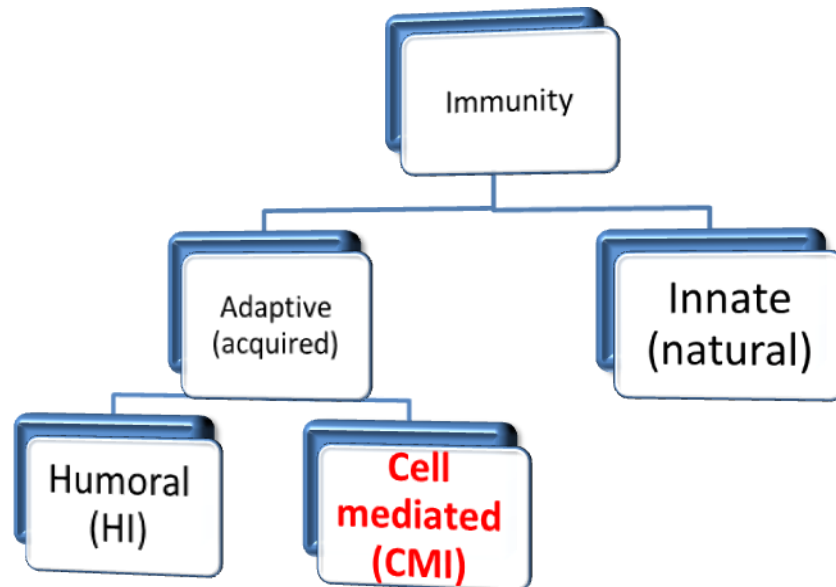


These Notes are what u should added to your slides ,,

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:

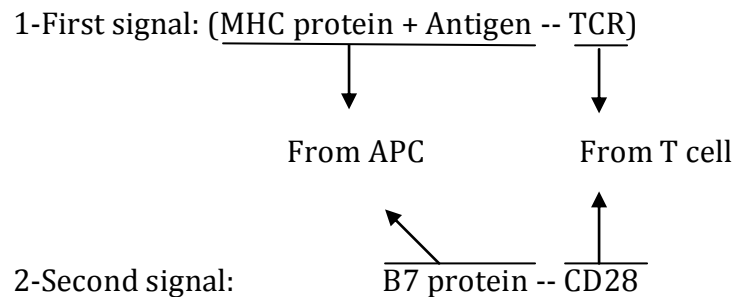
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* B lymphocytes can act as an antigen presenting cell, when the antigen is soluble .

(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:



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 γ) are cytokines:

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

Fas-Fas Ligand interaction - apoptosis