



The Braun Lab: Engineering T-Cells to Treat HIV

While engineered T-Cells (CAR-T Cells) are currently celebrated as the next breakthrough in cancer treatment, oncology was not their original application. Engineered T-Cells were first conceived of as a way to fight HIV infection – and the early attempts with HIV, though ultimately unsuccessful, paved the way for the development of CAR-T therapies for cancer which are now seeing great successes in the clinic. Combining their own expertise with lessons learned from these successful attempts in cancer treatment, the lab of **Steve Braun** at the Tulane National Primate Research Center has developed a next-generation approach to treat HIV using genetically engineered T-Cells. This approach to HIV treatment has multiple advantages over current pill-based approaches.

Engineered T-Cells: Toward a Long-Term Cure

Unlike cancer CAR-T Cells (which use a single chain modified antibody), anti-HIV engineered T-Cells use human CD4 as their cell surface targeting molecule. This is advantageous because, while the HIV's surface glycoprotein regions that are usually targeted by antibodies are highly mutable, engagement with CD4 by HIV is absolutely essential in viral replication. In simple terms: HIV cannot mutate away from these cells during treatment, which can and does happen with both pharmacological- and antibody-based treatments for HIV. Additionally, the CD4 is modified to include in its protein sequence an HIV fusion inhibition peptide sequence. Thus, even if free HIV virus binds the modified cells through engagement with the CD4 molecule, it will be unable to enter the cell and replicate. Summarily, the Braun lab modified T-Cells are able to 1) recognize and target HIV-infected cells while 2) not being targets for productive infection themselves.

Immunology

Engineered T-Cells & HIV Treatment

The Long-Term Cure (Continued)

Additionally, these modified cells are linked to CMV-specific T-Cells. CMV is a chronic, persistent viral infection present in most of the population. By linking these modified cells to naturally occurring CMV-responsive cells, the lab has achieved a persistent activation of the modified T-Cells with a long-term anti-HIV response. As a result, instead of taking drugs every day to achieve viral suppression, patients could be treated via a single “dose” of modified T-Cells to achieve life-long suppression. The benefits of this alternative to current treatments become more pronounced the earlier in life and in the infection cycle patients are identified.

These modified T-Cells have been shown to be persistent in a primate model more than one year post treatment. Infected animals treated with these cells have also shown a 1.5 log drop in viral load vs. control animals. The lab is continuing to expand the scope of testing these cells, coupling their own expertise in the genetic engineering of T-Cells and their adoptive transfer with the institutional expertise and experience of the Tulane National Primate Research Center.

This technology, when perfected, would revolutionize the way that we treat HIV infection: transforming it from a chronic disease managed by daily medication to one that can be functionally cured by a single procedure using the individuals own cells.

Contact & Further Info:



James R Zanewicz, RTTP
Chief Business Officer
zanewicz@tulane.edu
504.919.3800 (m)



Claiborne M Christian, PhD
Business Development Assoc.
christian@tulane.edu
504.909.3905 (m)

engage.tulane.edu
t: engagetulane