Autofluorescence-free, imaging-guided precision therapy for rheumatoid arthritis

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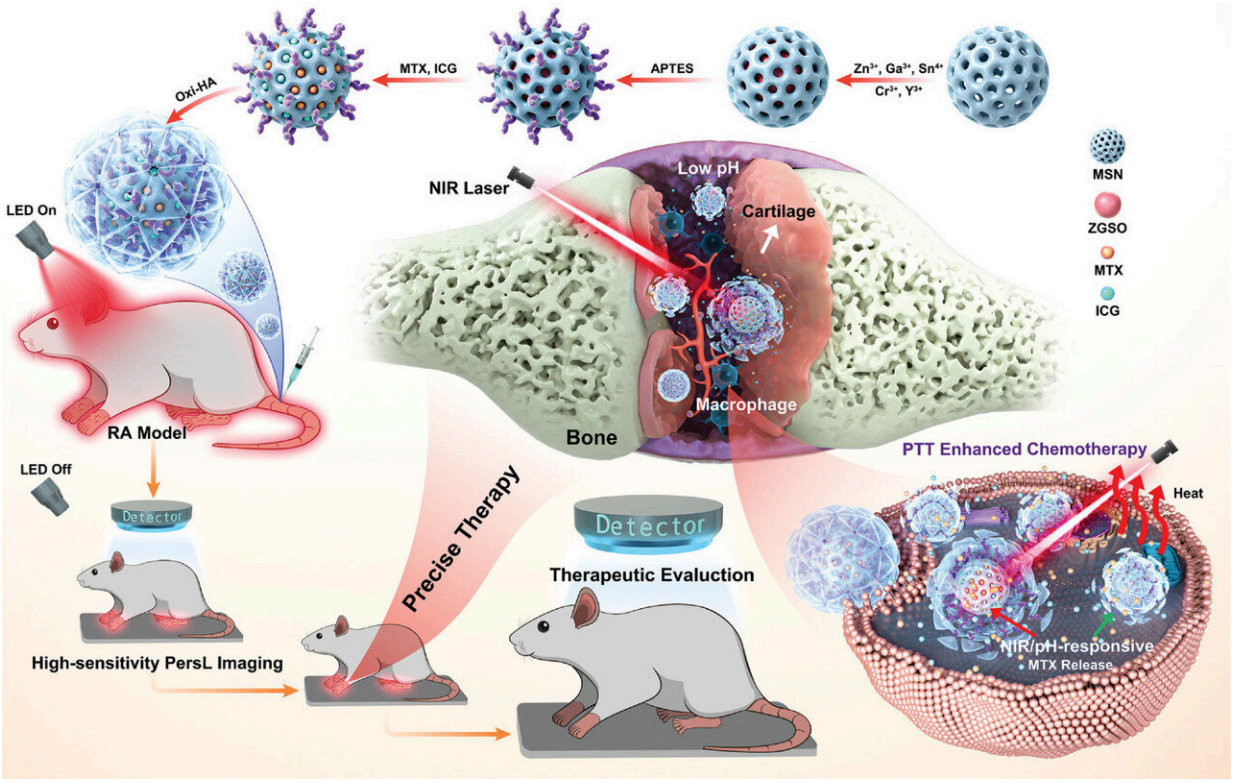

Schematic illustration of the fabrication process of the designed dual-triggered theranostics nanoprobe and the high-sensitivity autofluorescence-free imaging-guided RA treatment and therapeutic evaluation. Credit: *Advanced Science* (2022). DOI: 10.1002/advs.202205320

Rheumatoid arthritis (RA), known as "immortal cancer," is a chronic,

progressive autoimmune inflammatory disease. The development and application of an RA high-sensitivity theranostics probe can help to accurately monitor the progression and realize the efficient treatment of RA.

In a study published in *Advanced Science*, a research group led by Prof. Zhang Yun from Fujian Institute of Research on the Structure of Matter of the Chinese Academy of Sciences developed a dual-triggered theranostics nanoprobe based on persistent luminescence nanoparticles (PLNPs) for RA autofluorescence-free imaging-guided precise treatment and therapeutic evaluation.

The researchers first prepared a renewable near-infrared (NIR)-emitting $Zn_{1.3}Ga_{1.4}Sn_{0.3}O_4$:0.5%$Cr^{3+}$,0.3%$Y^{3+}$ (ZGSO) PLNPs by a facile mesoporous silica template method.

By drug co-loading and surface modification, they then constructed ZGSO as a targeted theranostics nanoprobe with a good ability to control drug release via NIR/pH-responsive processes.

In the adjuvant-induced RA model, such a theranostics nanoprobe efficiently targets the RA lesion site and performs the effective noninvasive diagnosis of RA joint tissues with high signal-to-background ratio.

Remarkably, by persistent luminescence (PersL) imaging to guide precision treatment, the researchers found that the progress of RA was significantly suppressed.

Additionally, they employed PersL imaging characteristics of the theranostics nanoprobe for RA therapeutic evaluation. The results were consistent with clinical micro-CT and histological analyses.

This study provides an efficient and non-invasive RA diagnosis and treatment strategy, which is of great significance for effectively monitoring and controlling the development process of RA to optimize the treatment strategy.

More information: Ruoping Wang et al, Dual-Triggered Near-Infrared Persistent Luminescence Nanoprobe for Autofluorescence-Free Imaging-Guided Precise Therapy of Rheumatoid Arthritis, *Advanced Science* (2022). DOI: 10.1002/advs.202205320

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