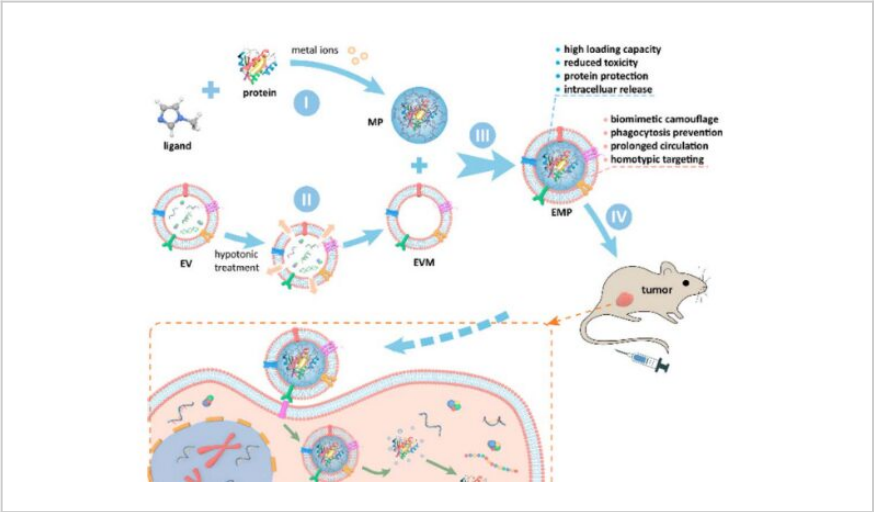
Nanoparticle for Protein Delivery

ID# 2018-4778



Schematic illustration of intracellular delivery of guest proteins.

Technology Summary

This innovation crafts MOF nanoparticles, self-assembling in water to encapsulate therapeutic agents like small molecules, DNA, RNA, or proteins. These nanoparticles feature an outer surface comprising an extracellular vesicle membrane (EVM), substantially extending their in vivo circulation half-life. By harnessing EVs from a patient's autologous biological sample, including those from specific tissues and tumors, the invention achieves impressive loading efficiencies of up to 97% and a loading capacity of approximately 41%. In vitro and in vivo studies confirm the ability of these EV-like nanoparticles to shield proteins from protease degradation, evade immune clearance, selectively target tumor sites, facilitate uptake, and autonomously release the encapsulated protein post-internalization.

Application & Market Utility

This biomimetic nanoplatform offers a breakthrough solution for systemic and intracellular protein delivery, exhibiting minimal cytotoxicity. Camouflaging with EVM prevents phagocytosis, while membrane-anchored proteins facilitate targeted endocytosis. Tested in vitro and in vivo, it demonstrates targeted tumor apoptosis with low toxicity to vital organs. Published in JACS, its potential spans therapeutic interventions across various diseases.
https://pubs.acs.org/doi/10.1021/jacs.8b03584

Next Steps

Explore clinical trials for diverse therapeutic applications.

TECHNOLOGY READINESS LEVEL 3-5

Seeking

Investment | Licensing | Research

Keywords

- Therapeutic protein delivery
- Nanoparticles
- Extracellular vesicle (EV) coating

Researchers

Siyang Zheng, Ph.D.
Associate Professor of Biomedical Engineering and Electrical Engineering

Gong Chen
Professor and Verne M. Willaman Chair in Life Sciences

Other Researchers

Originating College

College of Engineering

Office of Technology Management Contact

Matthew Smith
mds126@psu.edu