MINISTRY OF EDUCATION
AND SCIENCE OF THE KYRGYZ REPUBLIC

Salymbekov University

INTERNATIONAL FACULTY OF MEDICINE

DEPARTMENT OF MORPHOPHYSIOLOGICAL DISCIPLINES

TOPIC:
Immunotherapy of Acute and Chronic leukemia

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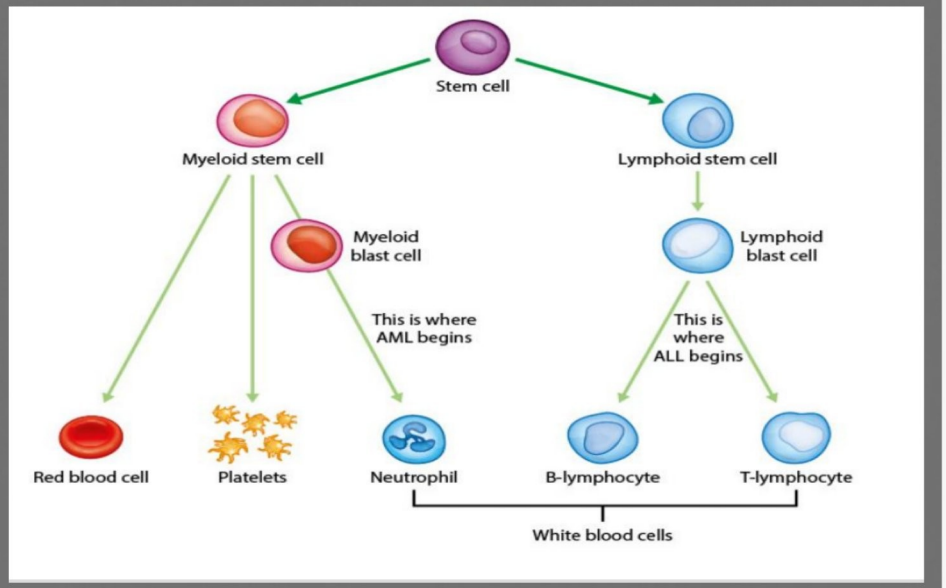
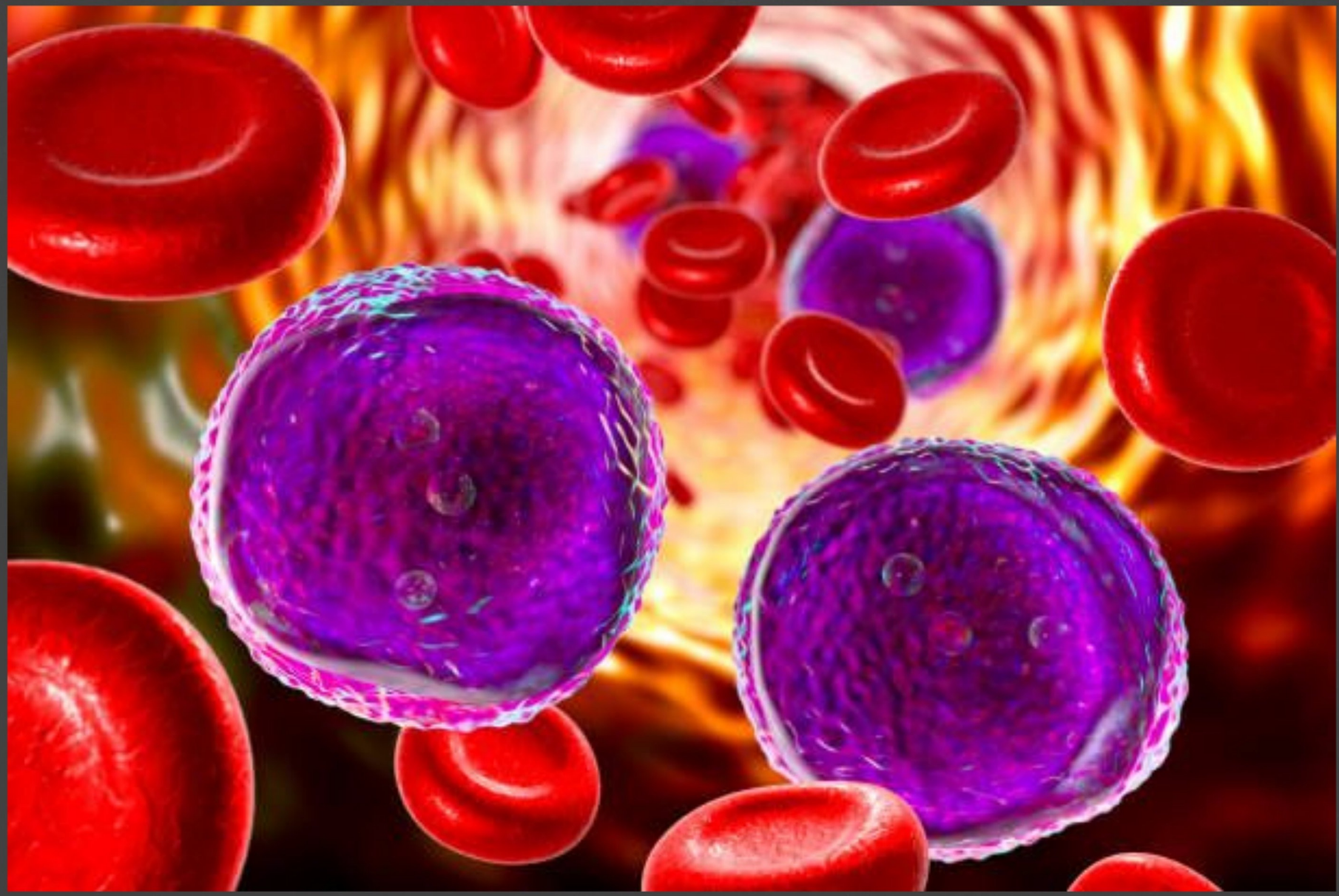
The main goal of the report –
to demonstrate the possibility **of Immunotherapy** as a treatment that uses **the patient's immune system to fight cancer**. Substances made by the body or made in a laboratory are used to boost, direct, or restore the body's natural defenses against cancer.

Immunotherapy of Acute and Chronic B-cells leukemia

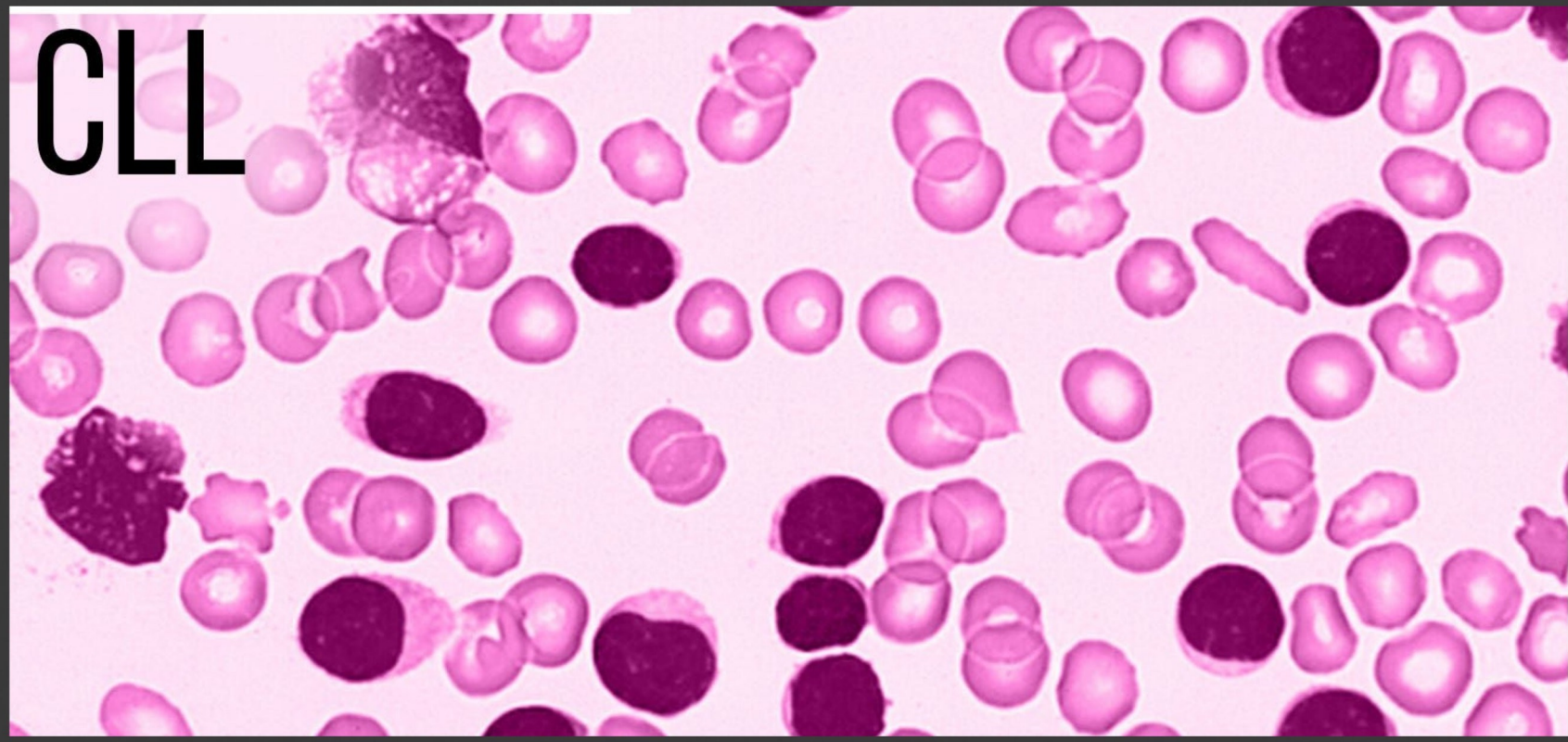
Acute lymphoblastic (B-cell) leukemia (ALL) is a cancer of the lymphoid line of blood cells characterized by the rapid proliferation of immature, poorly differentiated lymphoid progenitor cells inside the bone marrow. Is a disease found mainly in children and in young adults. ALL progresses rapidly and is typically fatal within weeks or months if left untreated.

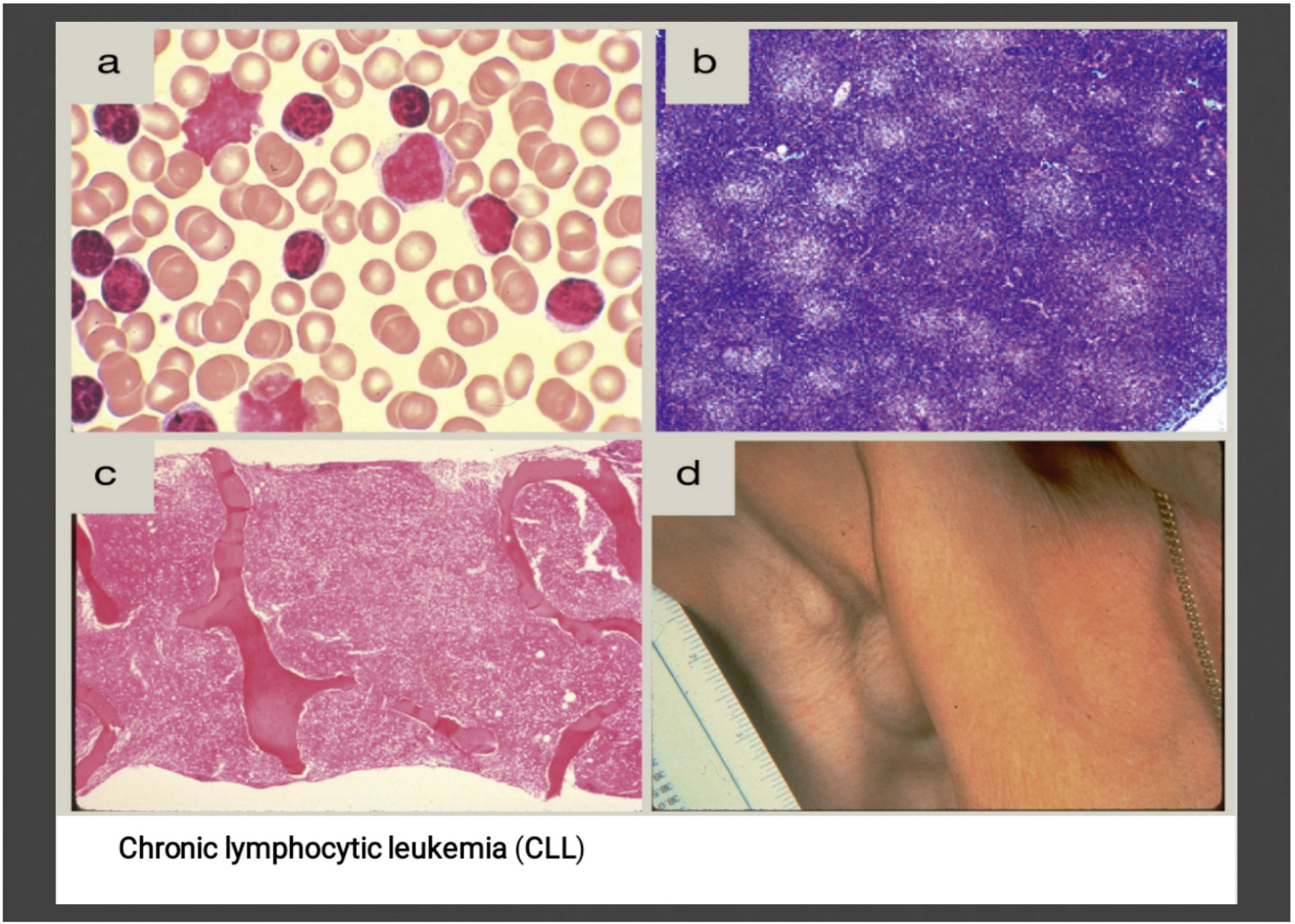


Lypmhoblastic leukemia photo



Chronic lymphocytic leukemia (CLL)
is a type of cancer in which the bone marrow makes too many lymphocytes (a type of white blood cell). Chronic lymphocytic leukemia most commonly affects older adults.

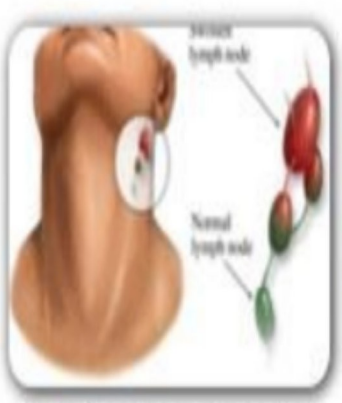




Chronic lymphocytic leukemia (CLL)

Common

Leukemia symptoms

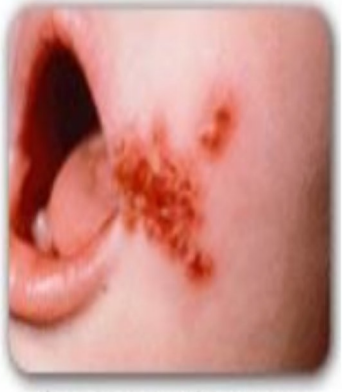


Swollen lymph nodes

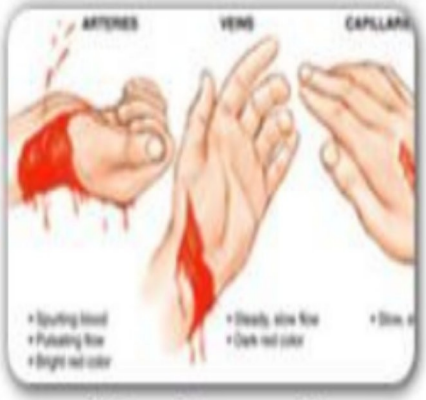
Fever

Night sweats

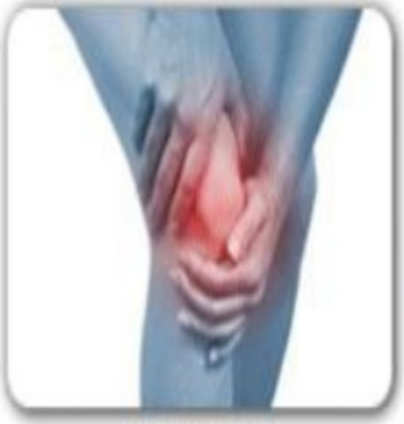
Nose bleeds



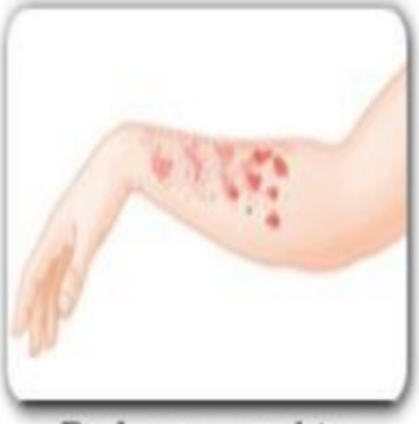
Severe infections



Bleeding easily



Bone pain



Red spots on skin

Weight loss

Principles of Treatment

The goal of treatment is complete remission without relapses.
1: The main treatment for B-cells leukemia is typically long-term chemotherapy (chemo).
2: An important part of treatment is central nervous system (CNS) prophylaxis – treatment that lowers the risk of the leukemia spreading to the area around the brain or spinal cord.
3: Radiation therapy,
4: Treatment typically takes place in 3 phases:
Induction (remission induction)
Consolidation (intensification)
Maintenance
The total treatment usually takes about 2 years, with the maintenance phase taking up most of this time. Treatment may be more or less intense, depending on the subtype of ALL and other prognostic factors.

If the leukemia is refractory – that is, if it doesn't go away with the first treatment (which happens in about 10% to 20% of patients) – then newer or more intensive doses of chemo drugs may be tried, although they are less likely to work.

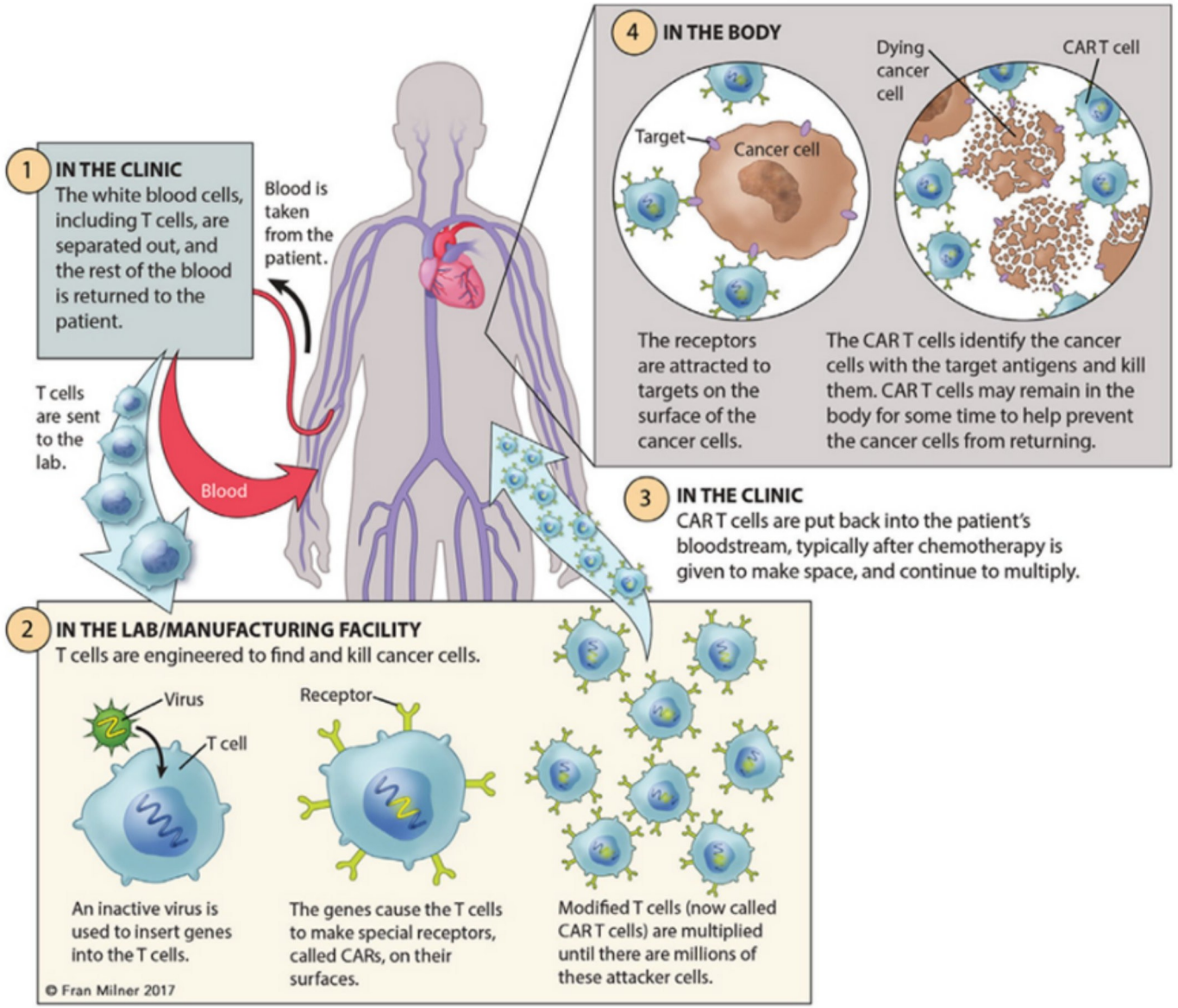
5. Immunotherapy (CAR T-cell therapy) may be an option for patients with B-cell ALL.

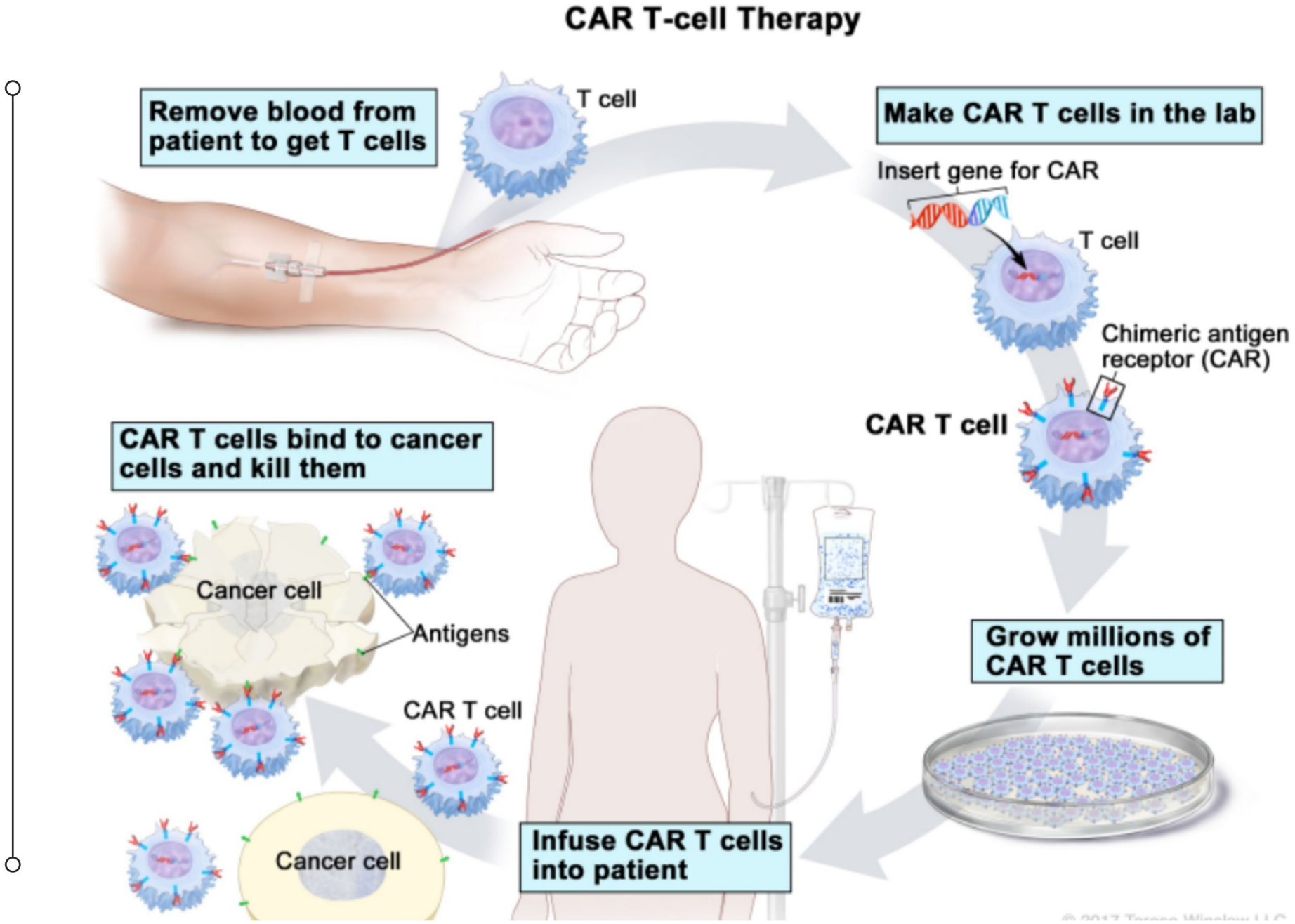
6. A stem cell transplant may be tried if the leukemia can be put into at least partial remission. Clinical trials of new treatment approaches may also be considered.

CAR T Cells

Chimeric antigen receptor T cells (also known as CAR T cells) are T cells that have been genetically engineered to produce an artificial T cell receptor for use in immunotherapy.
Chimeric antigen receptors (CARs, also known as chimeric immunoreceptors, chimeric T cell receptors or artificial T cell receptors) are receptor proteins that have been engineered
to give T cells the new ability to target a specific antigen – CD-19 on the surface of the leukemic B cells.
The receptors are chimeric because they combine both antigen-binding and T cell activating functions into a single receptor.

Autologous CAR T-Cell Therapy Process




CAR T-cell Therapy
Remove blood from patient to get T cells
T cell
Make CAR T cells in the lab
Insert gene for CAR
T cell
Chimeric antigen receptor (CAR)
CAR T cell
CAR T cells bind to cancer cells and kill them
Cancer cell
Antigens
CAR T cell
Cancer cell
Infuse CAR T cells into patient
Grow millions of CAR T cells

When the CAR-T cells recognize CD19 on the surface of cancer B-cells, they release cytokines, perforin, and granzymes, killing the cells much as a cytotoxic T cell recognizes and kills virus-infected cells. These “cell-based” therapies remain extremely expensive because they require manipulating each individual patient’s cells and then reinfusing them as an autologous transplant.

CAR-T cells can cause systemic inflammatory responses due to excessive cytokine release: Il-1, Il-2, Il-6, TNF-a, causing serious side effects, including dangerously high fevers and precipitous drops in blood pressure. In some cases, severe CRS can be fatal.

Interleukin 6 is a cytokine relevant to many inflammatory diseases and many cancers. There are two available drugs based on human monoclonal antibodies against IL-6 receptor, Tocilizumab and Sarilumab to stop cytokine storm. Because healthy B cells also have CD19, patients must take pooled intravenous immunoglobulin (IVIG) replacement to counteract the persistent B-cell deficiency that occurs.

Conclusion

The first commercial CAR-T cell therapy was approved by the US Food and Drug Administration for B-cell leukemia in 2017.

Clinical trials have shown very promising results in end-stage patients with a full recovery of up to 92% in Acute Lymphocytic Leukemia.

Despite such results in hematological cancers, the effective translation of CAR T-cell therapy to solid tumors and the corresponding clinical experience is limited due to therapeutic barriers, like CAR T-cell expansion, persistence, trafficking, and fate within tumors.

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:> Have a nice Day ❤