Tokyo Bay was calculated for MP contained in products, synthetic fibers derived from laundry, and tire wear particles. As one attempt to estimate a threshold concentration for the use in risk characterizations, we devised an estimation method for SSD using a hierarchical Bayesian model, which can quantitatively take into account the characteristics of MPs and attempted to estimate the hazardous concentration (HC5). In this talk, as a case study of Tokyo Bay, the results of environmental emission estimates of the selected sources and model analyses, as well as the risk estimates based on monitoring data of MPs, will be presented.

1.09.P-Mo055 Comparison of Species Sensitivity Distribution Methods for Risk Assessment of Microplastics
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Most papers published on ecological risks of microplastics (MP) are based on laboratory studies with limited exposure profiles or field studies that focus on the occurrence of MPs in aquatic organisms. However, the current scientific literature and knowledge regarding MP toxicity is sparse and often challenging to interpret. Examples of challenges with MP studies include incomplete/inconclusive reporting on microplastic characterization, and uncertainty in dose ranges (e.g., particle counts) due to particle aggregation. Given the limited number of high-quality studies that can be used in risk assessment, most efforts to quantify MP risk have lumped MPs into a single class rather than differentiating them based on a specific property (e.g., particle shape, polymer type). While this approach may currently be the most feasible, it may also be too simplistic and potentially under protective. In the past decade, there has been an increase in research and regulatory activity directed at supporting MP risk assessments. In 2016 the State of California, USA passed legislation requiring a comprehensive literature review to determine if a risk assessment could be conducted for human health (via drinking water) and aquatic organisms. California concluded that while there were insufficient data to conduct a formal risk assessment for human health, sufficient data were available to generate species sensitivity distributions (SSDs) based on no observed effect concentrations (NOECs) or lowest observed effect concentrations (LOECs). The SSDs were used to define four threshold levels; however, given the small sample sizes and well documented limitations associated with NOECs/LOECs, the confidence intervals calculated for each threshold almost entirely overlap. An alternative approach, first developed by USEPA's Office of Pesticide Programs to support ecological risk assessments of pesticides, and subsequently applied to site assessments of legacy contaminants, utilizes the full dose-response curve (DRC) rather than selected points of departure. The DRC method produces a composite DRC and confidence interval that reflects the range of different shapes of DRCs. Here we compare the threshold values for MPs when SSDs are constructed using the NOEC/LOEC approach and when the same study data are integrated using the DRC approach. We discuss the advantages and limitations of the approaches and demonstrate the implications of grouping MPs into subclasses based on common properties.

1.09.P-Mo056 Bioenergetic Status of Human Intestinal Caco-2 Cells After Exposure to Simulated Environmental Nanoplastic
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The ubiquitous human exposure to nanoplastic (NP) in our daily life increasingly raises concerns regarding our health. Currently, it is difficult to evaluate effects of NP in real-life exposure as substantial studies exposed human cells to pure nanopolymer particles with rather high concentrations, which cannot represent complicated NP samples suffering weathering in our living environment. In this study, the bioenergetic effects of four simulated environmental NP samples on human intestinal Caco-2 cells were investigated. To this aim, big micro-PET (polyethylene terephthalate) particles were mechanically milled into a lower size range sample (M-PET) with multiple shapes. Then the M-PET particles and a polystyrene (PS) mixture (100 nm and 700 nm, mixed) were irradiated by ultraviolet (UV) light for 1273 h, corresponding to 15 months of central European solar irradiance exposure. After weathering procedures, both virgin and UV-weathered M-PET samples were filtered by 0.8-µm filter to obtain nano-PET particles with size less than 800 nm. Subsequently, Caco-2 cells were exposed to nano-PET and nano-PS samples with and without UV weathering at realistic exposure levels (10^1-10^6 particles/mL) for 48 h. The mitochondrial respiration and glycolytic parameters of exposed cells were measured by Seahorse XF96 Analyzer. Based on these results, the harmful impacts of nano-PET on cellular bioenergy were stronger than those of nano-PS. Basal respiration, spare respiratory capacity, proton leak, and basal glycolysis were stimulated by stress from exposure to both virgin and UV-weathered nano-PET samples. Comparing virgin and UV-weathered nano-PET, the negative effects on mitochondrial respiration were alleviated while anaerobic glycolysis was enhanced for UV-weathered PET. Similarly, mitochondrial functions were more sensitive to virgin nano-PS while basal glycolysis was more vulnerable to UV-weathered PS sample. This research is the first to study bioenergetic responses of simulated environment NP samples on human health. It highlights that effects between virgin and weathered NP are different at a bioenergetic level, which has important implications for the risk assessment of NP on human health.

1.09.P-Mo057 Macroplastics to Microplastics: The Production of Microplastic Particles from Large Debris in Freshwater Systems
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Plastic pollution poses one of the greatest environmental challenges to date, mainly due to the microplastics produced. Microplastics can be produced from macroplastics in aquatic systems due to mechanical abrasion or weathering, UV degradation or photolysis, chemical degradation, and hydrolysis. As a result, it is extremely challenging to predict or model the abundance of