Injectable Recombinant Protein-Based Hydrogels for Therapeutic Delivery

The solution is a self-healing protein-based hydrogel that supports minimally invasive cell delivery through catheter injection.

What is the Problem?

Cell-based therapies hold great potential in revolutionizing current treatments for diseases such as cancers and heart diseases. A major limitation of cell-based therapies are the long-term survival and engraftment of transplanted cells in the host due to a combination of mechanical, cellular, and host factors. The efficacy of cell therapy relies on the number of injected cells reaching the target tissue, their viability, and their ability to promote tissue regeneration. As a result, strategies aimed at improving viable cell engraftment are necessary to increase the general efficacy of cell therapies and advance the field of regenerative medicine.

What is the Solution?

The innovative solution is a self-healing protein-based hydrogel that supports minimally invasive cell delivery through catheter injection. This injectable biomaterial platform protects cells from the mechanical forces of shear through the needle and supplies a scaffold for the cells to stabilize once injected. The single-component design consists of an unstructured hydrophilic, biodegradable protein polymer flanked by self-associating protein domains, permitting solid support and sustained localization of injected therapeutics. The physical interactions of the proteins can be temporarily disturbed through sheer from syringe injection through a needle and upon sheer removal, the materials will rapidly self-heal back into a stable gel. Through genetically encoded alterations in the self-associating protein domains, the injectable hydrogel solution can be customized with tunable sheer-thinning and self-healing characteristics. Furthermore, the gel system can be readily functionalized with bioactive proteins to direct specific cell fates and enhance cell therapy engraftment.

What is the Competitive Advantage?

The competitive advantage of this innovation lies in its ability to enable highly customizable and uniform injectable hydrogels due to its use of synthetic and genetically encoded materials compared to natural protein-based hydrogels. These materials can be used for minimally invasive therapeutic delivery through syringe injection for a wide range of diseases. By offering improved long-term survival and engraftment efficiency of transplanted cells, this technology can help advance the cell and gene therapy market. In 2022, the global market for cell and gene therapy was estimated to be at $13 billion with an expected CAGR of 22.8%.

Technology ID

BDP 8721

Category

Materials/Nanomaterials
Research Tools
Therapeutics/Platform Technology
Selection of Available Technologies

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Patent Information:

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