Docket #: S23-161

Methods and Composition for Targeted Receptor-Mediated Programmable Macromolecule Delivery

Researchers at Stanford have developed a novel method for programmable macromolecule delivery via engineered cells, using trogocytosis.

Genome editing technologies have revolutionized the field of personalized medicine. Despite its initial promise, many of these methods have failed to deliver useful clinical therapeutics. Two commonly used methods, AAV and nanoparticles, lack flexibility in their cellular specificity programming to be widely used in tissue or cell specific diseases. Engineered cells have emerged as promising delivery vehicles, but current engineering methods lack specific and programmable macromolecule delivery. Cells have evolved several methods of direct molecule exchange that have cell type specificity, including trogocytosis. Trogocytosis is favorable because it has been shown to be bidirectional, and it maintains the functional integrity of the transported molecules. However, engineered macromolecule delivery methods have yet to capitalize on this method of cell-to-cell transport.

Stage of Development
Research - in vivo

Stage of Research
The inventors have created a novel cell engineering strategy (TRANSFER) for the delivery of macromolecules in a cell specific fashion. More specifically, the inventors have harnessed the power of trogocytosis to deliver macromolecules from an engineered cell to another cell in vivo, allowing for targeted delivery while maintaining the functional integrity of the macromolecules being transported. The macromolecules can subsequently be freed from endosomes in recipient cells and

optionally functionalized in a trogocytosis-like pH-responsive membrane fusion. This method is fully programmable and allows for tissue and cell specific targeting as well as the delivery of many different macromolecules.

Applications

- Programmable and specific delivery of functional molecules into various cell types

Advantages

- Fully programmable delivery of most macromolecules to tissue specific or cell specific targets
- Tunable, efficient, and versatile delivery method

Patents

- Published Application: WO2025122775

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