



CAR-T Cell Therapy

[Source: IE](#)

Why in News?

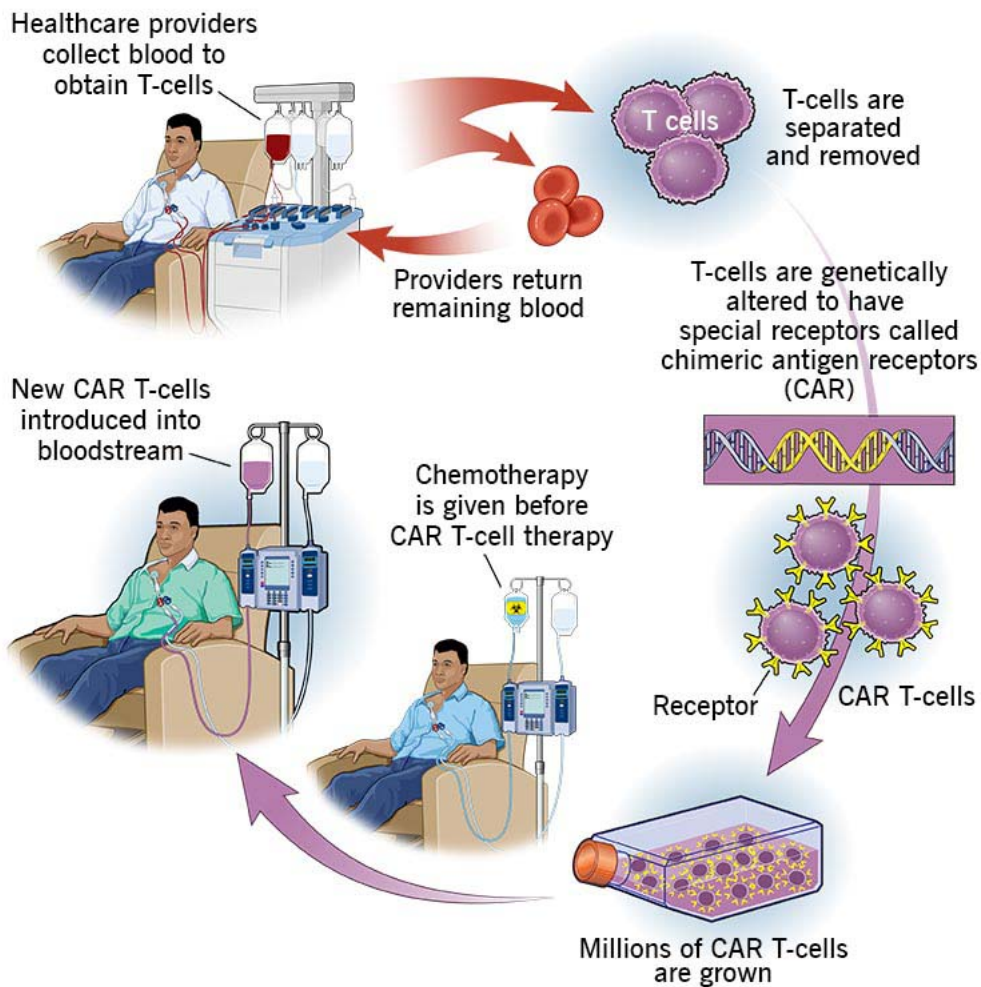
Following [India's approval of CAR-T cell therapy](#), a pioneering treatment for cancer, a patient recently underwent the procedure, achieving freedom from cancer cells, marking a significant advancement in cancer treatment accessibility in the country.

What is CAR-T Cell Therapy?

- **About:** CAR-T cell therapy, also known as **chimeric antigen receptor T-cell therapy**, is a type of immunotherapy that uses a patient's own immune system to fight cancer.
 - CAR T-cell therapy has been approved for **leukaemias** (cancers arising from the cells that produce white blood cells) and **lymphomas** (arising from the lymphatic system).
 - CAR-T cell therapies, often referred to as '**living drugs**'.
- **Procedure:** It is a complex and personalised treatment process that involves:
 - **Collecting T cells:** T cells, a type of [white blood cell](#) that helps fight infection, are extracted from the patient's blood through a process known as **Apheresis**.
 - **Genetic Engineering:** In the laboratory, the T cells are genetically modified to express a special protein called a **chimeric antigen receptor (CAR)** on their surface.
 - This CAR is designed to recognize and bind to a specific **antigen (marker)** found on cancer cells.
 - **Expansion:** The engineered T cells are multiplied in large numbers in the lab.
 - **Infusion:** The expanded **CAR-T cells** are then infused back into the patient's bloodstream, where they can identify and attack cancer cells that express the targeted antigen.

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How CAR T-cell therapy is used to treat cancer



- **Development in India: NexCAR19**, an indigenously developed therapy for **B-cell cancers**, has been collaboratively developed by ImmunoACT, Indian Institute of Technology Bombay (IIT-B), and Tata Memorial Hospital.
 - The commercial use of this therapy to treat certain blood cancers was approved by the [Central Drugs Standard Control Organisation \(CDSCO\)](#) in October 2023.
 - NexCAR19 is the **first CAR-T cell therapy to get CDSCO approval**.

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

▪ Potential Benefits of CAR-T therapy

- **High Remission Rates:** For some patients with advanced cancers who have not responded to other treatments, CAR-T therapy can lead to **high rates of complete remission**.
- **Personalised Approach:** The therapy is tailored to each individual patient's cancer, making it a highly targeted treatment.

▪ Potential Risks:

- **Severe Side Effects:** CAR-T therapy can cause serious side effects, including **cytokine release syndrome** (a widespread activation of the immune system and collateral damage to the body's normal cells) and neurological symptoms (severe confusion, seizures, and speech impairment).
- **High Cost:** CAR-T therapy is a very expensive treatment.

What are the Indian Government's Initiatives Related to Cancer?

- [National Programme for Prevention and Control of Cancer, Diabetes, Cardiovascular Diseases and Stroke](#)
- [National Cancer Grid](#)
- Encouraging [Cervical Cancer](#) Vaccination for girls (9-14 years) (Interim Budget 2024-25)

UPSC Civil Services Examination, Previous Year Question (PYQ)

Q. Which one of the following statements best describes the role of B cells and T cells in the human body?(2022)

- (a) They protect the environmental allergens. body
- (b) They alleviate the body's pain and inflammation.
- (c) They act as immunosuppressants in the body.
- (d) They protect the body from diseases caused by pathogens.

Ans: (d)

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