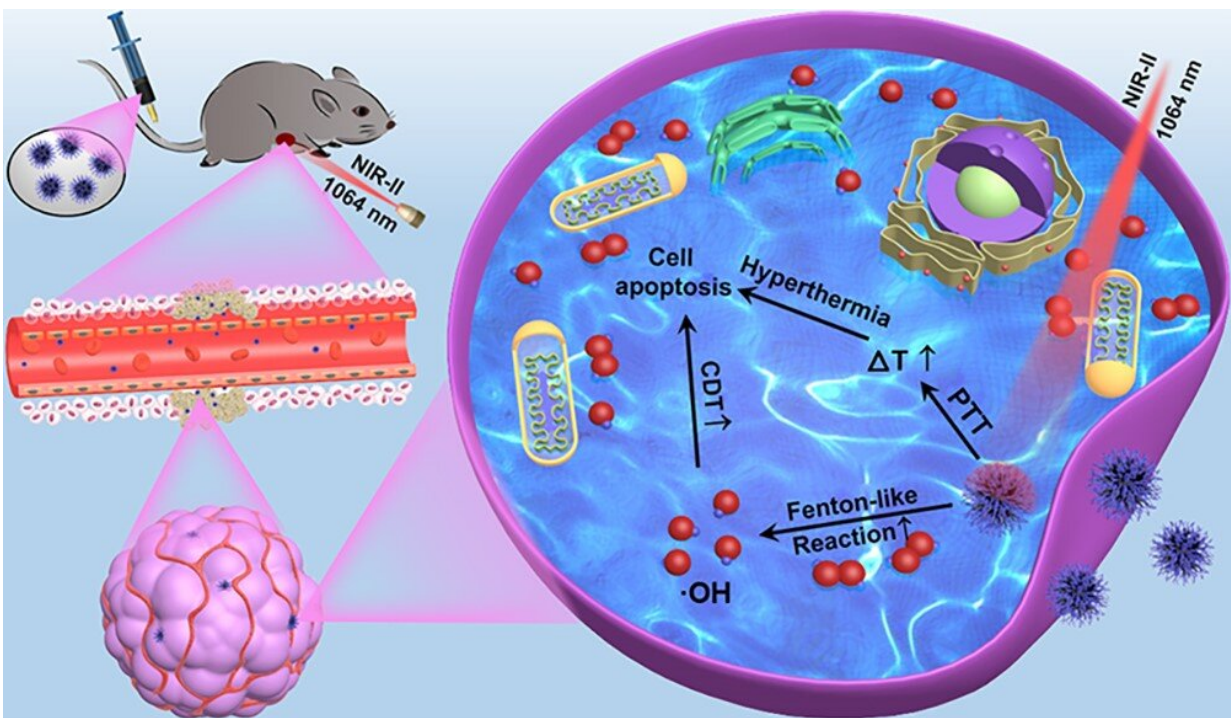


NIR-II-responsive nickel-based therapy provides new solution for synergistic oncotherapy

May 9 2022, by Zhang Nannan



Schematic illustration of 9T-PUNNC-mediated photothermally enhanced chemodynamic synergistic therapy. Credit: WANG Hui

A polyethylene glycol-modified urchin-like nickel nanoclusters (PUNNC) with an applied 9 Tesla magnetic field can efficiently kill tumor cells in vitro and inhibit tumor tissue growth in vivo, when used

for photothermal enhanced chemodynamic synergistic therapy under near-infrared (NIR)-II radiation, according to a recent study published in *Theranostics*.

The solvothermal synthesis of the novel 9T-PUNNC was reported by a collaborative research team led by Prof. Wang Hui at the Hefei Institutes of Physical Science (HFIPS) of the Chinese Academy of Sciences (CAS).

Chemodynamic therapy (CDT) based on Fenton or Fenton-like reactions to generate [hydroxyl radicals](#) in situ has low side effects and a noninvasive treatment modality. Among the reported non-metal-based or metal-based nanomaterials as Fenton agents for CDT and photothermal agents for photothermal therapy (PTT), it is difficult to make greater progress in the combined therapy due to the inherent instability, low catalytic efficiency and poor photothermal conversion efficiency of the materials. Therefore, it is necessary to design a new therapeutic agent for combined therapy.

In this study, the researchers used a one-step solvothermal method to synthesize PUNNC modified with [polyethylene glycol](#) to improve stability and biocompatibility under an applied [magnetic field](#).

The increase of the magnetic field strength contributed to the increase of the length of the needle-like protrusions on the surface and reduce the crystallinity of the nickel clusters, and 9T-PUNNC could effectively absorb NIR-II and converted it into local heat to achieve the effect of PTT, while the decrease of crystallinity and the increase of local temperature accelerated the acidification process of PUNNC. As a result, it promoted the occurrence of Fenton-like reaction and enhanced CDT efficacy.

The experimental results showed that PUNNC-mediated combined

treatment of PTT&CDT could significantly increase the killing of [tumor cells](#) and inhibit the growth of tumor tissue.

This study demonstrates a bifunctional nanotherapeutic based on NIR-II-Responsive PUNNC for synergistic tumor therapy.

More information: Yong Qian et al, NIR-II responsive PEGylated nickel nanoclusters for photothermal enhanced chemodynamic synergistic oncotherapy, *Theranostics* (2022). [DOI: 10.7150/thno.70841](https://doi.org/10.7150/thno.70841)

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