CAR-T CELL

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Context:

A blood cancer patient recently got cured with the help of special treatment called Chimeric Antigen Receptor T (CAR-T) cell therapy.

Background:

This advanced method helps fightcancer by using the patient's own immune system.

Key takeaways:

CAR-T cell therapy, chimeric antigen receptor T-cell therapy, is an immunotherapy-based cancer treatment that uses the power of a patient's own immune system to fight cancer.
The immune system is the body's defence network against infections and diseases. White blood cells (WBCs) play a pivotal role in the immune system.

How does the immune system work:

1. The immune system protects the body from infections using two main strategies: innate and adaptive immunity.
2. Innate immunity provides immediate, non-specific defence through barriers (skin, mucous membranes), phagocytic cells (neutrophils, macrophages), and inflammatory responses.
3. Adaptive immunity involves lymphocytes – a type of white blood cells. Adaptive immune responses are carried out by different classes of lymphocytes called B-cells and T-cells.
4. B-cells (originate and mature in the bone marrow) produce antibodies targeting specific pathogens (antigens), while T-cells (originate in the bone marrow and mature in the thymus) destroy infected cells.
5. Upon pathogen entry, the immune system recognises antigens, activates immune cells, eliminates the threat, and forms memory cells for faster future responses.

Why T-Cells:

1. T-cells are primarily used in CAR-T cell therapy because of their pivotal role in the immune system's response to pathogens. These cells can be genetically engineered to express chimeric antigen receptors (CARs), which are specifically designed to recognise and bind to antigens on the surface of cancer cells. Once bound, these modified T-cells can efficiently kill cancer cells.
2. Other cells like B cells also play roles in immunity but don't have the same adaptability and memory capabilities as T cells.

Procedure:

1. The CAR-T cell therapy starts by collecting a patient's T-cells through a process called

apheresis, which separates these cells from the blood. These T-cells are then sent to a lab where scientists modify them to add special receptors called chimeric antigen receptors (CARs).

2. These receptors help the T-cells find and kill cancer cells. The modified T-cells are grown in large numbers before they are given back to the patient's bloodstream.
3. It represents a form of personalised medicine, as the therapy is tailored to each individual's specific cancer.
4. CAR-T cell therapies are also called "living drugs" because they use a patient's own living T-cells, genetically engineered to target and destroy cancer cells.
5. These cells actively seek out, proliferate, and persist in the body, providing a dynamic and personalised defence against cancer, unlike traditional static drugs.