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Pharmacological potential of cerium oxide nanoparticles.

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Abstract

Nanotechnology promises a revolution in pharmacology to improve or create ex novo **therapies**. Cerium oxide nanoparticles (nanoceria), well-known as catalysts, possess an astonishing pharmacological potential due to their antioxidant properties, deriving from a fraction of Ce(3+) ions present in CeO(2). These defects, compensated by oxygen vacancies, are enriched at the surface and therefore in nanosized particles. Reactions involving redox cycles between the Ce(3+) and Ce(4+) oxidation states allow nanoceria to react catalytically with superoxide and hydrogen peroxide, mimicking the behavior of two key antioxidant enzymes, superoxide dismutase and catalase, potentially abating all noxious intracellular reactive oxygen species (ROS) via a self-regenerating mechanism. Hence nanoceria, apparently well tolerated by the organism, might fight chronic inflammation and the pathologies associated with oxidative stress, which include cancer and neurodegeneration. Here we review the biological **effects** of nanoceria as they emerge from in vitro and in vivo studies, considering biocompatibility and the peculiar antioxidant mechanisms.

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