Engineering Antigen-Specific T Cells for CAR T Cell Therapy via Antigen-Presenting Lipid Nanoparticles

Production costs and complexities limit efficiency

Researchers at the Georgia Institute of Technology have built upon the success of existing FDA-approved CAR T cell therapies, innovatively incorporating lipid nanoparticles (LNPs) encapsulated with CAR mRNA and decorated with MHC molecules. This strategic design aims to target and reprogram antigen-specific T cells directly within the body. By bypassing the need for external cell manipulation, this method addresses the significant challenges of high production costs and complex manufacturing processes associated with current CAR T cell therapies.

New method provides for broader applications

The preliminary data is encouraging, demonstrating that this novel approach can efficiently target and program T cells in vivo, thereby showing potential for broader applications in cancer treatment. Furthermore, it promises to mitigate several drawbacks, such as long lead times for CAR T cell production, the risks associated with off-target effects, and the potential activation of autoimmune T cells.

Summary Bullets

- **Technology Overview**: Georgia Tech's new CAR T cell therapy uses lipid nanoparticles (LNPs) to program antigen-specific T cells in vivo, potentially reducing costs and production time.

- **Advantages**: This approach avoids expensive and time-consuming ex vivo manufacturing, minimizes off-target effects, can adapt to various CAR constructs and cancer types, and promises rapid scaling and reduced costs.

- **Commercial Applications**: Applicable to multiple myeloma, CD19+ cancers, and a wide range of other cancers, this technology streamlines CAR T cell therapy manufacturing for faster, more affordable treatments.

Solution Advantages

? Direct in vivo programming of antigen-specific T cells circumvents expensive and time-consuming ex vivo manufacturing.
? Specific targeting of antigens minimizes off-target effects and the potential for autoimmune reactions.
? Adaptation to different CAR constructs and cancer types enhances therapeutic potential.
? Potential for rapid scaling and reduced therapy costs makes treatment more accessible.

Potential Commercial Applications

? Treatment options for multiple myeloma and CD19+ cancers.
? Applicability to a wide range of other cancers and diseases amenable to CAR T cell therapy.
? Streamlining of CAR T cell therapy manufacturing for faster, more affordable treatments.

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IP Status

Patent application has been filed. :

Publications

In vivo mRNA delivery to virus-specific T cells by light-induced ligand exchange of MHC class I antigen-presenting nanoparticles, Science Advances - 2022

Images

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