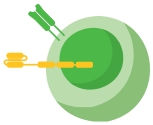
What Is Adoptive T-Cell Therapy?

Adoptive T-cell therapy (ACT), also called cellular immunotherapy, dramatically increases the number of cancer-killing T cells, thus boosting a patient's immune system to seek and destroy cancer cells. It is a complex and multistep medical procedure. During the treatment, T cells are harvested from the patient to expand them in number and/or genetically modify them in the laboratory to enhance their cancer-fighting capabilities. The expanded or genetically enhanced T cells are then reinfused in the patient to help eliminate cancer cells.

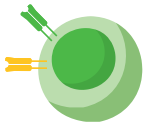
TYPES OF ACT

Currently, there are three types of adoptive T-cell therapies:



Chimeric antigen receptor (CAR) T-cell therapy

T cells are harvested from a patient's blood and genetically modified in the laboratory to have a new engineered gene that makes a protein called a CAR, which comprises parts of several different proteins and is designed to bind a specific surface protein on patient's cancer cells. The genetically enhanced T cells are expanded in number and infused back into the patient. The CAR modification helps the T cells directly bind to and attack the patient's cancer cells.



T-cell receptor (TCR) T-cell therapy

T cells are harvested from a patient's blood and genetically modified in the laboratory to have a new gene that makes a protein called a TCR, which recognizes a small fragment of a protein on the surface of patient's cancer cells. The genetically enhanced T cells are expanded in number and infused back into the patient. The TCR modification helps the T cells seek out patient's cancer cells more effectively and triggers them to attack the patient's cancer cells.

Tumor-infiltrating lymphocyte (TIL) therapy

T cells are harvested directly from a patient's tumor, expanded in number in the laboratory, and infused back into the patient. Many of these T cells naturally recognize and kill the patient's cancer cells.

ACT APPROVED BY THE U.S. FOOD AND DRUG ADMINISTRATION (FDA)

As of July 31, 2022, there are six distinct FDA-approved CAR T-cell therapies—the only type of ACT approved so far—to treat different cancer types:

- **Axicabtagene ciloleucel (Yescarta)**
  First approved in 2017, to treat adult patients with certain types of B-cell lymphoma.
- **Brexucabtagene autoleucel (Tecartus)**
  First approved in 2020, to treat patients with relapsed or refractory mantle cell lymphoma.
- **Ciltacabtagene autoleucel (Carvykti)**
  First approved in 2022, to treat adult patients with relapsed or refractory multiple myeloma.
- **Idecabtagene vicleucel (Abecma)**
  First approved in 2021, to treat adult patients with relapsed or refractory multiple myeloma.
- **Lisocabtagene maraleucel (Breyanzi)**
  First approved in 2021, to treat adult patients with certain types of B-cell lymphoma.
- **Tisagenlecleucel (Kymriah)**
  First approved in 2017, to treat adults with certain types of B-cell lymphoma and young adult patients up to age 25 with certain types of lymphoblastic leukemia.