**Mechanism of CAR-T Cell Therapy**

- **Cancer Cell**
- **Antigen**
- **T cells** have protein receptors, that bind to protein fragments, known as **antigens**, on the surface of pathogenic, invading cells. If recognised by the **T cell** as abnormal, the **T cell** will secrete toxic chemicals that degrade the target cell.

- **CAR-T cell**
- **Mechanism**: CAR-T therapy has been developed as an immunotherapy approach, boosting the patient’s immune system to better kill the cancer cells.

**Recent Innovations in CAR-T Cell Therapy**

In recent years, CAR-T therapy has been promising in treating leukaemia, namely R/R B-ALL.

**In May 2022**, in a collaboration between GOSH for Children and UCL, a 13-year-old was the first person in the world to receive base-edited CAR-T cells for the treatment of resistant leukaemia.

She was diagnosed with T-ALL in 2021 and received a bone marrow transplant and chemotherapy, but the disease persisted.

Within 4 weeks of treatment, her leukaemia was undetectable.

**Benefits and Potential Side Effects**

1. **Targeted action**: the therapy specifically targets and kills cancerous cells, minimising damage to healthy cells.
2. **Personalised treatment**: CAR-T therapy is tailored to the individual, enhancing its effectiveness.
3. **Potential for long-term remission**: some patients achieve long-term remission, reducing the likelihood of relapse.
4. **Reduced need for conventional therapies**: such as chemotherapy and radiotherapy, improving patient’s quality of life.
5. **Symptoms of CRS like fever, chills, nausea, and difficulty breathing due to an allergic reaction to CAR-T cells.**
6. **CAR T-cells can cause neurotoxicity, leading to headaches, altered consciousness, confusion, speech changes, and seizures.**
7. **Rapid breakdown of cancer cells can elevate uric acid levels in the blood, potentially overloading the kidneys.**

**References**

3. Mayo Clinic. Exploring the Role of B-cell activating factor receptor (BAFFR)-based chimeric antigen receptor T cell (CAR-T) in BAFFR-expressing B-cell haematologic malignancies and autoimmune rheumatologic disorders. Available at: https://www.mayo.edu/research/clinical-trials/bis-20151300. Last accessed: 30 May 2024.

**Abbreviations:**

AML: acute myeloid leukaemia; B-ALL: B cell acute lymphoblastic leukaemia; BAFFR: B cell activating factor receptor; CAR: chimeric antigen receptor; CLL: chronic lymphocytic leukaemia; GOSH: Great Ormond Street Hospital; IC19/1563: a CD19-targeted CAR-T therapy for R/R B cell malignancies; R/R: relapsed/refractory; SJS: Stevens-Johnson syndrome; UCL: University College London; UCLH: UCLH Children’s Hospital; UCL: UCL; T cell acute lymphoblastic leukaemia; UCL: University College London.