Effects of differently shaped TiO_2NPs (nano-spheres, nano-rods and nano-wires) on the *in vitro* model (Caco-2/HT29) of intestinal barrier

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The biological effects of nanoparticles depend on several characteristics, such as size and shape which must be taken into account in any type of toxicological assessment. The increased use of titanium dioxide nanoparticles (TiO_2NPs) for industrial applications, and specifically as a food additive, demands a deep assessment of their potential risk for humans, including their abilities to cross biological barriers.

In this study we have investigated the interaction of three differently shaped TiO_2NPs (nano-spheres, nano-rods and nano-wires) in an *in vitro* model of the intestinal barrier, where the co-culture of Caco-2 and HT29 cells confers inherent intestinal epithelium characteristics to the model (i.e. mucus secretion, brush border, tight junctions, etc.).

According to the obtained results, adverse effects in the intestinal epithelium were detected by studying the barrier's integrity (TEER, trans-epithelial electrical resistance), permeability (LY, Lucifer yellow translocation) and changes in the gene expression of selected specific markers. In addition, using Laser Scanning Confocal Microscopy, we detected a different behaviour in the bio-adhesion and bio-distribution of each one of the TiO_2NPs. Moreover, we were able to specifically localize each type of TiO_2NPs inside the cells. Interestingly, general DNA damage, but not oxidative DNA damage effects, were detected by using the FPG version of the comet assay.

As a conclusion, our results indicate different interactions and cellular responses related to differently shaped TiO_2NPs, nano-wires showing the most harmful effects.

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