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# Cytotoxic effects of micro and nano polystyrene plastics on Caco-2 and Hep-G2 human cell lines

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## Abstract

The impact of micro and nano plastics (MNPs) on marine life has been thoroughly researched. However, studies focusing on the toxic effects of MNPs on humans remain limited. Through the study of five different biological parameters: cell number (CN), nuclear area (NA), nuclear intensity (NI), mitochondrial mass (MM), and mitochondrial membrane potential (MMP), the impacts of MNP exposure on two human cell lines, Caco-2 (human intestine cells) and HepG2 (human hepatoma cells), were investigated using High Content Screening (HCS). 100 nm polystyrene (PS) particles were found to cause mitochondrial dysfunction and damage the mitochondrial membrane in both HepG2 and Caco-2 cells. Furthermore, a decrease in particle concentration and size was found to generate a proapoptotic signal indicating that chronic exposure to 100 nm PS causes cell death in the liver and intestinal cells. When compared with 1.1  $\mu\text{m}$  PS particles, 100 nm PS particles were more cytotoxic for both cell lines. Coupled with ongoing genotoxicity experiments including RNA sequencing and quantitative PCR, we believe useful information will be obtained which will facilitate risk assessment approaches for MNPs. The impact of this research has the potential to guide changes in the use of plastics in the food industry and consumer products.

**Keywords:** polystyrene, liver cells, intestinal cells, microplastics, nanoplastics, toxicity

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