PURDUE INNOVATES | Office of Technology Commercialization

Flexible Non-cationic Nanocapsules for Nucleic Acid Delivery

A soft, non-cationic nanocapsule enables safer, systemic delivery of RNA therapeutics to solid tumors, improving efficacy and reducing toxicity compared to existing methods.

Researchers at Purdue University have developed a soft, flexible non-cationic nanocapsule for systemic delivery of RNA therapeutics. Compared to non-viral vectors, typically based on cationic lipids or polymers, the Purdue technology, dubbed "Nanosac", performs well in the anionic environment prevalent in the body. Nanosac showed efficient cellular uptake in cancer cells. Nanosac was taken up less by macrophages and penetrated more into tumor tissues than hard nanoparticle counterparts. Nanosac was also non-toxic to cells. In a mouse colon cancer model using CT26 cells, siRNA targeting the PD-1/PD-L1 immune checkpoint interaction was delivered via Nanosac systemically, and the treated group showed a significant attenuation in tumor growth.

Advantages:

-Enables systemic delivery of RNA therapeutics

-Avoids toxicity and nonspecific protein adsorption

-Enhanced transvascular and interstitial delivery

-Improved intratumoral penetration

-Safer, more scalable, less heterogeneous, and less immunogenic than cell-derived vesicles

Potential Applications:

-Delivery of RNA-based Gene Therapy

Technology Validation: Cellular uptake and toxicity were evaluated in cell culture, and efficacy of a therapeutic delivered by Nanosac was validated in a mouse model.

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Authors
Hyungjun Kim
Yoon Yeo

Further information
Joe Kasper
JRKasper@prf.org

Nathan Smith
nesmith@prf.org

View online

Related Publications:

Nanosac, a Noncationic and Soft Polyphenol Nanocapsule, Enables Systemic Delivery of siRNA to Solid Tumors

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Intellectual Property:

Provisional-Gov. Funding, 2020-11-06, United States | PCT-Gov. Funding, 2021-10-27, WO | NATL-Patent, 2021-10-27, Europe | NATL-Patent, 2021-10-27, Canada | NATL-Patent, 2023-05-02, United States | NATL-Patent, 2023-05-31, Republic of Korea

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