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BIOPACT CELLULAR TRANSPORT

TECHNOLOGY BREAKDOWN

A look at Biopact Cellular Transport's patented MGMR technology and its potential to revolutionize genetic engineering and the cancer fighting CAR-T therapy market.

Biopact's core technology is **Medical Grade Molecular Rebar** (or MGMR for short). MGMR is a nano-scale molecular delivery vehicle – millions of times smaller than the size of a typical human cell.

The small size, unique architecture and high surface-to-volume ratio of MGMR allow it to serve as an ideal "molecular shuttle" for carrying specialized molecules across a cell's outer protective membrane.

Typically, this protective membrane serves a very important function: it shields cells from foreign materials and contaminants.

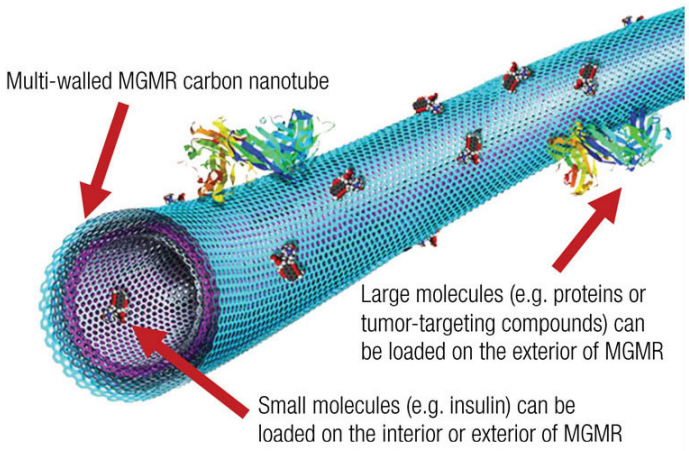
However, new therapeutic technologies such as gene-editing require specialized molecules to be shuttled across this protective membrane in order to access the inside of cells. **MGMR makes it possible** – it's small enough to easily penetrate the inside of cells (without damaging their integrity), and its vast surface-to-volume ratio allows it to carry virtually any type of molecular cargo on its surface.

If the specialized molecular technologies that will enable tomorrow's cures are the cargo, MGMR is the delivery system.

CAR-T THERAPY AND CANCER

An example of how MGMR can enable advances in medicine is CAR-T, a promising cell-based therapy for many types of cancer.

VISUAL REPRESENATION OF MGMR:



CAR-T uses a patient's own immune cells (called T-cells) to attack cancer.

T-cells are the body's defense against infection and disease, but do not normally recognize cancerous cells, allowing tumors to grow and spread.

In order to adapt a patient's T-cells to recognize and fight the cancer, the cells must first be extracted from the patient's blood and grown outside the body. In the lab, the cells are modified to produce a specialized protein complex (called CAR) which allows them to "search and destroy" cancer cells.

Once a sufficient number of CAR-T cells are produced in the lab, they are infused back into

the patient, where they seek out the tumor and destroy the cancerous cells by mounting a complex immunological attack.

Currently, about 50 companies are involved in the field. And even with the very high cost per treatment ($400,000-$500,000 per patient), the CAR-T market is expected to increase from nearly $300 million in 2018 to **$3.3 billion** in 2028.

Lower costs would greatly expand the market due to the CAR-T treatment effectiveness.

HOW MGMR WILL IMPACT CAR-T

The cost and complexity of CAR-T production stems from factors that are directly addressable by MGMR.

CAR-T manufacturing is semi-personalized, meaning that patients' own T-cells are genetically engineered to be capable of fighting cancer cells. Current methods use modified viruses to act as shuttles that cross cell membranes. Viruses, however, have serious side effects that cause cost, quality and toxicity issue.

Each type of editing agent/virus requires a different viral vector, which is costly to develop, validate and use to produce CAR-T cells.

There are other problems with viral vectors as well. Their toxicity to cells **reduces** the yield of CAR-T production, there is a risk of causing **mutations** and other side-effects, and it could generate **quality control issues** while largely complicating the use of multiple rounds of gene-editing to modify more than one gene.

Because MGMR is biochemically inert, it avoids many of the issues associated with viruses. MGMR transports genes into cells without the cell-damage and contamination risk caused by stray viruses. Moreover, **MGMR stimulates cell growth, improving yields and decreasing the time required** to collect enough cells to infuse to the patient.

Finally, MGMR may enable the use of more complex, but also more efficient, gene-editing.

It simply replaces viruses in the same step of the current cell production process. At the time of cell harvesting, the small, initial population of cells which internalized MGMR can be identified and removed by cell sorting, leaving only the cellular progeny (MGMR-free) for implantation in the patient. By removing it from the cells before re-entry into the body, MGMR is not a factor is receiving FDA clearance for drug status

As a viral-free technology for intracellular delivery, **MGMR would substantially decrease costs by up to 50%, improve quality, decrease the time to make the new treatment, reduce compliance risks and minimize the regulatory burden.**

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