

## Toxicity assessment of anatase and rutile titanium dioxide nanoparticles: The role of degradation in different pH conditions and light exposure.

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Recently, development in nanotechnology has promoted the use of nanomaterials in many different fields. On other hand, increasing in the use of nanomaterials has led to release of these materials to the environment. Therefore, before employing these materials in biological and environmental and living systems, they should be evaluated in terms of biocompatibility and distribution. Although the toxic effects of nanomaterials on living organisms, human health and the environment have been studied by some researchers [1], however, there are too much uncertainty about the effects and mechanisms of toxicity of nanomaterials. The study of nanomaterial impacts on environment, health and safety (nanoEHS) has been largely predicated on the assumption that exposure and hazard can be predicted from and associated to physical-chemical properties of nanomaterials. Titanium dioxide nanoparticles ( $TiO_2NPs$ ), in the two crystalline forms, rutile and anatase, have been widely used in many industrial fields, especially in cosmetics, and, more recently, in solar energy applications [2]. Therefore, a lot of details about their safety issues have been discussed by the scientific community. Many studies have led to a general agreement about  $TiO_2NPs$  toxicity, in particular for anatase form, but no mechanism details have been proved yet. In our study, data confirm the different toxic potential of rutile and anatase  $TiO_2NPs$  in two cell lines up to 5 nM nanoparticles concentration [3]. Moreover, we evaluated the role of titanium ions released by  $TiO_2NPs$  in different conditions, at pH = 4.5 (the typical lysosomal compartment pH) and at pH = 5.5 (the skin physiological pH) in conditions of darkness and light, to mimic the dermal exposure of cosmetics. Anatase nanoparticles were proner to degradation both in the acidic conditions and at skin pH. Our study demonstrates that pH and sunlight are dominant factors to induce oxidative stress,  $TiO_2NPs$  degradation and toxicity effects.

[1] P. C. Ray et al., *J Environ Sci Health C Environ Carcinog Ecotoxicol Rev.* **27**(1), 1-35 (2009).

[2] M. Milanese et al., *Solar Energy Materials & Solar Cells* **147**, 321-326 (2016).

[3] V. De Matteis et al., *Toxicol In Vitro* **37**, 201-210 (2016).