TH 160

Co-exposure to nano-TiO2 and ultraviolet: an ecotoxicological evaluation

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Studies about the potential ecotoxicological risks of titanium dioxide nanoparticles (nano-TiO_2) have been published but the results are still inconclusive. The properties of the diverse nano-TiO_2 must be considered in order to establish experimental models to study their toxicity. TiO_2 has important photocatalytic properties and its photoactivation occurs in the ultraviolet range. The aim of this study was to investigate the effects of co-exposure to nano-TiO_2 and ultraviolet. A South America fish (*Piaractus mesopotamicus*) was exposed to nano-TiO_2 Sigma Aldrich (25 nm, 100% anatase) under different illumination conditions: visible light (V) or visible light and ultraviolet A (UVA) at 2.7 J/cm²/h. Animals (n=8) were exposed during 96h to 0, 1, 10 or 100 mg/L nano-TiO_2. The solutions were renewed daily, and the characteristics of nanoparticles in solution were: 596.1 ± 38 nm, pdi 0.31 ± 0.09; zeta potential -19.2 ± 1 mV. Protein carbonylation, lipoperoxidation and the activities of catalase, superoxide dismutase, acid phosphatase and glutathione s-transferase (GST) were analyzed in liver. Metallothionein concentration was analysed in gills. Comet and micronucleus assays were performed with blood. The LC_{50} was >100mg/L for both conditions tested. GST showed a significant decrease in groups exposed to 1 and 10 mg/L nano-TiO_2 under UVA compared to control under V. The results of comet assay showed the greatest damage in fish exposed to 100 mg/L nano-TiO_2 under V and 10 mg/L under UVA. For the other biomarkers there was no statistics difference between groups and control groups. Our results corroborate with literature, showing low acute toxicity of nano-TiO_2 in fish. However, co-exposure of nano-TiO_2 and UVA can cause biochemical and genetic changes. The decrease in GST activity can be related with an inhibition or reduction of expression levels, but more investigation is needed. Further studies will be carried to investigate the relevance of considering the nano-TiO_2 properties in ecotoxicological studies. Supported by: FAPESP, CNPq, CAPES, Fundunesp and Embrapa (AgroNano).