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Affinity-Enhanced Biotin-Binding CAR T cells: A Universal Cancer Treatment

ID: 4353

Jason Lohmueller, PhD

For the roughly 40 percent of Americans who will develop cancer at some point in their lives, chimeric antigen receptor T cells (CAR-Ts) offer an exciting new avenue for treatment. CAR-Ts work by targeting a tumor-specific antigen to selectively destroy cancer cells without harming normal tissue. Although CAR-Ts have enjoyed some success in clinical trials, cancer cells can drop the targeted antigen to evade lysis, necessitating the non-trivial process of designing and testing a new CAR-T. Also, persistent CAR-T activity can be toxic to healthy tissue. To avoid these issues, we created a universal CAR-T system that maintains a high binding affinity for tumor cells while also offering greater control over toxicity and more nimble design adaptability for treating a wide array of cancers.

Technology Description

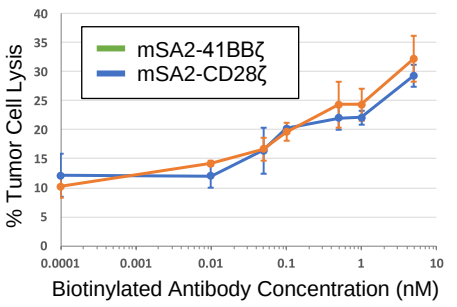
With our system, patients would receive two treatments. The first is biotin-tagged antibody that binds to tumor cells. The second is CAR-Ts that react with the tagged antibodies on the tumor cells. By separating the tumor-associated antigen from the CAR T cell, this system is much easier to adapt to changes in tumor antigen expression, allowing for infusion of additional antibodies targeting new tumor antigens. Furthermore, it offers the potential for lower toxicity because the CAR T cell potency is directly controlled by the concentration of tagged antibody. Compared to other biotin-binding CARs, our engineered affinity-enhanced monomeric streptavidin 2 (mSA2) biotin-binding protein domain has a 25-fold stronger affinity. When incubated together with target cells and various biotinylated tumor-specific antibodies, our adaptable mSA2-CARTs had comparable potency to traditional CARs.

Advantages

- Allows for using a single population of CAR T cells to target multiple tumor antigens
- Potential for reduced toxicity
- Anti-tumor efficacy on par with single-antigen CAR-Ts
- Can be used with the ever-increasing list of FDA-approved tumor-targeting antibodies

Applications

- Treating a wide array of tumor types
- Screening antibody candidates for tumor antigen targeting drug development



Two types of mSA2-CAR T cells demonstrate **tunable tumor cell lysis** by titrating in the tagged tumor-targeting antibody.

Stage of Development

In vitro data

IP Status

Provisional patent application filed

University of Pittsburgh
Innovation Institute
200 Gardner Steel Conference Center
Thackeray & O'Hara Streets
Pittsburgh, PA 15260

Andrew Remes, PhD
Technology Licensing Manager
412-624-3134
aremes@innovation.pitt.edu