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Interaction of chitosan, curcumin, and hydroxyapatite nanoparticles on the reproductive system and its molecular parameters in male rat

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Hydroxyapatite nanoparticles (HAP NPs) have been widely used as a biocompatible ceramic in many areas of medicine, but mainly for contact with bone tissue, due to its resemblance to mineral bone. Risk assessment of HA NPs has attracted extensive attention despite their promising potential in many biomedical applications, that's why the present study aimed to investigate the toxic effects of HAP NPs on the reproductive system and its molecular parameters in male rat and the protective role of nano-antioxidants (Chitosan CSNPs and curcumin CurNPs) alleviating this toxicity. The present results indicated that HAP NPs showed significant decrease in semen characteristics and testosterone level, 17-ketosteroid reductase, antioxidant enzymes (GST, SOD, CAT, GPx and TAC), and reduced glutathione in testes; Total antioxidant capacity and total oxidative stress levels were determined to evaluate the oxidative injury, While HAP NPs caused significant increase in LH and FSH, abnormal sperm, 17β-hydroxysteroid dehydrogenase, TBARs, NO, p53, TNFα and interliukin-6 in testes. The DNA damage was also analyzed by suppression of the mtTFA, induction of UCP2 gene and 8-OHdG level as indicators of genotoxicity. In conclusion, the presence of CSNPs and CurNPs with HAP NPs showed obvious improvements in the activities of the antioxidant enzymes reduced glutathione and improved sperm parameters also, alleviated its reproductive toxicity via its ameliorative effects on the fertility, testicular tissue functions, antioxidant system and hormonal status.

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