



ORIGINAL ARTICLE

Spermotoxicity of nickel nanoparticles in the marine invertebrate *Ciona intestinalis* (ascidians)

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Abstract

Nickel nanoparticles (Ni NPs) are increasingly used in modern industries as catalysts, sensors, and in electronic applications. Due to this large use, their inputs into marine environment have significantly increased; however, the potential ecotoxicological effects in marine environment have so far received little attention. In particular, little is known on the impact of NPs on gamete quality of marine organisms and on the consequences on fertility potential. The present study examines, for the first time, the impact of Ni NPs exposure on sperm quality of the marine invertebrate *Ciona intestinalis* (ascidian). Several parameters related with sperm status such as plasma membrane lipid peroxidation, mitochondrial membrane potential (MMP), intracellular pH, DNA integrity, and fertilizing ability were assessed as toxicity end points after exposure to different Ni NPs concentrations. Ni NPs generate oxidative stress that in turn induces lipid peroxidation and DNA fragmentation, and alters MMP and sperm morphology. Furthermore, sperm exposure to Ni NPs affects their fertilizing ability and causes developmental anomalies in the offspring. All together, these results reveal a spermotoxicity of Ni NPs in ascidians suggesting that the application of these NPs should be carefully assessed as to their potential toxic effects on the health of marine organisms that, in turn, may influence the ecological system. This study shows that ascidian sperm represent a suitable and sensitive tool for the investigation of the toxicity of NPs entered into marine environment, for defining the mechanisms of toxic action and for the environmental monitoring purpose.

Keywords

Ascidians, environmental risk, nickel nanoparticles, sperm quality, toxicity assay

History

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