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Ecotoxicity and Environmental-Impact Assessment of Nanoparticles

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Clean water is at the very core of human survival. Significant work remains to address challenges associated with water contamination as a biosecurity threat. Growing use and potential for dual-use of nanomaterials presents significant environmental security challenges. Aquatic contamination occurs for multiple reasons ranging from taking the water sources for granted, negligence in waste disposal, deliberate contamination, and technological innovations outpacing development of effective guidelines for life-cycle management and regulations to properly recycle/reuse/dispose commercial products, especially prepared using nanoparticles. Potential toxicity of nanosized particles using model of the sea urchin Paracentrotus lividus, Zebra Fish and their offsprings will be presented. Passage through membranous barriers via the digestive tract to the coelomic fluid is the subject of ongoing study using biomarkers, such as coelomic fluid inside coelomocytes (uptake), cholinesterase activity, and using expression of stress-related proteins (HSP70) and Gonads morphological features. Aquatic (nano)ecotoxicity is arguably the least understood and requires systematic investigation. Ongoing research aims to detect, counter, and mitigate potential security threats and is at the core of our current and ongoing investigations, hence we present a strategic thrust to identify, assess, and recommend revolutionary strategic solution pathways using field-ready technologies. With recent progress in genetic engineering and integration with NMs and NPs, yet another environmental security risk arises due to intentional or accidental release of genetically modified biological systems with potential of incurable infections and resistance to drugs. An outline of dispersion and characterization methodologies of harmful NPs in different aqueous media will be presented along with acute toxicity and risk assessment methodologies.