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Mechanisms underlying the enhancement of toxicity caused by coincubation of ZnO and Cu nanoparticles

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Abstract:
The purpose of the study was to determine the mechanisms underlying the enhancement of toxicity produced by co-incubation of copper (CuNPs) and zinc oxide nanoparticles (ZnONPs) in the fish hepatoma cell line PLHC-1 after 48 h of exposure.
Cells were exposed to CuNP 50 nm at a range of concentrations (0.39 - 25.0 µg/mL), alone or in combination with ZnONP (25 and 100 nm) at a non-toxic concentration of 6.25 µg/mL. For both NPs, cells were exposed to suspensions (nanoparticles) or to supernatants (ions), and their combinations. Viability of cells was evaluated by the MTT cytotoxicity assay. Data about the characterization and behavior of the NPs in the cells was obtained by TEM, DLS and ICP-MS.

Cytotoxicity was enhanced when cells where coexposed to both NPs suspensions and after exposure to CuNPs supernatant and ZnONPs 25 nm suspension. Metal content was evaluated for each combination of CuNPs and ZnONPs suspensions and supernatants. The intracellular concentration of Cu remained stable whereas Zn increased significantly when cells were exposed to: 1) ZnONP supernatants and CuNPs suspensions, 2) ZnONP suspensions and CuNP

supernatants. Further studies by TEM are conducted to elucidate this mechanism.

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Keywords: Co-exposure, zinc oxide nanoparticle, copper nanoparticle, cytotoxicity

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