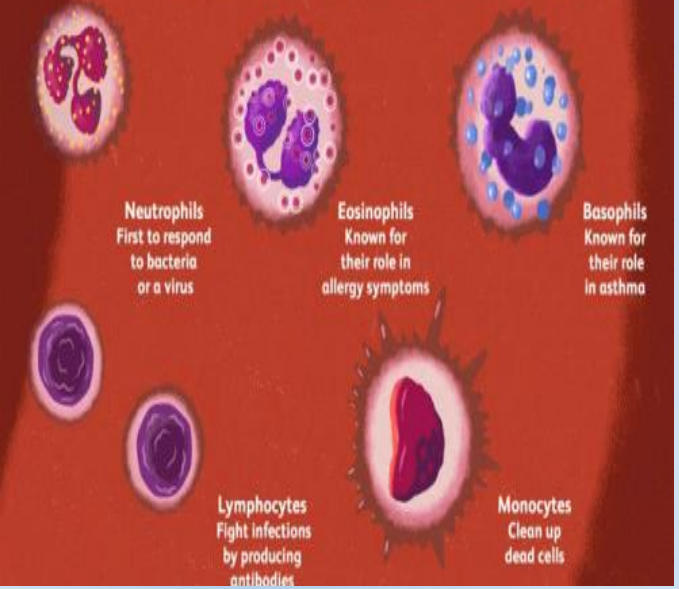
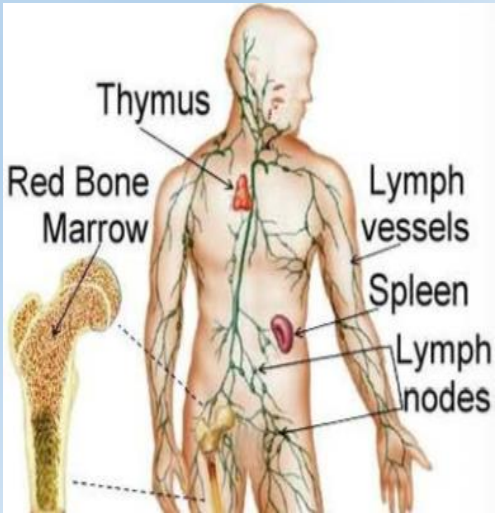


Biology Grade 8

Chapter 1: The Immune Response

Activity 2: Cells, Molecules and Organs of the Immune System



Instructor: Suhaib Audi

Activity 2: Cells, Molecules and Organs of the Immune System

Cells involved in immunity are **leukocytes (white blood cells)**.

There are 2 major types of leukocytes.

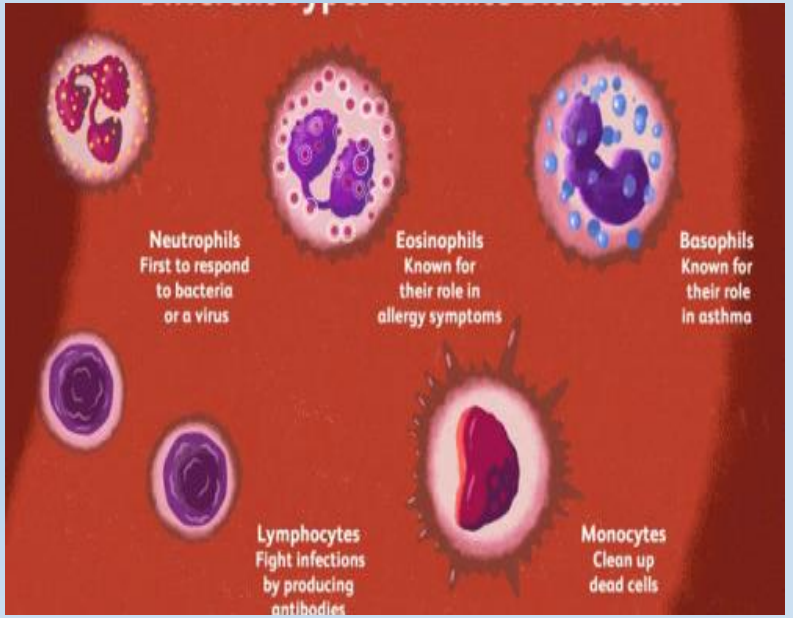
1. Phagocytes include the monocytes and the granulocytes.

2. Lymphocytes include the B- lymphocytes and T- lymphocytes

1) The phagocytes:

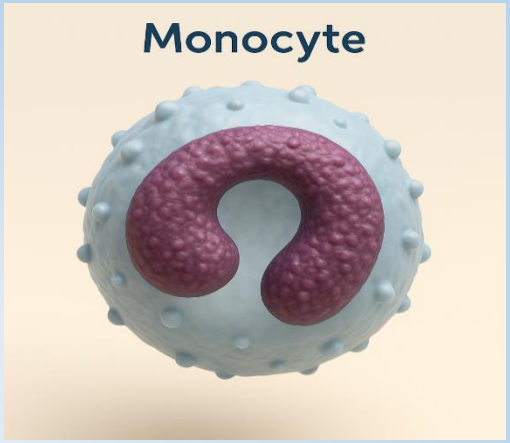
Phagocytes are specialized white blood cells that engulf and destroy pathogens, dead cells, and foreign particles.

They play a crucial role in the **non-specific immune response** which **fight any antigen regardless of its identity**, acting as the body's first response against infections.



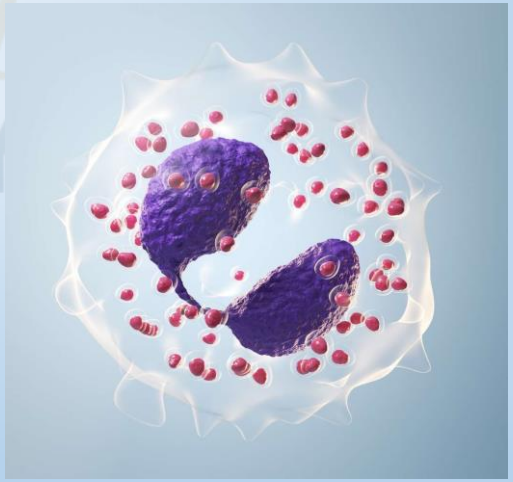
➢ The Monocyte

- Nonspecific immune cell.
- The monocytes have horse shoe shaped nucleus.
- they are able to cross capillary wall.
- They become macrophages in the tissue.
- They have phagocytic ability (ability to eat the antigen).



➢ The Granulocyte

- Nonspecific immune cell.
- They have multi-lobed nucleus.
- they are able to cross capillary wall.
- They have phagocytic ability (ability to eat the antigen).



2- The Lymphocytes

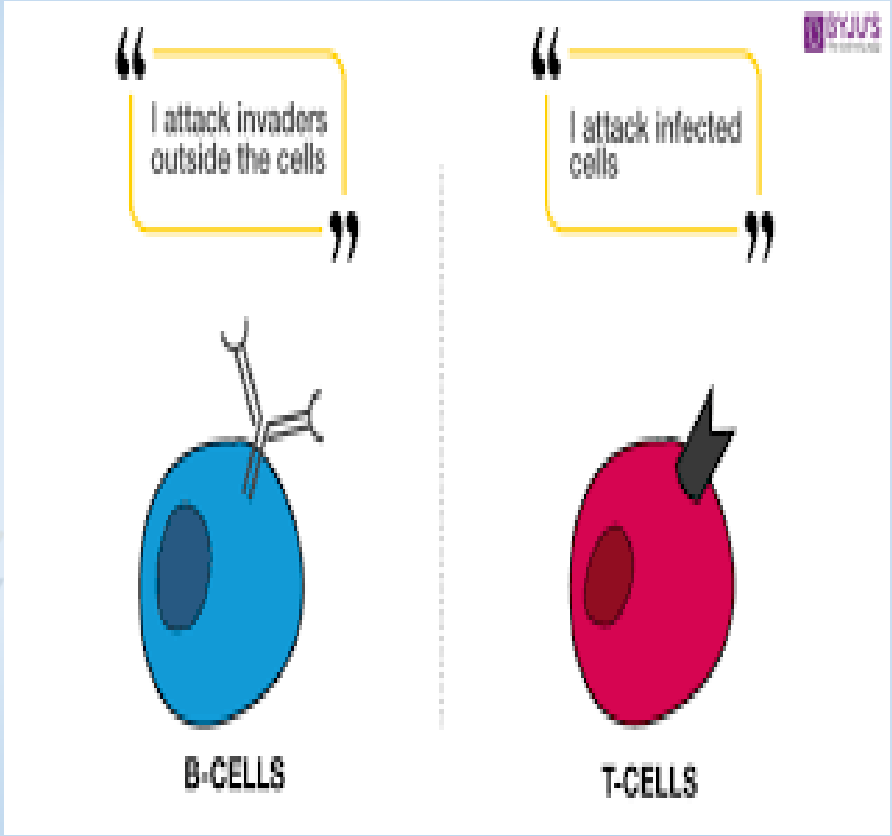
They are specific leukocytes which fight **specific** types of antigen.

➢ B- lymphocyte

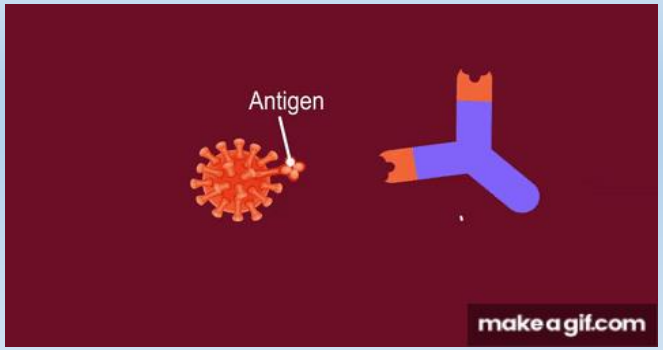
- Specific immune cell.
- They have a round shaped nucleus.
- They secrete antibodies in plasma.

➢ T- lymphocyte

- Specific immune cell.
- They have a round shaped nucleus.
- They are killer cell.



❖ Molecules of the immune system

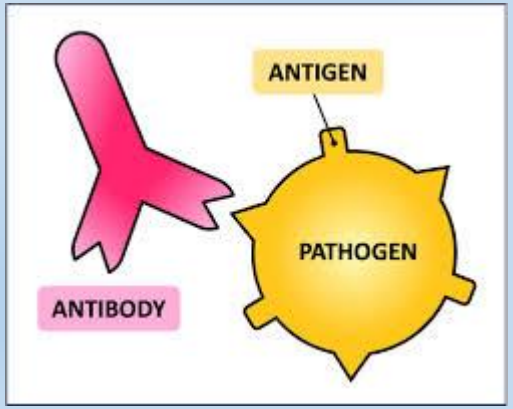


✓ Antibodies

- Antibodies are protein.
- They have Y- shape.
- They produced by **B-lymphocytes**.
- Antibodies are **specific**, they are only able to bind to a particular type of antigen.
- Antibody binds antigen in an interlocking manner (resembling puzzle).
- An antibody can recognize **only** one type of antigen that have the same spatial configuration.

✓ Antigen

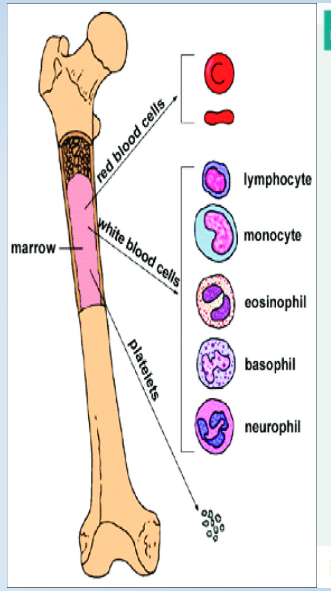
- a substance that is recognized by the immune system to be a **foreign body**.
- There are 2 types of antigens:
- **Cellular antigen**: which is found on the membrane of a cell such as virus.
- **Soluble antigen**: which is found dissolved in the blood such as toxin or allergens.



❖ Organs of the immune system

The organs of the immune system are called lymphoid organs they are divided into two types:

- ❑ **The primary lymphoid organs** which are the bone marrow and the thymus.



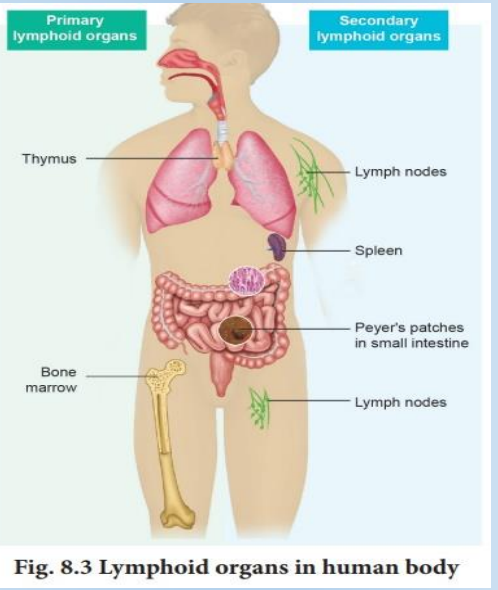


Fig. 8.3 Lymphoid organs in human body

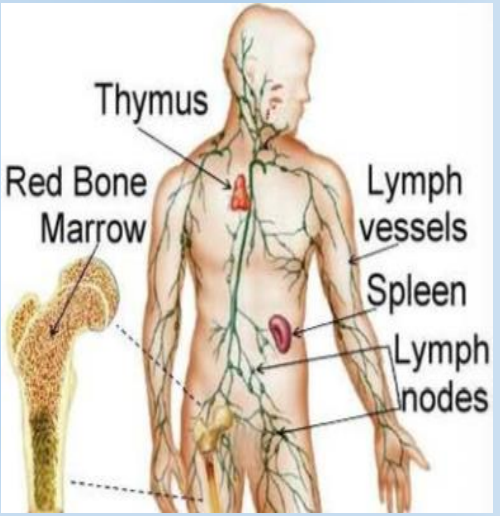
✓ The Bone marrow

- It is the site of a production of **all** leukocytes.
- It is the site of maturation of all leukocytes **except** T-lymphocytes.

✓ The thymus

It is a site of maturation of the T- lymphocytes.

- ❑ **The secondary lymphoid organs** which are the spleen, lymph nodes and lymphatic vessels (lymphatic network).



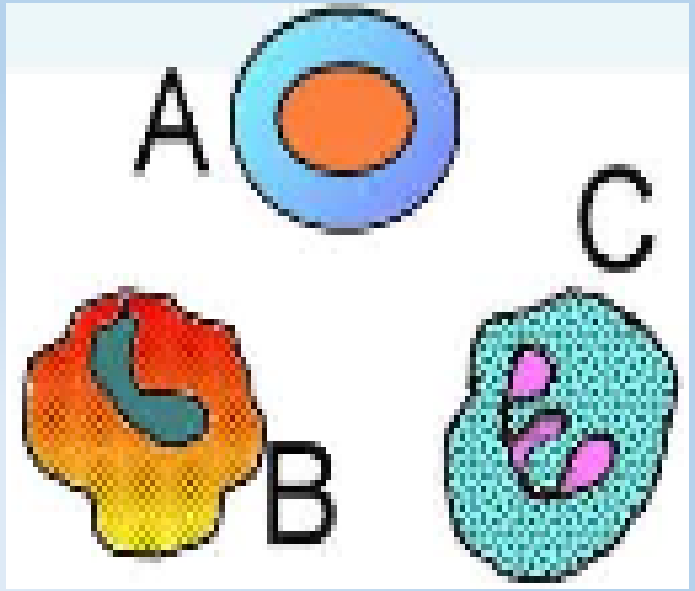
Note: lymphatic vessels are vessels that contain a liquid called lymph and allow the circulation of matured Leukocytes.

- ○ **Circulation of the Leukocytes**

Mature Leukocytes circulate constantly between the lymph nodes and the spleen through blood vessels and lymphatic vessels.

Exercise 1:

The adjacent document shows many kinds of immune cells.



a- These three cells belong to the same type of cells. Indicate it.

White blood cells.

b- Pick out the shape of the nucleus of each cell A, B and C.

(A) has round shaped nucleus.

(B) has horseshoe shaped nucleus.

(C) has a multi-lobed shaped nucleus.

c- Name each cell, and then indicate the role of each one.

(A) is lymphocyte it identifies and destroy invading antigen by killer kiss (T- lym) or antibodies (B- lym). (B) is monocyte , (C) is granulocyte both they eat and breakdown the bacteria.

d-Indicate the cell (s). that can cross the blood capillary.

Monocyte and granulocyte.

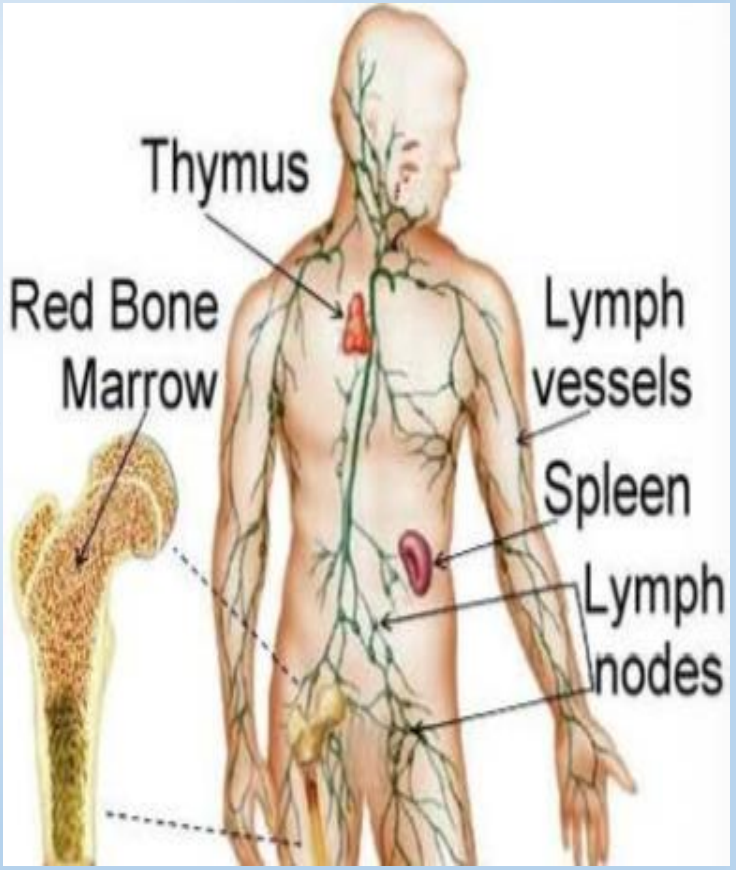
e-Knowing that A is T cell, compare the site of production and maturation of these different cells.

All cells are produced in the bone marrow. On the other hand, macrophages, granulocytes are matured in the bone marrow while T- lymphocytes are matured in the thymus.

Exercise 2:

Thanks God! We all have these different types of leukocytes that are sufficient to protect us against all types of invasions, but we are still wondering about the place they are produced, matured (trained), and the place they circulate (swim searching for bacteria). For this reason, the scientists applied these experiments:

Exp	Variable	Result
1	----------	B lymphocyte, T lymphocyte, Macrophage & Granulocyte were produced & matured.
2	Destruction of red bone marrow	All leukocytes were absent.
3	Ablation of kidney	B, T, M &G were produced & matured.
4	Ablation of thymus	B, T, M, & G were produced & matured except T was not matured.
5	Ablation of spleen	All leukocytes were produced & matured, but could not circulate & search for the bacteria.
6	Blocking the way of leukocytes into lymph vessels & nodes.	



1. Pose the problem.

Where are the immune cells produced, matured and circulate?

2. Analyze the 2nd experiment.

All leukocytes were absent when the red bone marrow was destructed.

3. Derive a conclusion.

The red bone marrow is responsible for the production of all leukocytes.

4. Determine if the kidney is involved in the production or maturation of the leukocytes.

Since the ablation of the kidney (exp.3) didn't cause any change in the production and maturation of the leukocytes. **so it is not involved in process of production and maturation.**

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6	Blocking the way of leukocytes into lymph vessels & nodes.	

5. Interpret the fourth experiment.

B, T, M and G were produced and matured except T was immature after ablating the thymus.

This indicates that the thymus is site of maturation of T-lymphocytes.

6. Identify the place of circulation of all leukocytes.

Since the ablation of spleen in exp.5 or blocking the way of leukocytes into lymphatic vessels and nodes in exp.6, prevents all leukocytes from circulating and searching for bacteria.

Then spleen, lymph vessels and nodes are places of circulation of all leukocytes.

Exp	Variable	Result
1	----------	B lymphocyte, T lymphocyte, Macrophage & Granulocyte were produced & matured.
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