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## Effects of ZnO nanoparticles and ZnSO<sub>4</sub> in common carp

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ZnO nanoparticles (Nps) are extensively used in various industrial and commercial applications. However, the available toxicological information was inadequate to assess the potential ecological risk of ZnO Nps to aquatic organisms and the public. In this work, the properties of ZnO Nps (nano-ZnO, <50 nm) were characterized in a water suspension and 6month old male carp *cyprinus carpio* was performed with three different doses (10,50 and 100µg/l) of ZnO Nps for seven days to assess the toxicity of ZnO Nps suspension and Znso<sub>4</sub> compound. Expression levels of several transcription factor genes (*20βhsd*, *dax*, *dmrt*, *wnt5b* and *gata*) were analyzed and quantified in control and treated (Zno-Nps and Zn SO<sub>4</sub>) groups. Interestingly, all genes were down and up regulated. Histological studies on testicular tissue of control group showed normal formation of testis tubules and testicular tissue cells at different stages of spermatogenesis. The histopathological changes of Zno-Nps and ZnSO<sub>4</sub> are observed as vacuolization from cells and detachment of germinal epithelium in tubules. These changes were markedly increased in testis tissue tubules of ZnSO<sub>4</sub> treated group. The results indicated that the activity oxidative stress enzymes catalase, superoxidedismutase, and glutathione-S-transferase were significantly increased in the testis of the treated groups when compared to control. Sertolicells and erythrocytes exhibited damage after Zno-Nps and ZnSO<sub>4</sub> treatments. Effects of Zno-Nps and ZnSO<sub>4</sub> treatment in TM3 Leydig cells showed cytotoxicity which is correlated well with morphological and flow cytometric analysis. Taken together, the results demonstrated that high dose of Zno-Nps and ZnSO<sub>4</sub> can be detrimental to carp testicular reproduction. Taken together, the present findings suggested that exposure of zinc containing compound (Znso<sub>4</sub>) even at minimum concentration affects reproductive health in carp than ZnO nanoparticles (Zno-Nps).

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