



Contribution ID: 94

Type: **not specified**

## The relationship between the biological effects of Titanium Dioxide nanofibers and their aspect ratio

*Wednesday, 11 March 2015 17:36 (24 minutes)*

A strict relationship between the toxicity of fiber-like nanomaterials and their aspect ratio emerges from the fiber paradigm. As a consequence, fiber shortening is expected to reduce material toxicity. Titanium dioxide nanofibers (TiO<sub>2</sub>NF) are a novel fibrous nanomaterial, used in several industrial applications but still requiring complete toxicological characterization. We evaluated the toxicity of commercial TiO<sub>2</sub>NF (length, 0.2-30µm; thickness, 0.2 to 0.6µm; aspect ratio 1:28, consisting of primary TiO<sub>2</sub> nanoparticles), before and after ball-milling, which lowered their aspect ratio to 1:8. The evaluated endpoints were cell viability, inflammatory markers, and trans-epithelial electrical resistance (TEER), an indicator of the epithelial barrier competence. TiO<sub>2</sub> NF exhibited cell specific cytotoxicity, markedly decreasing viability in A549 epithelial cells but not in Raw 264.7 macrophages. A dose- and time-dependent TEER decrease in CaLu-3 cell monolayers was also detected. Ball-milling significantly mitigated these effects but, conversely, enhanced the expression of inflammatory markers in macrophages.

This study indicates that TiO<sub>2</sub>NF exert significant toxic effects including cytotoxicity, macrophage activation and epithelial barrier impairment. While aspect ratio reduction mitigates TiO<sub>2</sub>NF effects on cell viability and epithelial barriers, it enhances the inflammogenic activity of the nanomaterial, indicating that different structural determinants are implied in the biological effects of fiber-like nanomaterials.

**Primary author:** ALLEGRI, Manfredi (Dept. of Biomedical, Biotechnological and Translational Sciences (SBiBiT), University of Parma)

**Co-authors:** BERGAMASCHI, Enrico (Dept. of Clinical and Experimental Medicine, University of Parma); BIANCHI, Massimiliano (Dept. of Clinical and Experimental Medicine, University of Parma)

**Presenter:** ALLEGRI, Manfredi (Dept. of Biomedical, Biotechnological and Translational Sciences (SBiBiT), University of Parma)

**Session Classification:** 6AToxicology and human health risks

**Track Classification:** Parallel Session 6A:Toxicology and human health risks