Docket #: S23-447

TrogoTACs - Bispecific Chimeras for Targeted Protein Transfer

Trogocytosis is a phenomenon in which one cell transfers small, membrane-bound vesicles called trogocytotic vesicles to another cell. These vesicles contain proteins from the donor cell surface, and the transfer of these proteins can have various effects on the recipient cell, such as modulating its behavior or triggering an immune response. Trogocytosis is a form of intercellular communication that can occur between many different types of cells, including immune cells, cancer cells, and epithelial cells.

Inventors in the Bertozzi Lab have leveraged the natural phenomena of trogocytosis to enable precision delivery of proteins to cells that do not genetically encode the protein of interest. They synthesized TrogoTACs, unique bifunctional molecules that enable control over trogocytosis to direct transfer proteins between cells of interest. TrogoTACs link receptors on recipient cells and ligands on donor cells to trigger trogocytosis and mediate transfer of cell surface proteins between recipient and donor cells. This would enable scenarios such as, TrogoTACs that can link B cells (recipient cells) to cancer cells (Donor cells) to allow the transfer of MHC molecules on cancer cells to B cells for presentation and immune activation.

TrogoTACs could enhance immune cell activity and counteract drug resistance in cancer research and can enable selective immune suppression in autoimmune disease treatments. Furthermore, the invention also has potential applications in metabolic disorders like enzyme deficiencies. This invention offers a paradigm-shifting approach that can be applied in various areas throughout medicine.

Applications

- Oncology research and therapeutics
- Inflammation and Immunology research and therapeutics

- Cellular application in research

Advantages

- Precise delivery of proteins based on spatial proximity between cells
- Enable transfer of proteins which are genetically difficult to encode - large protein complex or highly polymorphic

Publications

- Till, N. A., Ramanathan, M., & Bertozzi, C. R. (2025). Induced proximity at the cell surface.. *Nature Biotechnology*, 1-10.

Patents

- Published Application: WO2025189160

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