

## **Effect of Titanium Dioxide Nanoparticles on Haematological and Immunological Parameters and Histological Structure of Nile Tilapia, *Oreochromis niloticus***

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The increased industrial application of nanotechnology has potential to contaminate aquatic ecosystems with nanoparticles. However effects of nanoparticles on fish health are little known. Present study was carried out to evaluate the effect of Titanium dioxide (TiO<sub>2</sub>) nanoparticle exposure on haematological/immunological parameters and histological structure of the food fish, Nile tilapia. Fish were exposed to TiO<sub>2</sub> nanoparticles (0, 1, 10, 50 mgL<sup>-1</sup>) through water borne exposure under laboratory controlled conditions and haematological and immunological parameters in the blood, histological structures of gills, stomach and liver were assessed using standard methods at pre-determined time periods (7, 14 days).

Exposure to 50 mgL<sup>-1</sup> TiO<sub>2</sub> was found to be lethal for Nile tilapia as 33% mortalities occurred after exposure of seven days. Increased opercular movement rates, erratic swimming patterns were observed within two hours of exposure in the fish exposed to 10, 50 mgL<sup>-1</sup> TiO<sub>2</sub> concentrations. Hyperplasia conditions of the gills of the fish exposed to TiO<sub>2</sub> confirmed that the fish were under respiratory stress. Erythrocyte and haemoglobin levels in the blood of fish exposed to TiO<sub>2</sub> were increased significantly which may indicate the homeostatic responses in order to compromise the reduced oxygen extraction capacity. Neutrophil and lysozyme levels in the blood were increased in the fish exposed to TiO<sub>2</sub> whereas myeloperoxidase activity of the TiO<sub>2</sub> exposed fish was decreased indicating the stress induced by TiO<sub>2</sub> exposure. Histological structure of liver at high exposure levels displayed cellular vacuolations, sinusoidal congestions and focal necrosis whereas stomach mucosa showed autolysis. The present study revealed that short term exposure to high concentrations of TiO<sub>2</sub> nanoparticles can lead to ill health conditions of Nile tilapia. Detail studies on effect of environmentally relevant levels of nanoparticles on fish health are recommended as increased usage of nanoparticles will result in contaminations of inland water bodies.