

Titanium dioxide nanoparticles activate IL8 related inflammatory pathways in human colonic epithelial Caco-2 cells

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Nanosized titanium dioxide (TiO₂) particles are widely used as food additive or coating material in products of the food and pharmaceutical industry. Studies on various cell lines have shown that TiO₂ nanoparticles (NPs) induced inflammatory response and cytotoxicity. But the influence of TiO₂ NPs exposure on inflammatory pathways in intestinal epithelial cells has not been investigated so far. This study demonstrates that TiO₂ NPs with a particle size of 5 nm and 10 nm cause an activation of inflammatory pathways in the human colon adenocarcinoma cell line Caco-2. The expression of ICAM1, CCL20, COX2 and IL8 show a transient increase after NPs exposure measured by quantitative PCR, whereas larger particles (490 nm) fail to stimulate mRNA expression of these genes. Further, using nuclear factor (NF)- κ B reporter gene assays, we show that NP-induced IL8 mRNA expression occurs, in part, through activation of NF- κ B and p38 mitogen-activated protein kinase (MAPK) pathways. Furthermore, TiO₂ NPs did not affect Caco-2 enterocyte differentiation. We confirm that exposition of TiO₂ NPs can induce inflammation in the gut, but further work is needed to decipher the pathways involved in this inflammatory response.