



# CAR-T Cell Therapy

[Source: IE](#)

## Why in News?

Recently, The [Central Drugs Standard Control Organisation \(CDSCO\)](#) has granted market authorisation for **NexCAR19**, India's first indigenously-developed [Chimeric Antigen Receptor T cell \(CAR-T cell\) Therapy](#).

- India is now one of the first developing countries to **have its indigenous CAR-T and gene therapy platform**.

## What is NexCAR19?

### ▪ About:

- NexCar19 is a **type of CAR-T and gene therapy** developed indigenously in India by ImmunoACT, which is a **company incubated at IIT Bombay**.
- It is designed to target **cancer cells that carry the CD19 protein**.
  - This protein acts like a flag on cancer cells, which allows **CAR-T cells to recognise and attach themselves to the cancer cells** and start the process of elimination.
- Even some developed nations don't have their own CAR-T therapies; they import them from the **United States or Europe**.

# TREATMENT FOR SPECIFIC B-CELL CANCERS

NexCAR19 is a prescription drug for B-cell lymphomas, lymphoblastic leukaemias when other treatments have been unsuccessful

**PATIENT'S WHITE** blood cells are extracted by a machine through a process called leukapheresis and genetically modified, equipping them with the tools to identify and destroy the cancer cells.



**NEXCAR19 IS** manufactured to an optimal dose for the patient, and typically administered as a single intravenous infusion. Prior to this, the patient is put through chemotherapy to prime the body for the therapy.

## HOW NEXCAR19 WORKS



**T-cells** are naturally made by the body as an advanced defence against viruses and cancer cells.

As T-cells mature, they develop specific connectors (receptors) to target key signals on cancer cells.



**Scientists have** identified certain proteins that are abnormally expressed on the surfaces of specific types of cancer cells. Specially designed receptors can find and bind to these cells.



**However, cancers** can limit the inbuilt extent and efficiency with which T-cells are able to seek and fight them. This results in an increase in cancer burden.



**A safe shell** of a virus is used to genetically engineer T-cells so they express Chimeric Antigen Receptors – connectors that target a protein called CD19 on B-cell cancer.

Source: ImmunoACT

### ▪ Patient Eligibility:

- NexCAR19 therapy is intended for people with **B-cell lymphomas** who have not responded to standard treatments like chemotherapy and have experienced relapse or recurrence of cancer.
- Initially, the therapy is approved for **patients aged 15 years and older**.

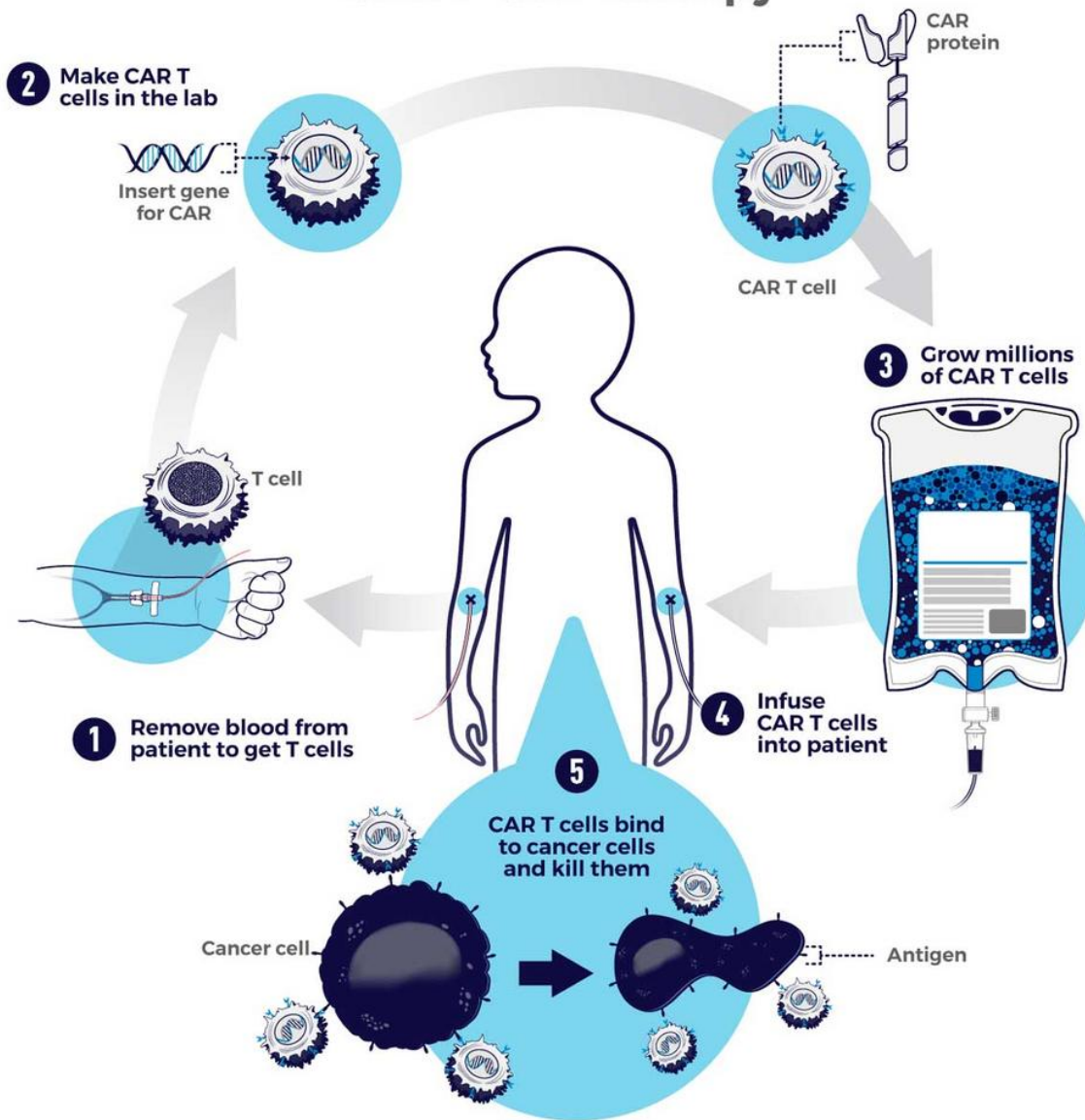
### ▪ Procedure:

- The process commences with the patient donating blood at a transfusion center. The T-cells are genetically modified and reinfused into the patient within a period of 7-10 days.

### ▪ Efficacy:

- It leads to significantly **lower drug-related toxicities**. It causes **minimal damage to neurons** and the central nervous system, a condition known as **neurotoxicity**.
  - Neurotoxicity can sometimes occur when CAR-T cells recognise the CD19 protein and enter the brain, potentially **leading to life-threatening situations**.
- This therapy also results in Minimal **Cytokine Release Syndrome (CRS)**, which is characterized by inflammation and hyperinflammation in the body due to the death of a significant number of tumour cells, as CAR-T cells are designed to target and eliminate cancer cells.

# CAR T-Cell Therapy



CAR T-cell therapy is a type of treatment in which a patient's T cells are genetically engineered in the laboratory so they will bind to specific proteins (antigens) on cancer cells and kill them. (1) A patient's T cells are removed from their blood. Then, (2) the gene for a special receptor called a chimeric antigen receptor (CAR) is inserted into the T cells in the laboratory. The gene encodes the engineered CAR protein that is expressed on the surface of the patient's T cells, creating a CAR T cell. (3) Millions of CAR T cells are grown in the laboratory. (4) They are then given to the patient by intravenous infusion. (5) The CAR T cells bind to antigens on the cancer cells and kill them.