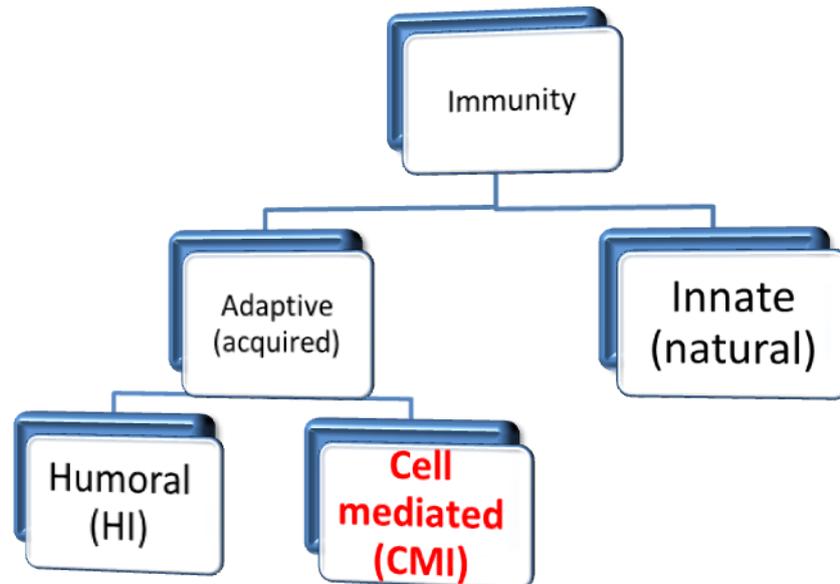


IMMUNOLOGY



These Notes are what u should added to your slides ,,

Immune Team wish u the best ☺



\*If our body gets infected by an extracellular microbe ( **extracellular antigen** ) the **B lymphocytes** will be responsible for the immune response by producing **antibodies** ( **Humoral immunity** )

\*If our body is infected by an **intracellular antigen** the antibodies will not be able to enter the cell. Then, **T lymphocytes** will be responsible for the Immune response ( **cell mediated immunity** = cellular response ).

\*T & B lymphocytes only respond to foreign antigens presented by antigen presenting cells (APC).

APC's phagocytose microbes, process them and take the antigen part of them. Then, APC's present it to T&B lymphocytes along with MHC protein.

\*\*T and B lymphocytes cannot be activated ( to perform an immune response ) except if the antigen was attached to MHC protein.

\***MHC protein** is synthesized by the endoplasmic reticulum.

\* MHC 2 is present only on immune cells (APC's & T lymphocytes), while MHC 1 is present on all body cells containing nuclei.

## Antigen Presenting Cells:

أنواعها وأماكن توأجدها في السلايدز

\* B lymphocytes can act as an antigen presenting cell, when the antigen is soluble .

(For example, toxins are soluble antigens).

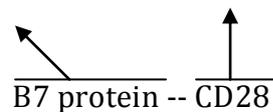
\* When T cells are activated they produce cytokines that activate [NK cells, Macrophages, Granulocytes → and this is called cell mediated immunity], then the activated cells will act on the antigen.

Two signals are required to activate T cells:

1-First signal: (MHC protein + Antigen -- TCR)



2-Second signal:



Second signal is also called Co- stimulatory signal.

\*\* **B7 protein** synthesis is induced by bacterial protein (antigens) not self protein and that prevents auto-immune diseases.

IL-2 & Gamma Interferon (IF $\gamma$ ) are cytokines:

- **IL-2**: activates other T lymphocytes (CD4 & CD8)

- **IF $\gamma$** : activates macrophages and other APC's.

\*\* **Immunosuppressant drugs** (which make the immunity weaker) inhibit the production of IL-2 . For example, patients that had a kidney transplant ( allograft ) must take those drugs, This will stop IL-2 from activating cytotoxic T cells which attack allograft tissue. Otherwise, the body will reject the new kidney.

Cytotoxic T lymphocytes kill virus infected cells, tumor cells and allograft.

The mechanism of activation is similar to T helper activation mechanism except:

# T helper contact with APC (MHC 2) while T cytotoxic contact with MHC 1 in the target cell directly

**\*\* " Rule of 8" :**

CD8 contact with MHC I  $\rightarrow 1 \times 8 = 8$

CD4 contact with MHC II  $\rightarrow 2 \times 4 = 8$

Mechanisms of killing by Cytotoxic cells :

1) T cell secrete **Perforins** to **make holes** on the target cell surface followed by secretion of **Granenzymes** that come and **degrade** the nucleus.

2) Fas-Fas Ligand interaction  $\rightarrow$  Apoptosis of target cell.

3) Antibody dependant cellular cytotoxicity, important in parasitic infections.

$\rightarrow$  Antibody recognizes the parasite and sticks on its surface and then cytotoxic cells recognize the antibodies and stick to them and secrete lysis substances (Antibodies act as bridges)

4) Immune Surveillance is the killing of tumor cells  $\rightarrow$  macrophages and NK cells are responsible for that.

5) Allograft rejection.

**MCQs /**

**CD4 ( T helper ) is attracted to MHC II**

**CD8 ( T cytotoxic ) is attracted to MHC I**

**Antigen Presenting cells that has MHC II ? Do u remember it ?**

**Antigen presenting cells**

**Monocytes/Macrophages**

**Dendritic cells**

**Langerhans cells**

**B-cells**

**CD8+ cytotoxic T lymphocytes (CTLs) that kill virus-infected and tumor cells**

**CD4+ helper T cells enhance CMI and production of antibodies by B cells**

**The activation of T cell in general by interaction between MHC – antigen complex and T cell receptor is called MHC restriction**

**Second signal (Co - stimulatory signal)**

**Interaction between B7 on APC with CD28 on T lymphocyte**

**Production of co-stimulatory protein depends on activation of the toll like receptor on antigen presenting cell**

**IL-2 is also know as T cell growth factor.**

- Delayed type of hypersensitivity mediated by Th-1 type of **CD4 positive cells** .

- Cytotoxicity: mediated by **CD8 +ve cells**

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**Fas-Fas Ligand interaction - apoptosis**