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ABSTRACT BOOK

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ated at T0 and T1 over an 8-weeks of intervention consted of tri-weekly training sessions. Hematochemical and strenght test assessment were performed; we analyzed biomarkers such as creatine kinase (CK), lactate dehydrogenase (LDH), interleukin-6 (IL-6), azotemia, and creatinine, and Optojump and handgrip test. The results demonstrated greater improvement in lower extremity strength in athletes who used Taopatch® as well as the reduction of IL-6 and CK levels ($p<0.05$). In conclusion, the study highlighted how the use of Taopatch® can represent a valid support for athletes, offering a new approach to improving performance and well-being, thanks to the acceleration of recovery processes and the optimization of sports training. The results open interesting perspectives on the use of nanotechnologies in the sports field, suggesting further research to explore their long-term benefits.

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LINKING NANOPARTICLES TO EMBRYONIC DEFORMITIES: EXPLORING THE TERATOGENICITY OF ZINC OXIDE NANOPARTICLES

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The exponential growth of nanotechnology has led to significant advancements in engineered nanoparticles (ENPs) between 1 and 100 nm in size, with zinc oxide nanoparticles (ZnO-NPs) playing a prominent role across various industries and applications. Particularly in biomedicine, ZnO-NPs have emerged as versatile tools, serving as antibacterial agents, drug and gene delivery platforms for cancer treatment, cellular imaging enhancers, and high-performance biosensors. For these reasons the aim of this study is to explore their potential toxicity on zebrafish early life stage using a combined *in vivo* and in-silico approach. In the first phase by SEM-EDS analysis, the ZnO-NPs purity was confirmed. After the Fish Embryo Acute Toxicity Tests according to OECD test guideline No. 236 (OECD, 2013) were performed. The embryos were exposed to five concentrations of ZnO-NPs: 50, 100, 150, 200 and 250 mg/L. At 96 hours, LC_{20} of about 58.201 mg/L and NOED of <50 mg/L, were determined. The most common sub-lethal alterations were pericardial and yolk edema, blood stasis, reduced blood circulation, reduced heartbeat, skeletal alterations and delayed hatching. Later, to further assess the toxicity of ZnO nanoparticles, oxidative stress was evaluated by quantifying lipid peroxidation using the thio-barbituric Acid Reactive Substances assay. The results showed as the treatment with ZnO-NPs led to a significant increase in lipid peroxidation in zebrafish larvae, as evidenced by the elevated levels of MDA induced by the treatment, indicating a low detoxification capacity of reactive oxygen species. To further confirm these findings, the gene expression of key antioxidant enzymes such as catalase (cat), superoxide dismutase (sod), and glutathione S-transferase (gstm) was also evaluated via RT-PCR. The results demonstrated a decrease in the expression of all the enzymes, suggesting that nanoparticles may interfere with the redox state of zebrafish larvae. Furthermore, since the oxidative stress is often associated with inflammation also key genes related to inflammation *tnfalpha* and *il1beta* were assayed. Our results showed a modulation of inflammation's genes, particularly treatment induced a low downregulation of *tnfalpha* and an opposite regulation of *il1beta* which expression increased at very high levels. Finally, molecular docking and dynamics approach were applied to further explore any potential molecular interactions between ZnO-NPs and critical embryonic proteins, such as hatching enzyme *ZHE1,* and superoxide dismutase, *SOD 1,* enzyme. Results shown that ZnO-NPs interfered with both enzymes inhibiting those activities, and causing a delayed hatching of zebrafish embryos most probably through a multi-modal mechanism. The integration of *in silico* and *in vivo* assessments provides a more comprehensive evaluation of the potential risks associated with exposure to nanomaterials, contributing to the fields of nanotoxicology and developmental biology. However, we are discussing preliminary results that require further testing and examination to fully understand the molecular mechanisms and causes of ZnO-NP toxicity.

IN VITRO AND *IN VIVO* ASSESSMENT OF GLYPHOSATE IN NORMOXIA AND HYPOXIA CONDITIONS

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Glyphosate (N-(phosphonomethyl) glycine) is a systemic and non-selective post-emergence foliar herbicide. It is today known as the most widely used herbicide worldwide. Because of the extensive use of glyphosate in agriculture, traces of this herbicide are nowadays found in soil, water, and air, as well as in food, becoming a growing concern for human health. A distinctive feature of some of these water environments, particularly those highly polluted, is the low water oxygen concentration. This leads to the development