Nature's own nanoparticles harnessed to target disease

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Credit: AI-generated image (disclaimer)

Using a novel form of immune-genetic therapy, researchers from Yale School of Medicine and the Jagiellonian University College of Medicine in Poland have successfully inhibited a strong immune allergic inflammatory response in the skin of mice. The results suggest the technique could be used to combat a variety of diseases.

"We use an antibody coating we chose to deliver therapeutic genetic material we selected to target cells," said Dr. Philip Askenase, professor of medicine and senior author of the study published July8 in the *Journal of Allergy and Clinical Immunology*.

The delivery system consists of naturally occurring nanoparticles called exosomes that are about one thousandth the size of donor cells that release them. These tiny vesicles were once thought to contain only unneeded cellular debris. However, in the last decade, scientists have shown that there are billions of exosomes in the circulation and that they carry genetic instructions in the form of micro-RNAs (miRNA) to regulate the functions of nearby and distant cells.

Askenase and colleagues found that exosomes could be coated with an antibody of their choosing. These nanovesicles were able to deliver therapeutic miRNA to specific cells targeted by the antibody. In the current study, the coated exosomes delivered their miRNA cargo to immune system cells, inhibiting an active allergic disease response in the skin of mice.

"These natural nanoparticles are present throughout the body," said Dr. Krzysztof Bryniarski of Jagiellonian University and lead author of the paper. "They seem to be a superior delivery system compared to artificial nanoparticles currently in use, which often are eliminated from the body because they are sensed as artificial."

In theory, the researchers said, the natural nanoparticles coated with chosen specific antibodies and loaded with selected miRNAs could be used to specifically target and then genetically alter crucial cells involved in allergic conditions such as asthma, autoimmune responses, and potentially even cancers and neurological diseases.

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