



These Notes are what u should added to your slides ,,
Immune Team wish u the best J

Lymphoid System (T & B Cell Development)

The lymphocytes origins (the primary organs):

Are responsible for maturation and organization of the lymphocytes

in the embryo → yolk sac

in the fetus → liver

After birth

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graph LR; A[After birth] --> B[thymus]; A --> C[bone marrow];
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After birth , the bone marrow will take over the function of the liver and the yolk sac will disappear .

Secondary lymphoid organs: -

where the immune response takes place, and store the mature T & B cells which are ready to work, e.g. (spleen, lungs, ...)

**Lymphocytes are big cells with big nucleus and little cytoplasm.

When the lymphocytes come out the bone marrow, some of them will pass through the *thymus* and are programmed to be *T lymphocytes* and some of them will re-enter the *bone marrow* and re-circulate to be *B lymphocytes*.

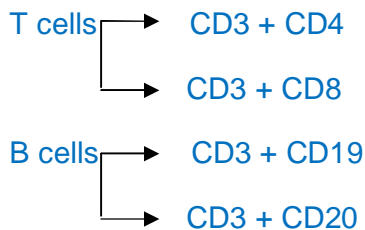
T & B lymphocytes circulate continuously between blood, lymph, and lymph nodes until they are activated.

T & B cells have specific areas in lymph nodes and the spleen, *T cells* are mostly found in the *Para Cortical region*. Whereas, *B cells* are found in the *outer part (general center)*.

The T cells "originated in the bone marrow": first aggregate in the cortex of the thymus and are immature at that time. Then, they go to the medulla of the thymus to become mature and from there they leave to the bloodstream.

Clusters of differentiation (CD) are Glycoproteins each one has a special function and are given numbers (CD1, CD2 , CD3 ,)

Both T & B lymphocytes have **CD3** , however **T lymphocytes** have got an extra marker either **CD4 or CD8** . **B lymphocytes** have a **CD3** either **CD19 or CD20**.

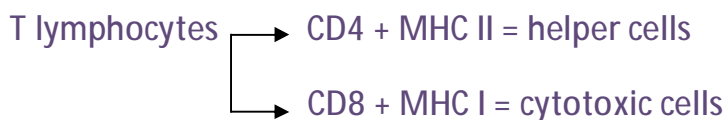


When the lymphocytes first enter the thymus gland, they have **no markers** so they are called **double negative**. After they enter the cortex of the thymus they acquire **both markers** so they are called **double positive**. Then, the T cells lose one of the markers in the medulla.

MHC is an important protein that functions as tissue antigens.

There are two types of MHC , MHC I and MHC II .

The importance of MHC is that it is responsible for our immune responses.



If the cell **attaches very firmly** with MHC molecule they will not be allowed to pass into the blood stream because they cause Auto-Immune diseases , they will be killed in the thymus gland and then cleared by **macrophages** , this is called **negative selection**.

Only cells that are **attached weakly** to MHC are allowed to pass into the blood stream, this called **positive selection**.

- In the thymus, MHC is going to teach T cells to:

- 1)** Recognize body cells from foreign bodies.
- 2)** Kill foreign bodies and body cells if they look abnormal (immune response).

Each single cell has a receptor for one single microbe, but if the microbe is not recognized by the receptors on our cells, then we will not have an immune response.

- CD8 positive (cytotoxic): cells kill virus infected cells, tumor cells and allograft (tissue transplanted from one human to another).

- CD4 (T helper): Binds to antigen from B cells that results in development of plasma cells secreting antibodies against the antigenic material.

Perforins are chemical substances that make holes in the attacked cell.

Maturation of B cells :

They don't require thymus to mature.

1- Antigen Independent:

- a- stem cells
- b- pre-B cells
- c- B cells

2- Antigen dependent.

On the surface it has **IgM** (immunoglobulin M) and **IgD** and it is going to work like an **antigen receptor**.

The thymus gland is a very big gland at birth , it decreases in size by age . In adults it is a very tiny tissue.

- The difference between B lymphocytes and plasma cells:

The antibodies B lymphocytes will produce will be on their surfaces, Plasma cells will send their antibodies to the circulation.

- Once the lymphocyte recognize a specific pathogen or foreign body and be activated it will be special for that pathogen for the rest of its life. For example, if a lymphocyte came across mycobacterium tuberculosis and was activated to kill it, it will never fight another pathogen except TB for the rest of its life.

MCQ:

Thymic Education J

What is negative selection ?

What are the function of T helper lymphocyte ?

Interferon gamma ? -----
امر معكم صح تتذكروا وين بالمحاضرة J

Clonal selection ?

كل شيء في الحياة يستحق الحصول عليه يستحق العمل من أجله .

النجاح غالبا يأتي للذين يجرأون بالقيام بالأعمال . ونادرا ما يأتي للخجولين الذين يخافون من النتائج.

يهرب امرئنا اثنان العمل