BABO2

MOLECULAR INSIGHTS INTO THE TOXICITY OF ZINC OXIDE NANOPARTICLES IN *Perna viridis*

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Advances in nanotechnology have led to the widespread presence of engineered nanoparticles in aquatic habitats, raising concerns about their potential impact on aquatic biota. Mussels, with their sedentary lifestyle and filter-feeding behaviour, are particularly susceptible to nanoparticle contaminants, making them valuable model organisms for biomonitoring studies. Among various engineered nanoparticles, zinc oxide (ZnO) is extensively used in diverse human products. In this study, we assessed the toxicological effects of ZnO nanoparticles on the marine mussel *Perna viridis.* A comparative transcriptomic analysis was conducted on mussels with and without nZnO induction. The mussels were exposed to 10 mg/L of ZnO nanoparticles in seawater for four days, and their gill tissue transcriptome was examined. Illumina sequencing generated 53,429,182 reads with a total of 7,602,115,416 bases. The transcripts were mapped and indexed using a reference, and the quantified data were used to analyse differential gene expression. Our results revealed 18,274 upregulated genes and 11,958 downregulated genes compared to the control groups. The study further uncovers that the molecular toxicity of ZnO nanoparticles is mediated by oxidative stress and calcium-mediated apoptotic pathways. This comprehensive transcriptome analysis significantly enhances our understanding of the molecular toxic processes of nanoparticles in marine mussels.

Keywords*:* *Perna viridis*, Zinc oxide nanoparticle, Toxicity