UNIVERSITY OF MINNESOTA
Driven to Discover℠

Glycoengineered mesenchymal stem cells as targeted therapeutic carriers

A targeted therapeutic delivery system utilizing glycoengineered mesenchymal stem cells for reduced toxicity and increased treatment residence time

IP Status: US Patent Issued; Patent No. 11,684,638

Applications

- Targeted drug delivery in oncology
- Tumor diagnostics

Key Benefits & Differentiators

- **Reduced toxicity:** Drug-containing nanoparticles are localized via glycoengineered stem cells to the targeted tumor
- **Lower dosages and longer residence time:** Drug-containing nanoparticles attach to stem cell anchors

Technology Overview

Effective treatment of most cancers is plagued by the delivery of toxic amounts of therapeutic agents to healthy, non-cancerous tissues. Furthermore, retention of therapeutic agents is limited, requiring repeated and frequent administration. Targeted delivery of diagnostic agents and drugs to tumors can improve detection and treatment outcomes. Nevertheless, currently available options suffer from a lack of selectivity for tumor cells. Ligand-based targeting attempts to exploit the fact that tumor cells overexpress specific membrane proteins that can be targeted with appropriate antibodies or ligands. However, it has become increasingly clear that many, if not most, of these proteins are expressed in normal cells as well.

Researchers at the University of Minnesota have developed a two-step targeting approach that leverages the introduction of synthetic targets in the tumor tissue, followed by the delivery of agents that have a high affinity for these targets. By glycoengineering mesenchymal stem cells (MSC), the tumoritropic nature of MSCs can be leveraged to localize unnatural azide groups by a targeted tumor. The subsequent reaction of these azide groups with alkynes such as dibenzyl cyclooctyne (DBCO) allows for bioorthogonal copper-free “click” chemistry. Administration of glycoengineered MSCs along with paclitaxel-loaded DBCO-functionalized nanoparticles resulted in significant ($p < 0.05$) inhibition of tumor growth and improved survival ($p < 0.0001$) in an orthotopic metastatic ovarian tumor model.

Phase of Development

TRL: 3-4
Proof-of-concept in subcutaneous and orthotopic mouse tumor models

Desired Partnerships

This technology is now available for:

Technology ID
20160092

Category
All Technologies
Life Sciences/Biologics
Life Sciences/Biomaterials
Life Sciences/Diagnostics & Imaging
Life Sciences/Human Health
Life Sciences/Therapeutics

Learn more

- License
- Sponsored research
- Co-development

Please contact our office to share your business' needs and learn more.

Researchers

- **Swayam Prabha, PhD, MBA** Professor, Department of Pharmaceutics

References

1. Buddhadev Layek, Tanmoy Sadhukha, Swayam Prabha(2016) , https://www.sciencedirect.com/science/article/pii/S0142961216001381?via%3Dihub, Biomaterials, 88, 97-109