Document 6

Specific Cell-Mediated Immune Response

***Specific Cell-Mediated I.R:**

- **Effector cells:** TC (activated by IL2 secreted by TH)

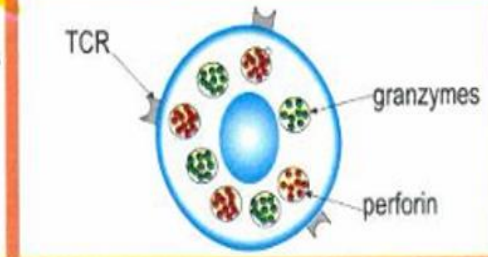
-**Target cells:** infected body cells, modified self-cells (cancer) and rejected graft cells.

- **Killing mechanism:** cytotoxicity or cell lysis.

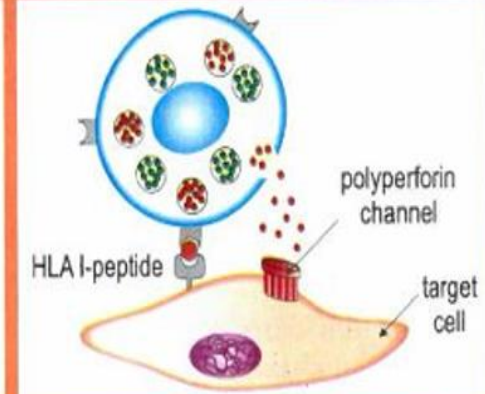
I. Elimination of Infected Host Cells:

Doc.a shows the mechanism of cytotoxicity of Tc lymphocytes.

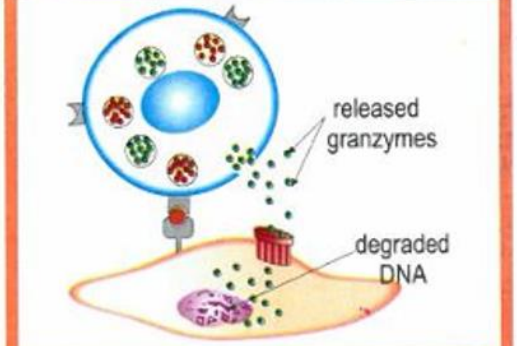
1- The T_C cell has cytoplasmic granules which contain toxic substances called cytotoxins, able to kill infected cells. There are two types of cytotoxins: perforin and granzymes.



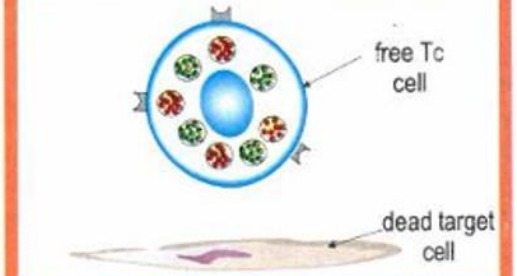
2- When a T_C cell recognizes an infected body cell and binds to the HLA I-peptide complex on the target cell membrane through its TCR, it releases its perforin content. Perforin assembles into polymers that form a hollow channel through the target cell membrane.



3- The Tc also release granzymes that penetrate into the target cell through the polyperforin channels. Granzymes trigger an enzymatic chain reaction within the cell, leading to DNA degradation: this causes cell death.



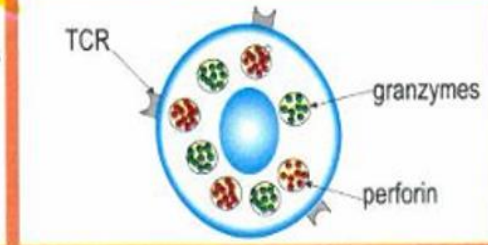
4- The Tc cell detaches from the killed target and recirculates. It is again ready to kill other targets carrying the same HLA I-peptide complex .



Doc.a *Mechanism of cytotoxicity of Tc lymphocytes.*

- Explain (describe) the mechanism of action of TC. Study Doc.a, p.148.

1- The T_C cell has cytoplasmic granules which contain toxic substances called cytotoxins, able to kill infected cells. There are two types of cytotoxins: perforin and granzymes.



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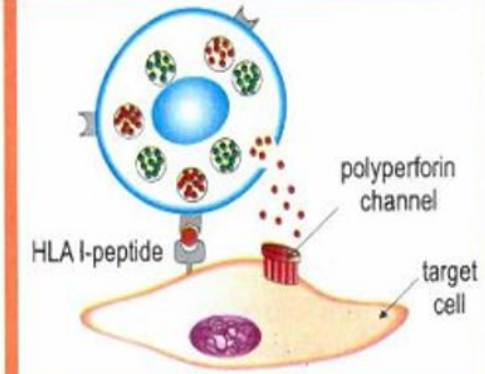

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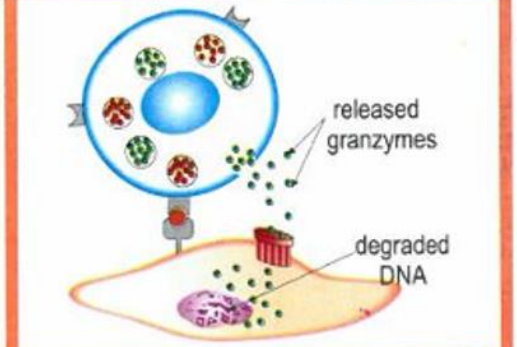

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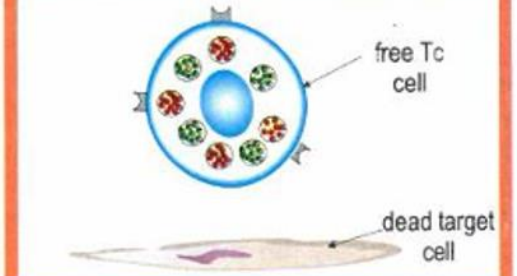


Doc.a *Mechanism of cytotoxicity of Tc lymphocytes.*

II. Cancer and Immunity:

-Tumor: increase in cell mass, due to uncontrolled mitosis. The tumor could be benign (harmless) or malignant (cancerous).

- There are many factors that lead to cancer: smoking, drugs, chemicals…

- Cancer results from a mutation in certain genes (oncogenes) that control cell division, which leads to the production of a modified self-protein carried on self HLA I. These cancer cells are "modified self-cells" characterized by uncontrolled division and they are attacked by TC cells.

* Treatment Methods of Cancer:

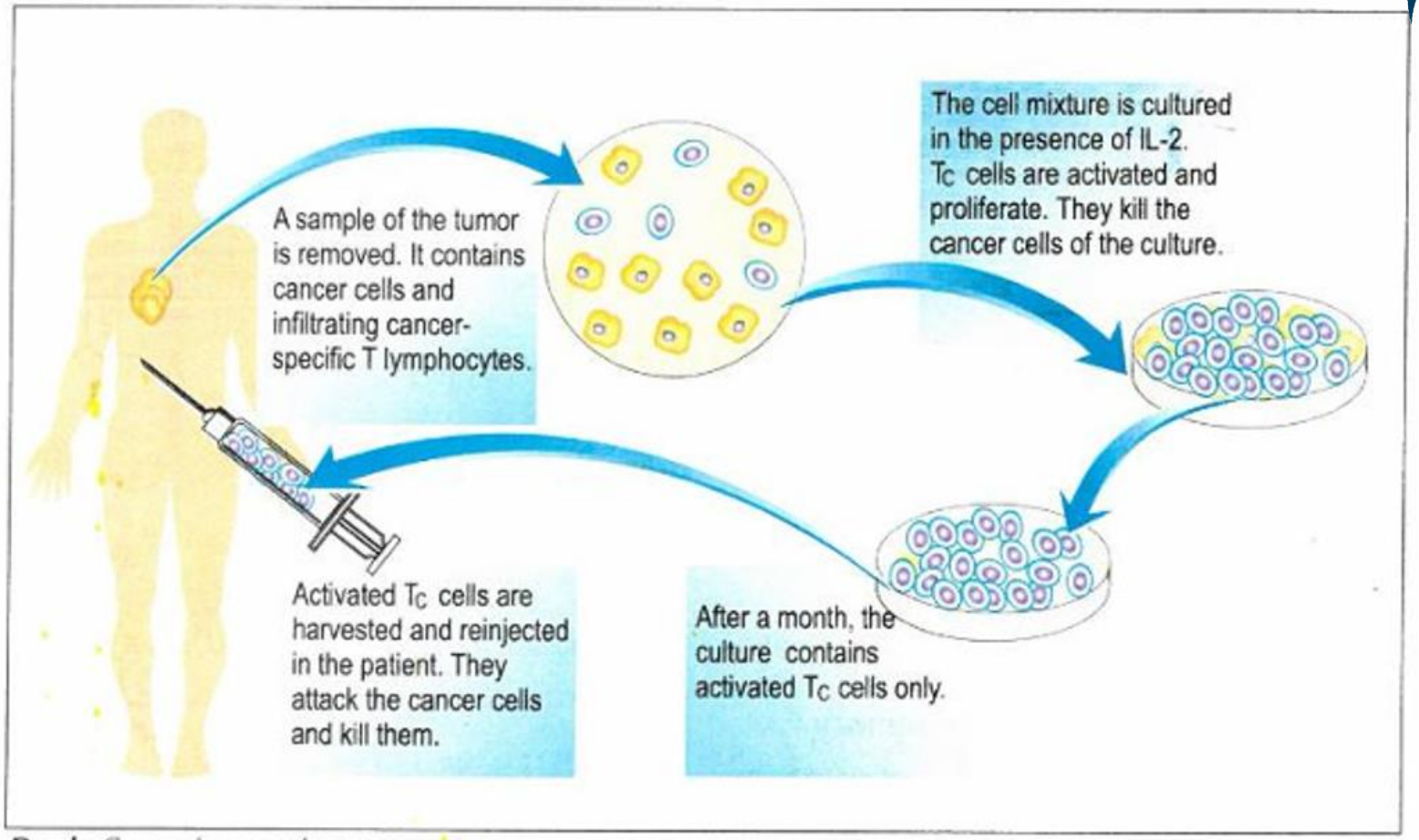
1- Surgical procedure: by removing of altered cancer cells

2- Radiotherapy: use radiations to kill cancer cells, it may destroy normal cells.

3- Chemotherapy: use of chemicals that block mitosis (anti-mitotic drugs) of cancer cells. It may destroy normal cells.

4- Immunotherapy: only target cancer cells.

- **Document b shows cancer immunotherapy.**



Doc.b *Cancer immunotherapy.*

Probing the documents

1. What is the role of each of the following: perforin and granzyme?
2. Why is DNA degradation considered a mechanism of cellular cytotoxicity?
3. Pick up the meaning of "modified cell" (paragraph 2) and indicate at which cellular level it is identified.
4. Why does the immune system fail in the case of cancer?
5. Find out the mode of action of radiotherapy and that of chemotherapy in the elimination of cancerous cells? Why do we consider immunotherapy as the best choice?

2- DNA contains gene responsible for the survival of the cell, so its degradation leads to the death of the cell.

4- Cancer cells have a high rate of proliferation with uncontrolled mitosis, so they overwhelm the immune system.