives on these questions and others: industry, government, academic and a non-governmental organization to continue the on-going dialogue regarding the risks associated with microplastics in aquatic environments.

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