



## Understanding Chimeric Antigen Receptor (CAR) T-Cell Technology

### Overview

Chimeric antigen receptor (CAR) T-cell therapy is a type of immunotherapy – it involves harnessing the power of a patient’s own immune system by engineering T cells to recognize and attack cancer cells.<sup>1</sup>

### The role of the T cell<sup>1</sup>

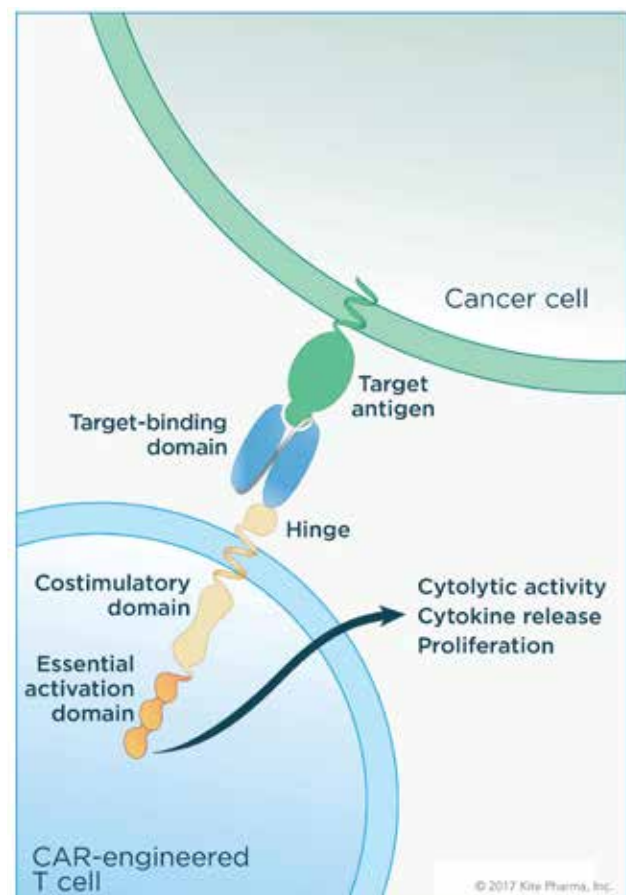
T cells are a type of cell that are critical to the immune system’s ability to detect and attack cancer cells. However, the immune system is unable to attack cancer cells when tumor-specific T cells are deficient in number, unable to function properly, or fail to recognize cancer as foreign to the body. CAR T therapy can potentially overcome these obstacles and harness the power of the immune system to target cancer cells.

### Chimeric antigen receptor (CAR) components<sup>2</sup>

CARs are engineered proteins composed of two distinct functional components:

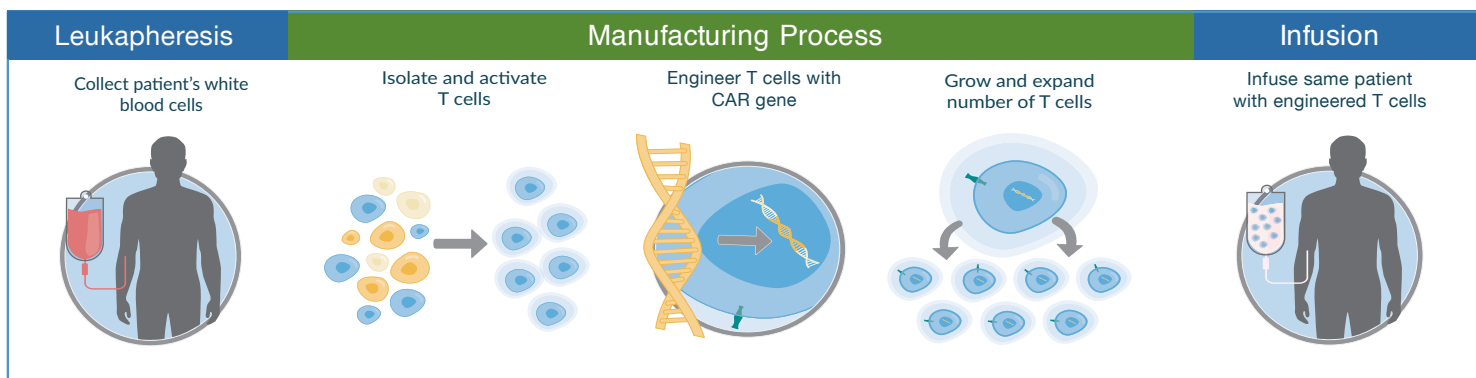
- An antibody fragment or target binding domain that allows CARs to recognize targets that are present on the surface of cancer cells
- A component that provides signals that activate the T cell to attack cancer cells

### Chimeric Antigen Receptor (CAR)



## How CAR T is designed to work<sup>1</sup>

CAR T-cell therapy is a one-time treatment of a single infusion of the patient's own T cells that have been engineered to target cancer.



The processing of CAR T-cell therapy begins with the collection of the patient's white blood cells (leukapheresis).

The cells are then sent to a central manufacturing facility at which time the T cells are isolated and activated. These cells are stimulated to proliferate, then transduced with a viral vector to introduce the CAR construct into the patient's T cells. The CAR T cells increase in number, and once a sufficient number of cells are available for infusion back into the patient, they are frozen and sent back to the clinical center where they can be administered to the patient.

At the hospital, in preparation for administration of CAR T therapy, the patient undergoes a short chemotherapy conditioning regimen prior to infusion of the CAR T cells. Once infused, the CAR T cells replicate and expand in vivo and are designed to recognize and attack cancer cells.<sup>1</sup>

## Possible Side Effects of CAR T Therapy<sup>1,3</sup>

Serious adverse events associated with CAR T therapy include low blood counts from the conditioning chemotherapy as well as cytokine release syndrome (CRS) and neurological events related to the CAR T therapy.

- Cytokine Release Syndrome (CRS): may consist of symptoms such as fever, fast heart rate, low blood pressure, and low blood oxygen.
- Neurologic Events: may include symptoms such as confusion, tremor, or difficulty speaking.

These symptoms are typically manageable and resolve in most patients.

These are not all the potential side effects associated with CAR T therapy. For more information, patients should speak with their healthcare provider.

## REFERENCES

- <sup>1</sup> National Cancer Institute. CAR T Cells: Engineering Patients' Immune Cells to Treat Their Cancers. <https://www.cancer.gov/about-cancer/treatment/research/car-t-cells#side-effects>. Accessed September 7, 2017.
- <sup>2</sup> National Cancer Institute. NCI Dictionary of Cancer Terms: Chimeric Antigen Receptor. <https://www.cancer.gov/publications/dictionaries/cancer-terms?Cdrid=787969>. Accessed September 14, 2017.
- <sup>3</sup> Lee, D. W., et al. Current concepts in the diagnosis and management of cytokine release syndrome. *Blood*, 124(2), 188–195. <http://doi.org/10.1182/blood-2014-05-552729>