EXPLOITING ZEBRAFISH TOOLS TO EVALUATE BIOINTERACTIONS AND ADVERSE EFFECTS OF SILICA- AND COPPER-BASED NANOMATERIALS

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To guarantee a safe and sustainable development of nanotechnologies, the human and environmental (nano)toxicological outcomes of new nanomaterials (NMs) should be evaluated since the design phase, with special attention to the relationship between the NM physico-chemical (P-chem) properties and the biological responses.

In this work, zebrafish (*D. rerio*) development is proposed as a valid model to screen and compare the biological effects of SiO_2- and CuO-based nanoparticles (NPs), differing for the synthesis process and surface functionalization.

Commercial SiO_2, ZnO@SiO_2 hybrid NPs and bio-nanosilica from rice husk (SiO_2-RHSK) NPs, as innovative fillers for tyre rubber and polyurethane foams, and CuO and Zn-doped CuO NPs, as effective antimicrobial agents, have been assessed by Fish Embryo acute Toxicity (FET) test, in parallel with their P-chem characterization.

Both commercial and bio-SiO_2 NPs had very mild embryotoxic effects, while their surface modification with ZnO enhanced the lethality, malformation rate and delayed the embryos hatching. The CuO NPs induced no lethality and only moderate malformation effects, but severely interfered with the embryos hatching. The Zn doping is able to modulate the CuO NP-induced adverse outcomes by lowering the effect on the embryos hatching, but slightly increasing lethality.

Zebrafish developmental features, like malformation and especially hatching rate are here demonstrated to be predictive tools to assess NMs adverse effects related to P-chem characteristics.

Acknowledgements

EU-H2020 - project BIOMAT (GA n. 953270)

ERA-NET AquaticPollutants Joint Transnational Call – project AMROCE (GA nª869178)