Microplastic and Microfiber Leaching and the Resulting Effect on Daphnia Magna

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Abstract:

As technological advancement continues and allows the world to operate more and more quickly, the need for easy to use and quickly disposable products increases as well. This drive to make things easiest for consumers has helped drive a large reliance on plastic products, many of which billions of people use worldwide on a daily basis. In 2012, over 280 million tons of plastic were manufactured globally, less than half of the plastic produced that year was recycled (Brown et al 2013).

Influxes of plastics on this magnitude each year present numerous problems for animal species throughout the world. Because plastic does not biodegrade, plastics, over time, are worn down into smaller and smaller pieces, eventually becoming microplastics (plastics less than 5mm in size). Microplastic fibers are also introduced into the environment via laundry process, as the loose synthetic fibers get washed off. Much of this plastic ends up washing down into oceans and freshwater bodies, the extremely small size of microfibers and microplastics make studying and removing them complex.

Most of the studying of microplastics has revolved around the uptake of microplastics by aquatic species close to the beginning of the food chain (i.e. zooplankton, mussels, worms). However, little research has been done to look at the potential leaching toxic chemicals by these microplastics into the water, and what effect that might have on aquatic food chains. My research looks at this leaching potential, and is trying to answer the question of whether or not plastic leaching can be tested for, and how this water may affect the growth and mortality rates of Daphnia Magna, an important zooplankton in many aquatic ecosystems.

I am running a series of controlled leaching experiments using de-ionized water, and testing the leaching properties of polyethylene (PE) and polystyrene (PS) microplastic beads, and polyethylene terephthalate (PET) fibers from fleece. I am using florescence spectroscopy to compare potential leaching to a pure water blank. The plastic is then strained out of the water, so that the Daphnia can be exposed to the contaminated water without the risk of ingesting the beads and fibers themselves. Effects on Daphnia Magna could have potentially wide reaching influences, as they are often key components of the aquatic food chain. This research attempts to gain some insight as to whether or not this is a legitimate concern.