Chimeric antigen receptor T- Cell (CAR T-Cell) is “the living” sword in the treatment of cancer

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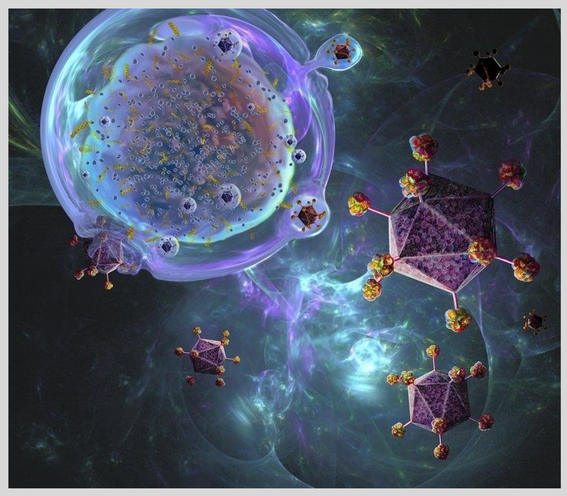
1 Immunotherapy



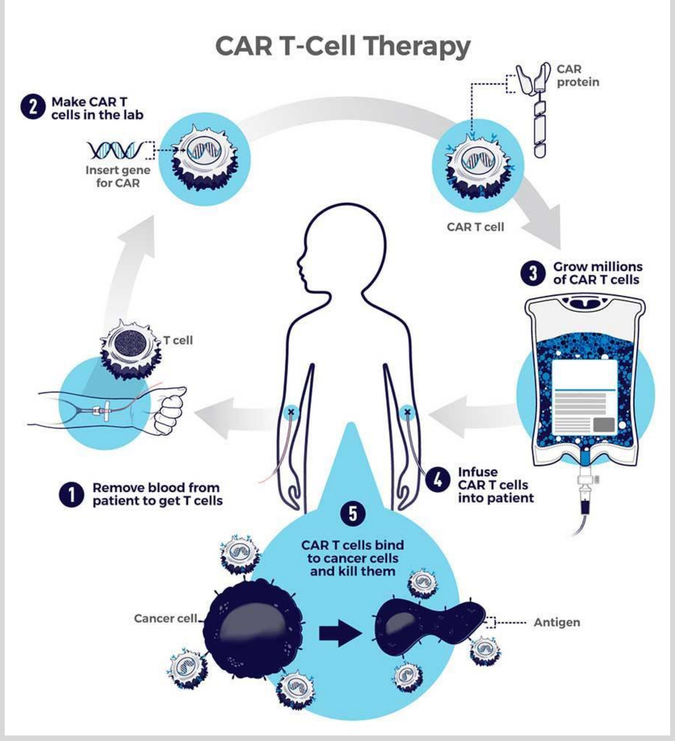
Immune system’s everyday job is to protect the body from intruders like viruses , allergens and any foreign substance that may harm the cells.
Cancer cells are moving target that constantly work by ways to dodge immune system’s defenses.
Immunotherapy is a very effective treatment for cancer that works by either training the immune system so it can do more to find and kill cancer cells or by helping the body to produce cancer fighting immune cells that effectively locate and destroy cancer cells.

2 CAR T – Cell

CAR-T Cell therapy, a form of immunotherapy that generated a substantial excitement among researchers and oncologists since it was approved by food and drug administration in 2017, as it showed its ability to eradicate very advanced leukemias and lymphomas.
Currently available CAR-T Cell therapy are customized for each individual patient. As each cancer cell has different antigen present on its surface for example in certain kinds of leukemia and lymphoma cancer cells have an antigen called CD-19 , CAR T-Cell helps to orchestrate the immune response and directly kill cancerous cells.

3 Process

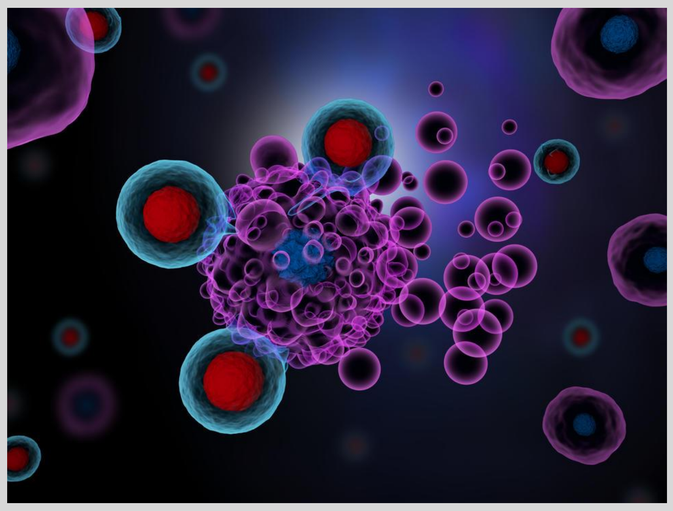
1. Blood is collected from the patient.
2. Leukocytes are isolated using blood cell separator known as leukocyte apheresis.
3. The product of leukapheresis are then transferred to a cell processing center.
4. Specific T cells are stimulated to proliferate and expand to large number.
5. The expanded T cells are then transduced with a gene encoding the engineered CAR – T Cell via retroviral vector that places the protein that will recognize the antigen of the cancerous cell on the surface of the T cell.



A few days before the CAR T-cell infusion, the patient might be given chemotherapy to help lower the number of other immune cells. This gives the CAR T cells a better chance to get activated to fight the cancer. But its not usually a strong chemotherapy as the CAR-T Cell works better when there are still some cancer cells to attack .

4 Types of cancers that are treated by CAR T-Cells

1. Large B-cell lymphoma
2. Leukemia
3. Myeloma

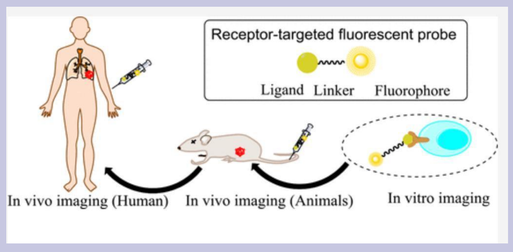


5 Side Effects

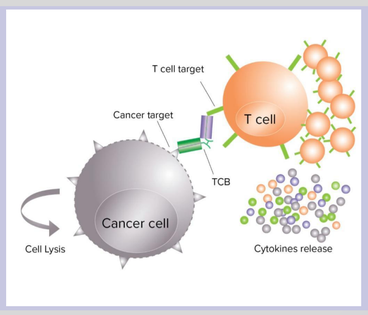
1. Neurotoxicity (difficulty speaking, loss of balance , tremors , seizures , delirium , confusion)
2. CAR T-cell – related encephalopathy syndrome (CRES). symptoms include (memory loss, confusion)
3. Infection.
4. Prolonged low platelet and red blood cell count.
5. Severe fatigue.

6 limitations

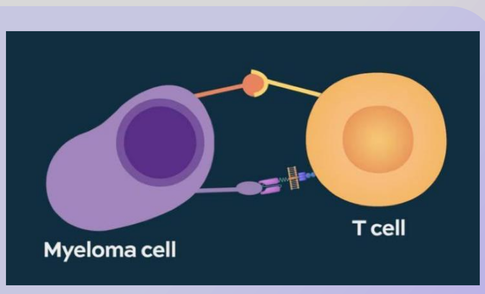
1. Constant mutations of the tumor
there will be no expression of the tumor antigen and the CAR-T Cell will not be able to recognize the cancer cell.
Strategy: tumor target fluorescent dye.



2. Cytokines release syndrome (CRS)
a systemic inflammatory response caused by cytokines released by infused CAR T cells.

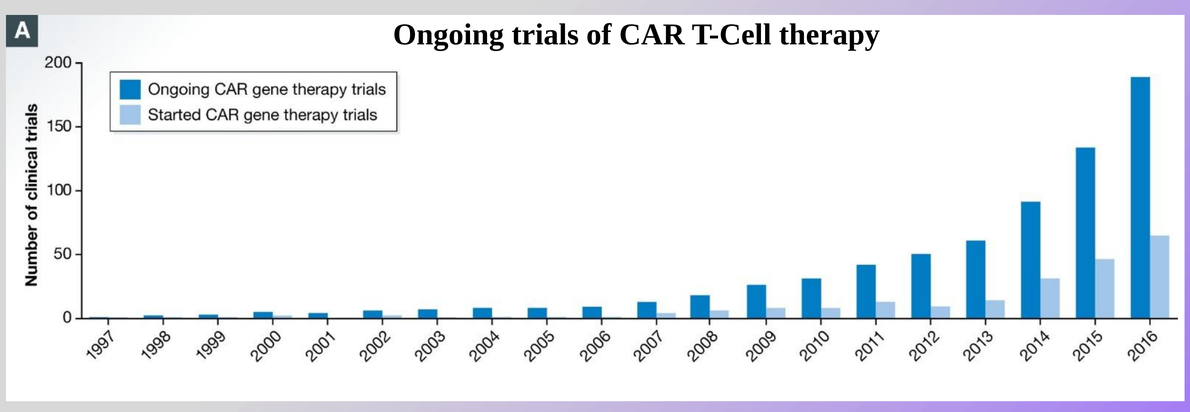


3. Exhaustion of the CAR-T Cell
Strategy: checkpoints inhibitors that will block the checkpoints that are made by the cancer cell allowing the engineered immune cell to pursue its function.



7 What gives it prevalence?

1.Does not require aggressive chemotherapy.
2.Short treatment time needed.
3. A living treatment that achieves remissions which last for years.



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