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Nanoecotoxicity of GO@AgNPs nanohybrid on Zebrafish embryos: Influence of natural organic matter and chorion membrane removal

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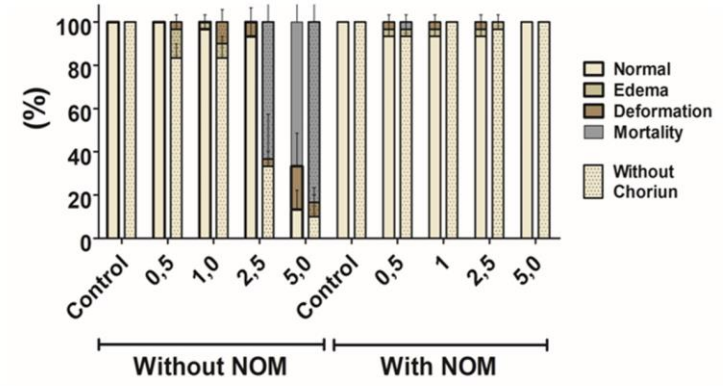
Single-layer graphene oxide decorated with silver nanoparticles (GO@AgNPs) nanohybrid is an emerging material to applications in nanotechnology such as catalysis, biosensors, composites, and antimicrobial materials. However, it is necessary to assess the potential risks of this nanohybrid material to environmental health. In aquatic environment, the nanomaterials can interact with natural organic matter (NOM), modifying their colloidal stability and consequently, change their effects on organisms. Here, we evaluated the nanoecotoxicity of GO@AgNPs on Zebrafish (Danio rerio) embryos in presence and absence of NOM. The GO@AgNPs nanohybrid material was synthetized by reducing AgNO3 with Na3C6H5O7 (sodium citrate) in the presence of GO. The nanohybrid was characterized by TEM, AFM, TGA, and XPS techniques. The colloidal stability of nanohybrid in zebrafish medium was monitored by UV-vis spectroscopy. The 24 hours post-fertilization (hpf) embryos were exposed during 96 hours to 0.5, 1.0, 2.5, 5.0 mg.L-1 GO@AgNPs, in presence or absence of NOM (Suwannee River NOM, 20 mg.L-1), with and without chorion barrier membrane. The positive and negative control groups' exposure were also performed. The fish embryo toxicity (FET) test showed the increase of deleterious effects on embryos with increase in concentration of nanohybrid material. This toxic effect was more severe in the embryos exposed without chorion. Its removal usually started the exposition of embryos to toxic materials in early phase. However, the presence of NOM mitigates the deleterious effects, revealing the antidotal proprieties of NOM for GO@AgNPs (Figure 1). These findings showed the critical influence of chorion membrane and NOM in the modulation of the adverse effects of GO@AgNP nanohybrid material on zebrafish model.



Session 5
5.2 Environmental interactions of nanomaterials