

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

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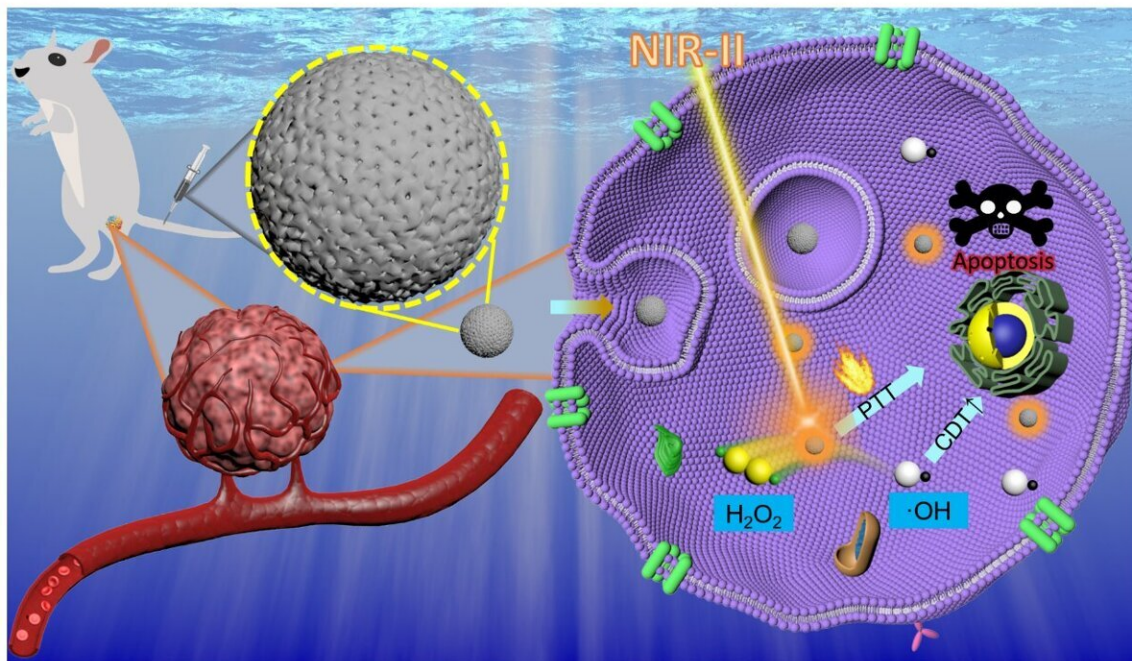


Illustration of the tumor-suppressing mechanism of FDCN nanozyme synergy.
Credit: Wang Xingyu

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 ($\cdot\text{OH}$) 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 $\cdot\text{OH}$ 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 $\cdot\text{OH}$ 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).

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