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New insights in the acute toxic/genotoxic effects of CuO nanoparticles in the in vivo Drosophila model.

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Abstract

Metal oxide nanoparticles are highly reactive from the biological point of view and, for this reason, it exists important reservations in regard human health impact. We used **Drosophila** as a promising in vivo model to diagnose the biological effects of copper oxide nanoparticles (CuO-NPs). Due to the potential role of ions release the effects of CuO-NPs were compared with those induced by copper sulfate, CuSO4. A wide battery of approaches has been used including toxicity, cell and body internalization, induction of reactive oxygen species (ROS) as well as changes in gene expression, related to both general stress and alterations in the intestinal barrier, and genotoxicity. The obtained results show that CuO-NPs have the ability to be distributed inside midgut cells and translocate to the general body compartment (internal hemolymph) interacting with hemocytes. Its exposure leads to reduced larval growth, decreased flies viability, delaying their emergency periods, especially at higher doses (2 and 10 mM). Moreover, deregulation of stress genes including antioxidant genes, and genes involved in wound healing were also observed. In this point it should be emphasized the novelty of using genes such as Duox, Upd3, PPO2, and Hml to determine injury on the intestinal barrier. On the other hand, CuO-NPs had non-genotoxic potential, in agreement with their inability to increase ROS production. In general dissolved copper produced higher toxic/genotoxic effects than those induced by CuO-NPs which would indicate that copper ions alone are more important in inducing harmful effects than copper nanoparticles itself.

KEYWORDS: CuO-NPs; **Drosophila** melanogaster; Duox; Hml genes; PPO2; Upd3; gene expression; genotoxicity; internalization

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