The Effects of Pollutants on Developing Vertebrates

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Plastic pollutants are an ongoing problem in our oceans and waterways, in particular, microplastics – plastic fragments that do not exceed five millimeters in diameter. Microplastics present an emerging threat to aquatic ecosystems. Narragansett Bay alone contains roughly 40 – 4.6 million particles/100 g of sediment. The impact of plastics on the environment starts at the lower trophic levels with primary consumers, and inevitably works its way up to larger marine mammals. Many organisms are exposed to microplastics through a variety of avenues, such as habitat disruption and contaminated food sources. In addition, chemicals that are insoluble in water are released into the environment by the sorbing and desorbing properties of microplastics. The general consensus of most studies point to the conclusion that microplastics are detrimental to the health of marine organisms. Previous findings suggest that toxins from plastics can have fatal impacts on developing embryos, in some cases reducing survivability and driving developmental abnormalities. However, the specific cellular/molecular pathways affected in the presence of microplastics and their chemicals remain unknown. This lack of understanding makes it important to take a closer look at how microplastics and their chemicals affect gene expression during embryonic development in aquatic organisms. For this study, we looked at the affect microplastics have on the embryonic development of Atlantic silverside (*Menidia menidia*) – a wild species native to the Narragansett Bay. Atlantic silversides play an important role in the Narragansett Bay ecosystem because not only are they primary and secondary consumers, feeding both on producers and small marine creatures, but they are also an important food source for larger fish and coastal birds. Using zebrafish embryos as a baseline, we look to assess the molecular effects of Polyethylene microplastics on silverside embryos in a controlled laboratory environment. Using in situ hybridization and qPCR we will monitor the development of early forming tissues and gene expression in developing embryos. These experiments will provide us with a better understanding on how microplastics, and the chemicals associated with them, affect vertebrate development in aquatic environments, and give us insight into the effects that they will have on the entire ecosystem.

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