



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**.

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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.



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.

Source: ImmunoACT



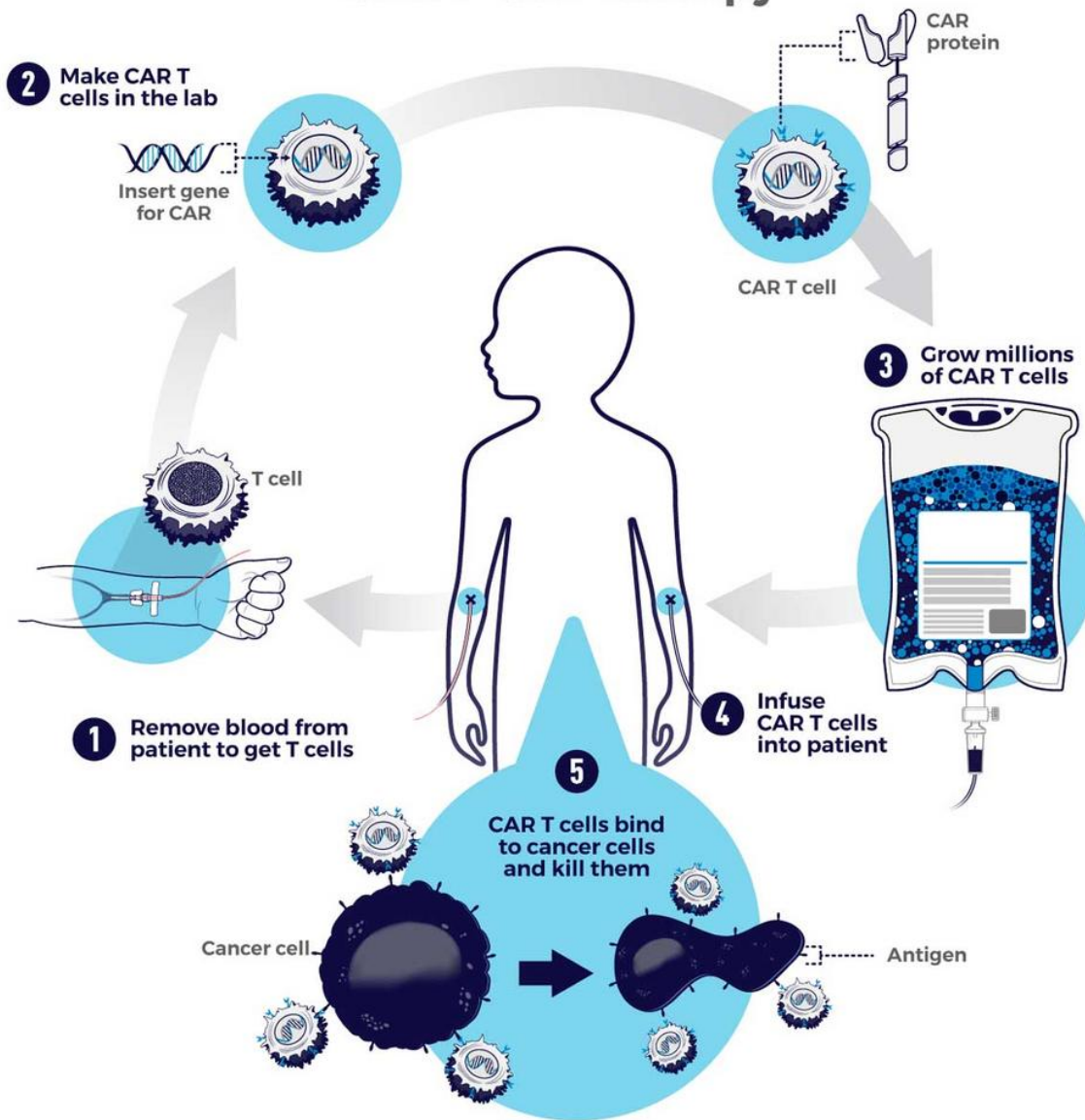
Scientists have identified certain proteins that are abnormally expressed on the surfaces of specific types of cancer cells. Specially designed receptors can find and bind to these cells.



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.

- **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.