

Title *

AN IN VITRO INVESTIGATION OF POLYMER NANOMEDICINE SAFETY USING
MACROPHAGE.

Abstract *

The use of polymeric nanoparticles (NPs) within a clinical setting is predicted to increase in coming years. There are still uncertainties relating the safety of polymeric nanoparticles. Therefore, a thorough assessment of the toxicity of these polymer NPs is required. Nanomedicines can be administered via inhalation. As it is established that inhaled NPs accumulate in the alveolar macrophages the impact of polymeric NPs on macrophages was investigated in this study. Poly (ethylene glycol) methyl ether-block-poly (lactide-co-glycolide) (PLGA- PEG) NPs of > 150nm diameter, containing a conjugated fluorescent polymer PPE (Poly (2,5-di(3',7'-dimethyloctyl)phenylene-1,4-ethynylene) were synthesized using PLGA of different chain lengths (4K, 15K and 55K). J774 cells (lung macrophage) were used to investigate cytotoxicity (Alamar Blue, at 4.69 to 150 µg/mL, 24 h post-exposure), uptake over time (at 1.96 to 250 µg/mL, 10, 60 and 1440 min) and cytokine production (TNF-a at 37.5, 75 and 150 µg/mL, 24 h post-exposure). Cell viability was above 70% at all concentrations suggesting low cytotoxicity. In J774 cells, there was a time and concentration dependent increase in uptake for all NPs. The longer the PLGA chain length the higher the uptake, which may be due to differences in the physicochemical properties of the NPs (such as size, composition or charge). Overall results indicate that the inhaled polymeric NPs are of relatively low toxicity but more comprehensive safety testing is required.

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