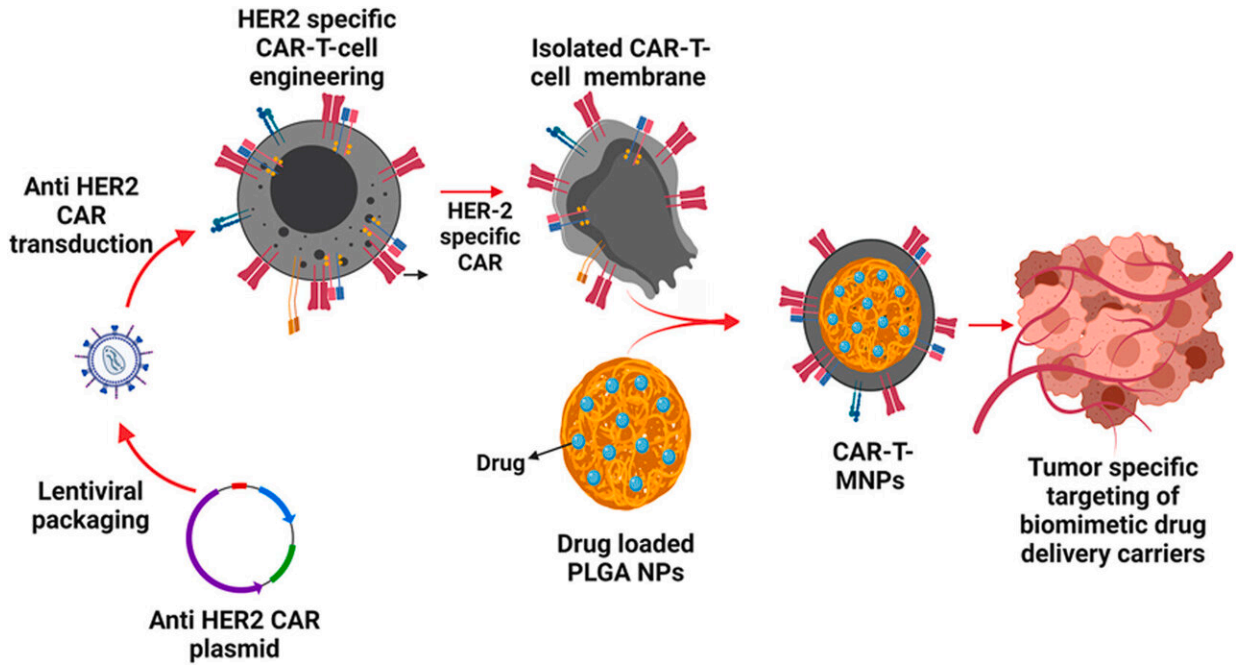
Chemotherapy method uses patient's own cells as trojan horse to direct cancer-killing drugs to tumors

February 23 2024, by Katherine Egan Bennett



Graphical abstract. Credit: *Bioactive Materials* (2024). DOI: 10.1016/j.bioactmat.2023.12.027

Lung cancer is not the most common form of cancer, but it is by far among the deadliest. Despite treatments such as surgery, radiation therapy, and chemotherapy, only about a quarter of all people with the disease will live more than five years after diagnosis, and lung cancer

kills more than 1.8 million people worldwide each year, according to the World Health Organization.

To improve the odds for patients with lung cancer, researchers from The University of Texas at Arlington and UT Southwestern Medical Center have pioneered a novel approach to deliver cancer-killing drugs directly into cancer cells.

"Our method uses the patient's own cellular material as a trojan horse to transport a targeted drug payload directly to the lung cancer cells," said Kytai T. Nguyen, lead author of a new study on the technique in the journal *Bioactive Materials* and the Alfred R. and Janet H. Potvin Distinguished Professor in Bioengineering at UTA.

"The process involves isolating T-cells (a type of immune cell) from the cancer patient and modifying them to express a specific receptor that targets the cancer cells."

The crucial step in this new technique involves isolating the cell membrane from these modified T-cells, loading the membranes with chemotherapy medications, and then coating them onto tiny drug-delivery granules. These nanoparticles are roughly 1/100 the size of a strand of hair.

When these membrane-coated nanoparticles are injected back into the patient, the cell membrane acts as a guide, directing the nanoparticles to the tumor cells with precision. This approach is designed to deceive the patient's immune system, as the coated nanoparticles mimic the properties of immune cells, avoiding detection and clearance by the body.

"The key advantage of this method lies in its highly targeted nature, which allows it to overcome the limitations of conventional

chemotherapy that often lead to detrimental side effects and reduced quality of life for patients," said co-author Jon Weidanz, associate vice president for research and innovation and a researcher in kinesiology and bioengineering.

"By delivering chemotherapy directly to the tumor cells, the system aims to minimize collateral damage to healthy tissues," continued Weidanz, who also is a member of UTA's Multi-Interprofessional Center for Health Informatics.

In the study, researchers loaded the nanoparticles with the anti-cancer drug Cisplatin. The membrane-coated nanoparticles accumulated in parts of the body with the tumors rather than in other parts of the body. As a result, this targeted delivery system was able to reduce the size of the tumors in the control group, demonstrating its efficacy.

"This personalized approach could pave the way for a new era of medicine tailored to each patient's unique characteristics and the specific nature of their tumor," Nguyen said. "The potential for reduced side effects and improved effectiveness makes our technique a noteworthy advancement in the field of cancer treatment."

More information: Serkan Yaman et al, Targeted chemotherapy via HER2-based chimeric antigen receptor (CAR) engineered T-cell membrane coated polymeric nanoparticles, *Bioactive Materials* (2024). DOI: 10.1016/j.bioactmat.2023.12.027

Provided by University of Texas at Arlington