New strategy enables targeted treatment of rheumatoid arthritis
21 October 2022, by Zhang Nannan

The high level of reactive oxygen species (ROS) in the rheumatoid arthritis (RA) microenvironment and its persistent inflammatory nature can promote damage to joints, bones, and the synovium. Strategies that integrate effective RA microenvironment regulation with imaging-based monitoring could lead to improvements in the diagnosis and treatment of RA.

A joint research team from the Shenzhen Institute of Advanced Technology of the Chinese Academy of Sciences and the University of Texas at Austin has proposed a new strategy that can achieve targeted treatment of rheumatoid arthritis.

The researchers integrated small interfering RNAs (siRNAs<sub>T/I</sub>) and Prussian blue nanoparticles (PBNPs) to silence the expression of the proinflammatory cytokines TNF-?/IL-6 and scavenge the ROS associated with the RA microenvironment.

The study was published in PNAS on Oct. 18.

To enhance the in vitro and in vivo biological stability, biocompatibility, and targeting capability of the siRNAs<sub>T/I</sub> and PBNPs, the researchers prepared macrophage membrane vesicles (MMVs) to construct biomimetic nanoparticles, M@P-siRNAs<sub>T/I</sub>.

They found that the M@P-siRNAs<sub>T/I</sub> suppressed TNF-?/IL-6 expression and overcame the hypoxic nature of the RA microenvironment, thus alleviating RA-induced joint damage in a mouse model.

Moreover, near-infrared photoacoustic imaging (PAI) allowed the targeting behavior of the M@P-siRNAs<sub>T/I</sub> to be followed in real time, thus permitting an evaluation of their therapeutic efficacy without the need for invasive procedures.

These findings show that macrophage-biomimetic M@P-siRNAs<sub>T/I</sub> and their analogs assisted by PAI can provide a new strategy for RA diagnosis, treatment, and monitoring.

The research was published in Proceedings of the National Academy of Sciences.


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