Research number 7

منشور دولي في2024

The effects of Rutin coat on the biodistribution and toxicities of iron oxide nanoparticles in rats

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Abstract

During various applications, Iron oxide nanoparticles (IONPs) can accumulate in different tissues and damage them with oxidative stress induction. In this study, we aimed to evaluate the protective effects of Rutin (Ru) with known higher antioxidant capacity against possible harmful effects of a mg/kg of body weight/day). Rats 7single-dose administration of IONPs (100 µl IV injection, 1 were sacrificed 1 hour, 1 day, and 1 week after treatment. The toxicities of IONPs in rats after different time intervals were determined and compared with a control group. The iron content in different tissues was quantified by atomic absorption spectroscopy. Results revealed that the prepared IONPs and Ru-IONPs have a spherical shape with an average diameter of about 7 and 11 nm and their surface potential was found to be -19±3.9 and -29.5 ± 5.4 mV, respectively. Additionally, it was found that IONPs enhanced oxidative stress, indicated by reduced contents of glutathione (GSH) in both heart and liver tissues, and increased their contents of malondialdehyde (MDA). Administration of IONPs resulted in hepatotoxicity characterized by a significant increase in ALT, and AST levels in addition to cardiotoxicity characterized by a significant increase in CK-MB, and LDH. Treatment with IONPs resulted in the downregulation of heat shock protein 70 (HSP70) expression while upregulation of TNF-α expression in both heart and liver tissues.

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Conversely, nearly all of these alterations were significantly ameliorated in the groups that were injected with Ru-IONPs along with the counteraction of the morphological injury and inflammation in both heart and liver tissues. Therefore, we suggest that Ru could be used to alleviate the harmful effects and damages associated with IONPs due to its antioxidant, anti-inflammatory, and free radical scavenging properties.