

Determining the toxicity of polyethylene photoproduct complex mixtures in developing zebrafish

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Sunlight degrades plastics into thousands of water-soluble compounds. The potential toxicity of this complex mixture of compounds remains largely unresolved for vertebrate animals. We evaluated acute toxicity and gene expression in developing zebrafish larvae after five days of exposure to photoproducts from additive-containing polyethylene grocery bags and additive-free films. Using a "worst-case" plastic concentration, exceeding those found in natural waters, we observed no acute toxicity for any of the plastics tested. However, at the molecular level, genome-wide gene expression measured by RNA sequencing revealed differences in the number of differentially expressed genes (DEGs) ranging from 1000s to none, depending on the plastic product formulation. From our RNA sequencing results, we inferred that plastic leachates may disrupt neuromuscular processes via biophysical signaling, with greater bioactivity for photoproducts. This work demonstrates that the potential toxicity of the complex mixture of plastic photoproducts can be product formulation specific. [Support: Gerstner Philanthropies].