

## Titanium dioxide genotoxic potential in marine organisms.

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Titanium dioxide (TiO<sub>2</sub>) particles are used in many products, including industrial materials, cosmetics and pharmaceuticals. Published data raised concern about the toxic potential of TiO<sub>2</sub> for both human and environmental health. However, most information deals with mouse and human experimental models while scarce data are available for marine organisms.

This work is aimed at presenting preliminary results about the genotoxic potential of nanosized TiO<sub>2</sub> anatase in different organisms including mussels, fishes, fish cell lines, bottlenose dolphin leukocytes and fibroblasts.

Genotoxicity was detected by the alkaline Comet assay and RAPD-PC and the genotoxic effects of TiO<sub>2</sub>-NPs was evaluated in *Mytilus galloprovincialis* and in *Dicentrarchus labrax* both *in vitro* and *in vivo*. This effect has also been investigated by the co-exposure of TiO<sub>2</sub>-NPs with Cadmium and 2,3,7,8-tetrachlorodibenzo-p-dioxin (TCDD). TiO<sub>2</sub>-NPs resulted to induce a reduction of genome stability both *in vitro* (sea bass cell cultures) and *in vivo* (mussels). Comet assay only showed an induction of DNA single strand breaks at 10 mg/L and of double strand breaks at 0,1-5-10 mg/L in mussel gill cells treated *in vitro*. An effect of Cd and dioxin in inducing DNA damage both *in vitro* and *in vivo* was also observed, while no induction of DNA strand breaks was observed after TiO<sub>2</sub>-NPs *in vivo* treatments in mussels. Even if referred to preliminary results, our data revealed that TiO<sub>2</sub> might possess a genotoxic potential, since a significant genomic stability reduction was found in sea bass cells and an increase of DNA strand breaks in mussel gill cells were observed after *in vitro exposure*. Moreover four days *in vivo* exposure to TiO<sub>2</sub>-NPs gave rise to a 50% reduction of genomic stability in mussel digestive gland. Interesting data comes from exposures coupled TiO<sub>2</sub>-NPs and Cd.

Different times (4, 24 and 48 hrs) and doses (20, 50, 100, 150 µg/ml) were also tested in bottle-nose dolphin cell lines. TiO<sub>2</sub> particles induced DNA damage both in leukocytes and fibroblasts, even if depending on, the cell line and the exposure time. These are the first data regarding the genetic susceptibility of toothed cetaceans toward an “emerging” pollutant such as TiO<sub>2</sub>, whose amount entering the marine environment is expected to increase in the next decade.