

IN VITRO GENOTOXICITY ASSESSMENT OF POLYSTYRENE MICRO- AND NANOPARTICLES IN HUMAN ALVEOLAR EPITHELIAL CELLS (A549)

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Polystyrene micro- and nanoparticles (PS-MNPs) are plastic particles widely distributed in the environment. Many studies with various test subjects have shown that polystyrene nanoparticles can enter living organisms, including humans, via multiple routes. This raises concerns about their potential adverse effects. In this work, the cytotoxicity and genotoxicity of 70 nm polystyrene nanoparticles and 1 µm polystyrene microparticles were investigated in the human alveolar adenocarcinoma cell line A549 in vitro. An oxidant-sensitive, fluorescent dye, 2,7-dichlorodihydrofluorescein diacetate (H2DCFDA), was used to evaluate cellular uptake and reactive oxygen species levels generated by PS-MNPs. A mixture of acridine orange and ethidium bromide dyes was used to determine the cytotoxic effects of PS-MNPs. The alkaline comet assay was used to evaluate primary DNA damage induced by PS-MNPs, and the enzyme-modified (Fpg) comet assay was used to evaluate oxidative DNA damage. Flow cytometry results showed that both polystyrene micro- and nanoparticles were efficiently absorbed by A549 cells. An increase in PS-MNP concentrations did not increase reactive oxygen species levels. The viability analysis showed that none of the concentrations caused cytotoxic effects in A549 cells. The alkaline and enzyme-modified comet assay showed that none of the polystyrene micro- or nanoparticle concentrations caused statistically significant changes in DNA damage. The obtained results suggest that PS-MNPs do not cause statistically significant DNA damage in A549 cells. However, since PS-MNPs were absorbed effectively by A549 cells, further research is needed.