Abstract

Nanoplastic–Biomolecular Interactions †

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The global-scale production of plastics has been instrumental for sustaining the modern way of life, while the accumulation of plastics in landfills, oceans, and any other environment has become a major stressor for environmental sustainability, climate, and, potentially, human health. While mechanical and chemical forces applied by man and nature can break down and recycle plastics, our understanding of the biological fingerprints of discharged plastics, especially of the nanoscale derivatives of plastics (i.e., nanoplastics), remains superficial. In 2010, we first reported on algal photosynthesis impaired by nanoplastic adsorption [1]. More recently, a host of studies have been conducted to elucidate the environmental implications of micro- and nanoplastics at the molecular, cellular, or whole-organism level, typically from a toxicological point of view. In this paper, I will first introduce our early representative studies focused on nanoparticle–biomolecular/environmental interactions [2–6]. I will then report on our recent finding that anionic polystyrene and poly(methyl methacrylate) nanoparticles can elicit disruptions in vascular endothelial cadherin junctions, a new phenomenon that is biophysical/biochemical and uncorrelated with cytotoxic events such as reactive oxygen species production, autophagy, and apoptosis [7,8]. The last part of my presentation will be focused on the effects of nanoplastics on the aberrant aggregation of amyloid beta and alpha synuclein, two pathogenic proteins associated with Alzheimer’s and Parkinson’s diseases [9]. This presentation aims to demonstrate the vast research potential towards elucidating the implications of plastics for environmental sustainability and human health protection.

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References


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