

Exposure to Nanoplastics Induces an Inflammatory Response in Healthy and Type 2 Diabetic Primary Human Proximal Tubular Epithelial Cells

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Published: 05 May 2023

Introduction: As environmental pollutants, micro- and nanoplastics are increasingly prevalent in ocean and freshwater ecosystems. Nanoplastics (NPs) are particles generated when microplastics inevitably degrade into particles ≤ 100 nm. Recent evidence from experimental models suggests that exposure to NPs induces renal injury and oxidative stress. We sought to determine if exposure to NPs induces an inflammatory response in healthy and type 2 diabetic (T2D) primary human proximal tubular epithelial cells (PTEC).

Methods: Healthy and T2D primary human PTECs were cultured in 96 well-plates and exposed to 0.026%, 0.052% w/v 0.05 μm monodisperse polystyrene microspheres (or vehicle) for 24 hours. After the 24 hour exposure, cells were subject to RT-PCR assessing markers of inflammation.

Results: Nanoplastic beads induced significant increases in tumor necrosis factor-alpha (TNF-alpha), transforming growth factor-beta (TGF-beta), and the TNF super family receptor molecule, CD40. In regard to TGF-beta, cells isolated from diabetic individuals demonstrated an elevated response compared to cells isolated from healthy individuals.

Conclusion: Our results suggest that NPs induce an inflammatory response in human PTECs, which may be enhanced in prevalent, pre-existing conditions, such as T2D, with important implications for human health that warrant further investigation.