Iron-doped carbon-based nanoparticles boost cancer treatment with enhanced precision and safety

September 10 2024

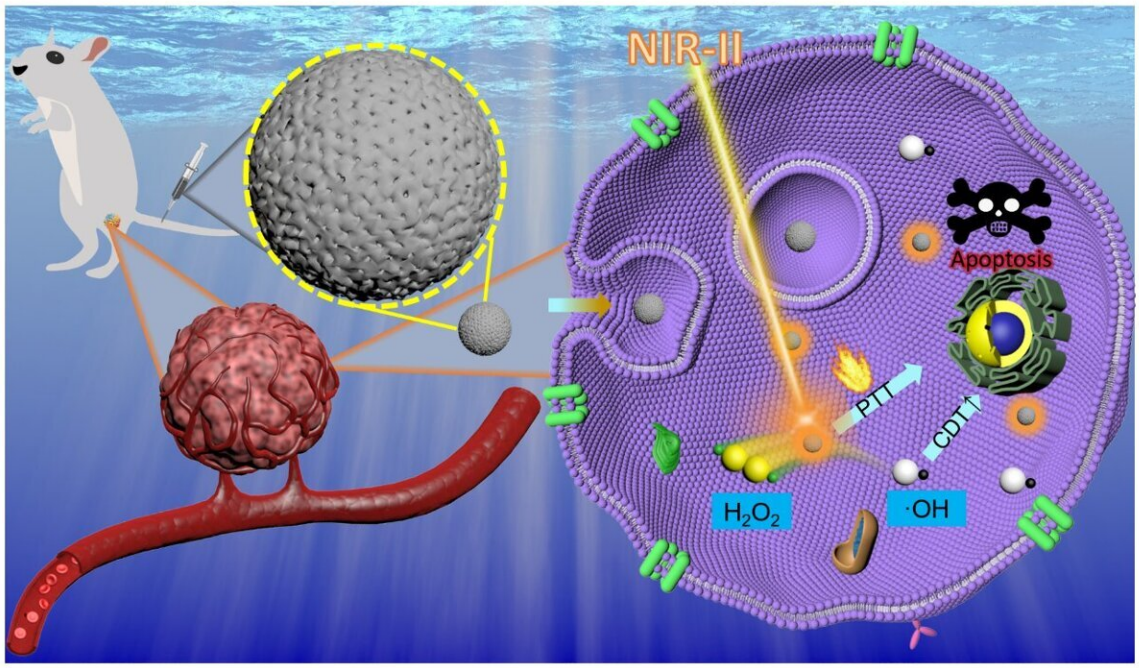

Illustration of the tumor-suppressing mechanism of FDCN nanozyme synergy. Credit: Wang Xingyu

Recently, a collaborative research team led by Prof. Wang Hui and Prof. Qian Junchao from Hefei Institutes of Physical Science of the Chinese Academy of Sciences designed a catalytically active, photoresponsive,

Fe-doped carbon nanoparticle (FDCN) for second near-infrared (NIR-II) window, photothermal-enhanced chemodynamic therapy.

The research has been published in *ACS Applied Materials & Interfaces*.

Carbon-based nanocatalyst-mediated chemodynamic therapy (CDT) has attracted significant attention in the field of tumor catalytic therapy. However, the suboptimal efficiency in catalyzing the generation of hydroxyl radicals (·OH) from hydrogen peroxide has posed limitations to its efficacy.

To solve this problem, the team introduced tiny amounts of iron to the carbon nanoparticles via a solvothermal method. This improved the treatment's ability to produce the needed ·OH radicals without harming healthy cells.

In addition, the team combined CDT with another treatment called photothermal therapy, which used light to generate heat. This heat speeds up the production of ·OH radicals, making the treatment even more effective.

Thorough testing on the newly designed FDCN nanoparticles showed promising results. These nanoparticles targeted cancer cells in a safe and effective way, and worked well with NIR-II light, which aids in better treatment.

This innovation offers an improved approach to cancer treatment and opens up possibilities for using carbon-based nanomaterials in medicine, according to the team.

More information: Xingyu Wang et al, NIR-II Responsive Fe-Doped Carbon Nanoparticles for Photothermal-Enhanced Chemodynamic Synergistic Oncotherapy, *ACS Applied Materials & Interfaces* (2024).

DOI: 10.1021/acsami.4c09215

Provided by Chinese Academy of Sciences

Citation: Iron-doped carbon-based nanoparticles boost cancer treatment with enhanced precision and safety (2024, September 10) retrieved 10 September 2024 from https://phys.org/news/2024-09-iron-doped-carbon-based-nanoparticles.html

This document is subject to copyright. Apart from any fair dealing for the purpose of private study or research, no part may be reproduced without the written permission. The content is provided for information purposes only.