Effects of TiO_2 nanoparticles on immune and digestive gland function in the marine bivalve *Mytilus*

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Due to the increasing production of nanoparticles (NPs) and their potential release in the aquatic environment, evaluation of their biological impact on aquatic organisms represents a major concern.Suspension feeding invertebrates, in particular bivalve mollusks, may play a role in NP biotransformation and transfer through food webs and may represent a significant target for NP toxicity.

The results of a recent study are reported on the effects of titanium dioxide (n-TiO_2), one of the most widespread NPs in use, in the bivalve *Mytilus galloprovincialis*, largely utilized as a sentinel for marine contamination. Mussels were exposed for 96 h to different concentrations of n-TiO_2 suspensions (1, 10 and 100 µg L^{-1}) and multiple responses were evaluated in the digestive gland and immune cells, the hemocytes. In the digestive gland, n-TiO_2 affected lysosomal and oxidative stress biomarkers and decreased transcription of antioxidant and immune-related genes. In the hemocytes, n-TiO_2 decreased lysosomal membrane stability-LMS and phagocytosis, increased oxyradical production and transcription of antimicrobial peptides, indicating immunomodulation; moreover, pre-apoptotic processes were observed. The effects of n-TiO_2 on digestive gland and hemocytes were distinct, also depending on the endpoint and on nominal NP concentrations, with many significant responses elicited by the lowest concentrations tested. The results show n-TiO_2, at concentrations close to predicted environmental levels, significantly affected different functional and molecular parameters of mussel digestive gland and immune cells.