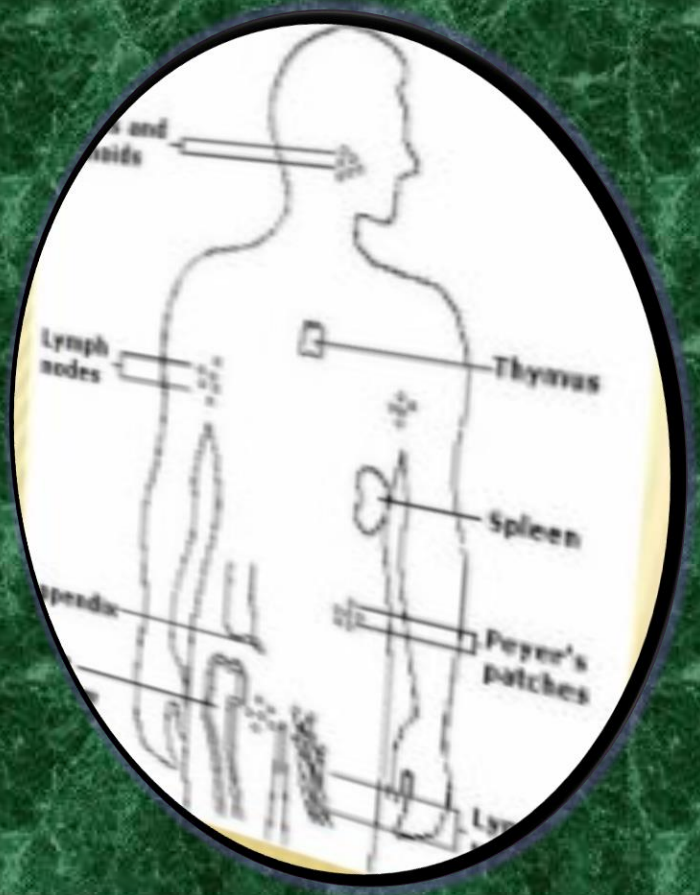
LYMPHOID ORGANS



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LYMPHOID ORGANS

The organs concerned with the production of immune cells and immune reactions are called lymphoid organs.

The lymphoid organs are the production and training centre of the army of lymphocytes.

The lymphoid organs are of two types. They are :

1.The primary lymphoid organs

2. The secondary lymphoid organs

PRIMARY LYMPHOID ORGANS

primary lymphoid organs are the major sites of lymphopoiesis . Primary lymphoid organs are the production centres and army head quarters of the immune system. They are large at birth and they atrophy with age. The mature lymphocytes of the primary lymphoid organs migrate through the blood or lymph and accumulate in the secondary lymphoid organs.

The following are the primary lymphoid organs:

1. Thymus
2. Bone marrow
3. Bursa of fabricious in birds

THYMUS

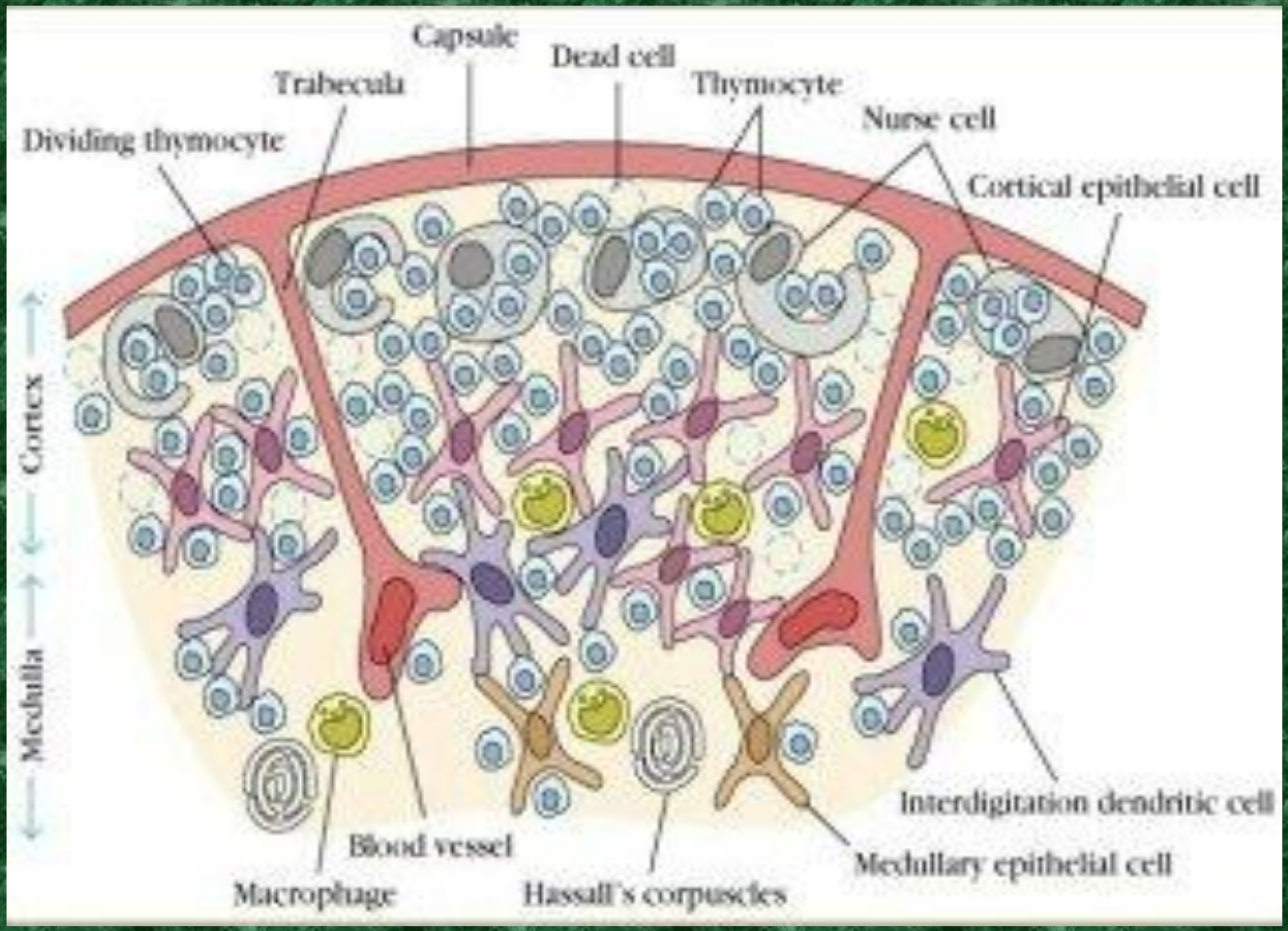
- Thymus is a primary lymphoid organ.
- Thymus is the training centre for the army of T lymphocytes.
- It resembles a thyme leaf and hence the name.
- It is a derivative of pharynx.
- It develope from the epithelium of the 3rd and 4th pharyngeal pouches.
- It beings its development on the 6th week of gestation.
- At the time of birth ,its weight about 15 to 20 gms and it increases in size after birth. It reaches about 40 gms in weight by puberty and thereafter it slowly atrophies. In the adult , it is really very hard to distinguish it from the fat in which it is normally embedded.
- It has two lobes.
- It is covered by a capsule.

Each lobe consists of many lobules seperated by septa.

Each lobe has an outer cortex and inner medulla.

Thymus is responsible for

- T cell maturation
- cell mediated immunity.
- Graft rejection.

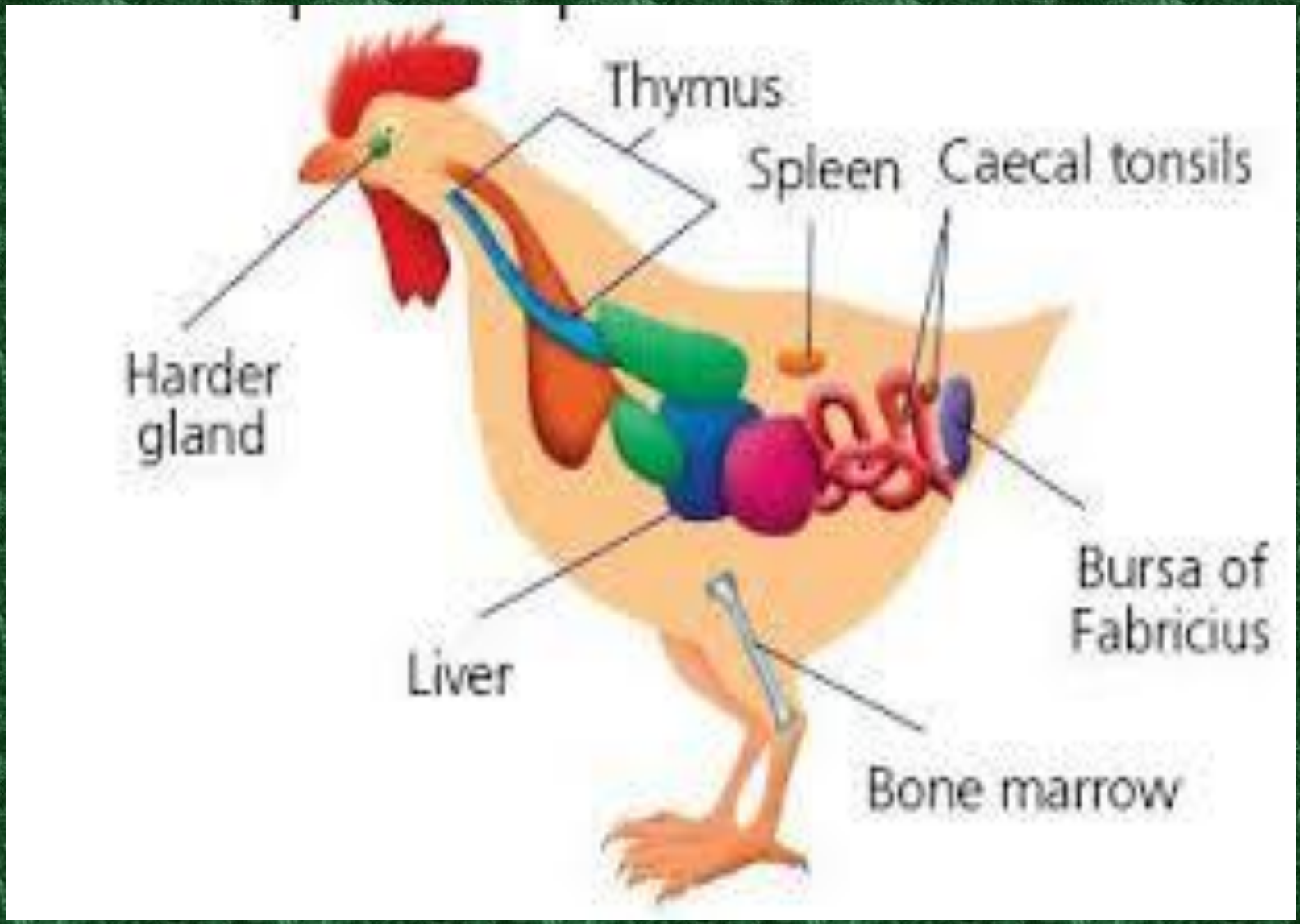

Capsule
Dead cell
Trabecula
Thymocyte
Dividing thymocyte
Nurse cell
Cortical epithelial cell
Cortex
Medulla
Interdigitation dendritic cell
Blood vessel
Medullary epithelial cell
Macrophage
Hassall's corpuscles

BURSA OF FABRICIOUS

- It is a primary lymphoid organ in birds.
- It is the training centre for the army of B lymphocytes.
- In birds B cell develop from the stem cell present in the yolk sac,liver and bone marrow. Then the primordial B cells migrate to the bursa and mature in to B cells.
- It is a sac-like lymphoepithelial structure attached to the cloaca.
- It is formed of many lobes called follicles.
- Each follicle has an outer cortex and an inner medulla.

Bursa is responsible for

- Maturation of B lymphocytes.
- Humoral immunity.


Thymus
Spleen
Caecal tonsils
Harder gland
Bursa of Fabricius
Liver
Bone marrow

BONE MARROW

Bone marrow is a primary lymphoid organ. It is a soft tissue located within the cavities of bones.
It is the production centre for the army of all lymphocytes and is the training centre for B lymphocytes.
It has a total weight of about 3 kg in an average human adult.
Bone marrow is a key component of lymphatic system producing lymphocytes that support the body's immune system.

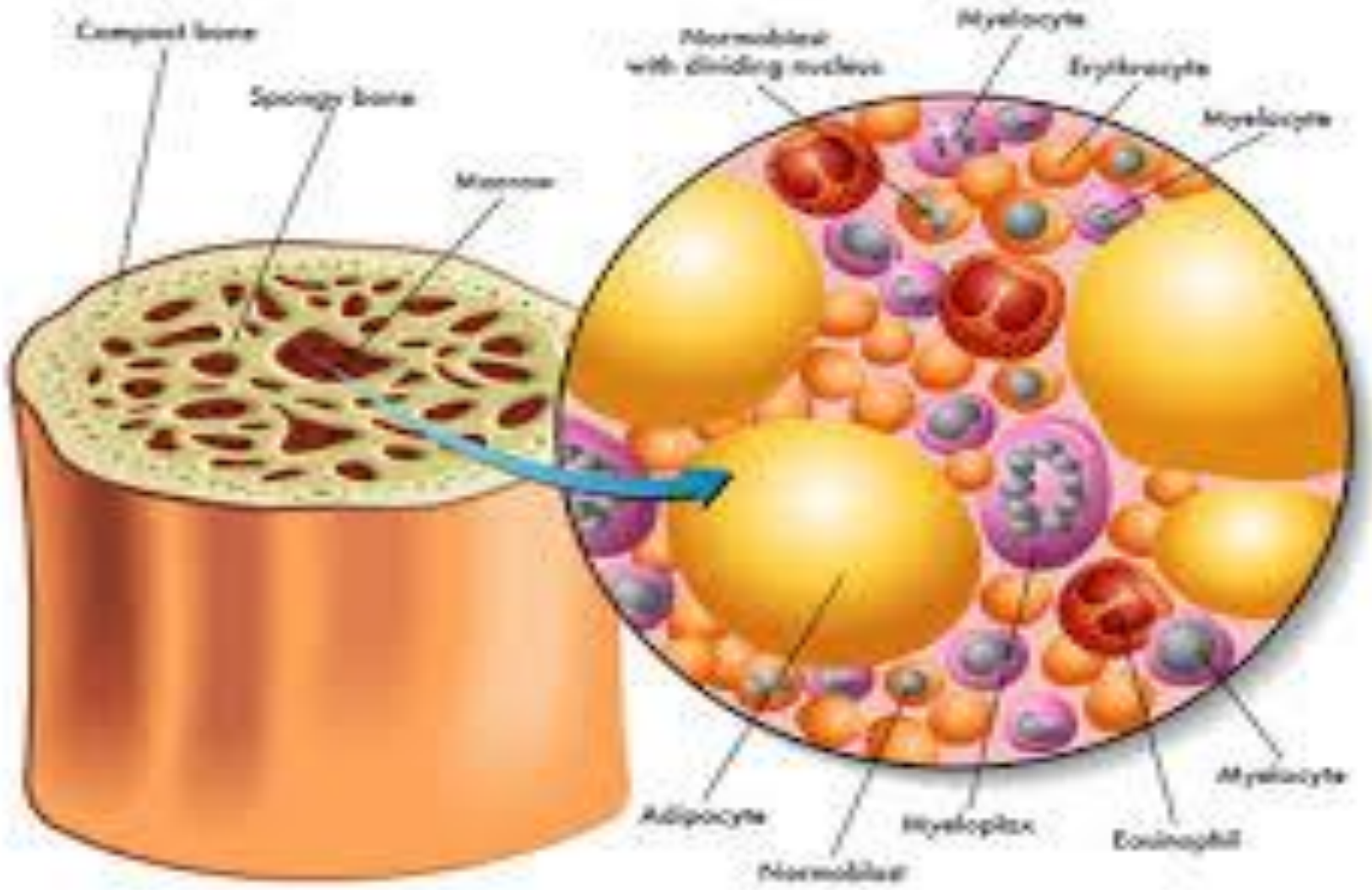
There are three types of bone marrow tissues,namely:

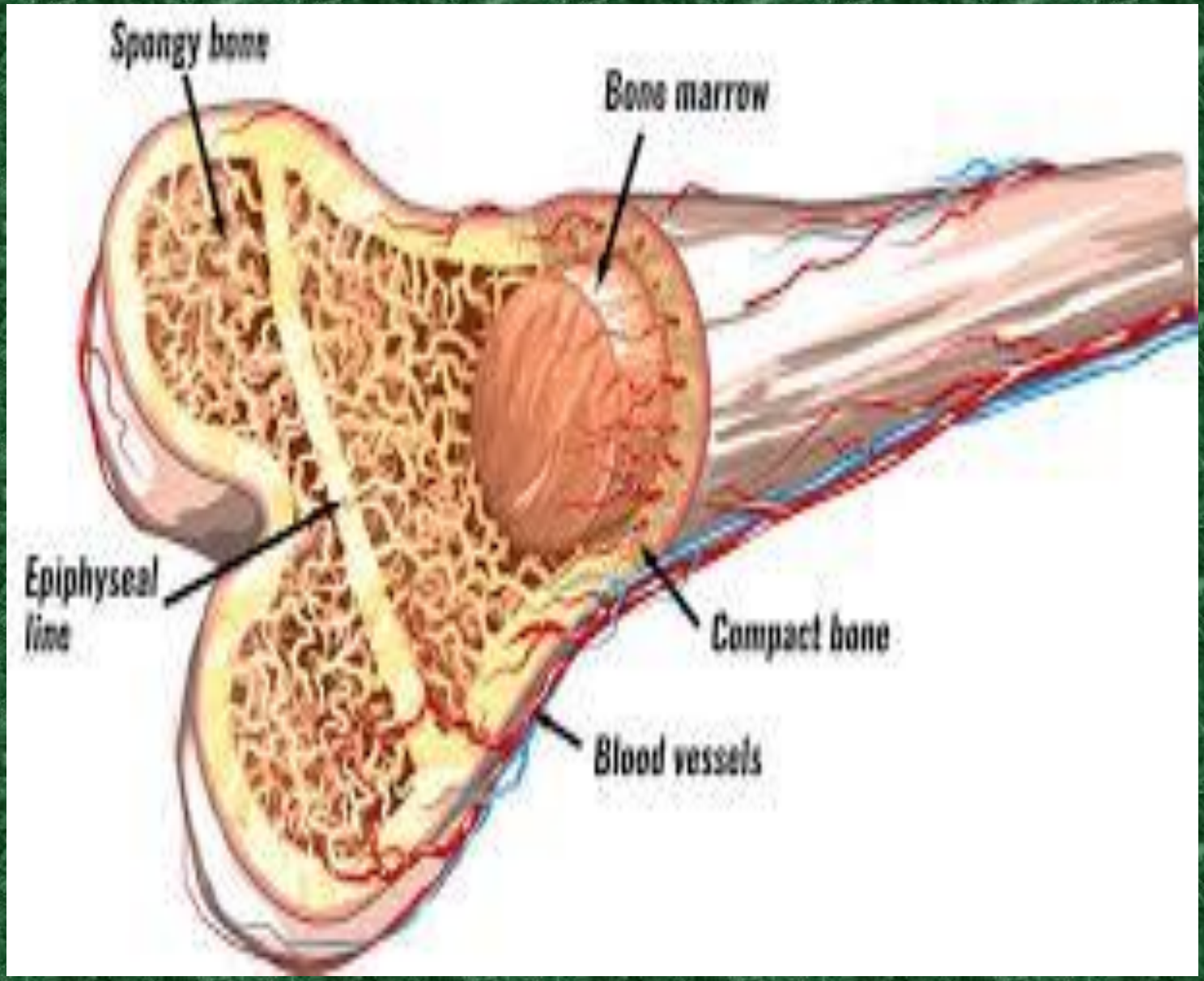
1.RED MARROW

2.YELLOW MARROW

3.STROMA

Bone Marrow Cells




Spongy bone
Bone marrow
Epiphyseal line
Compact bone
Blood vessels

SECONDARY LYMPHOID ORGANS

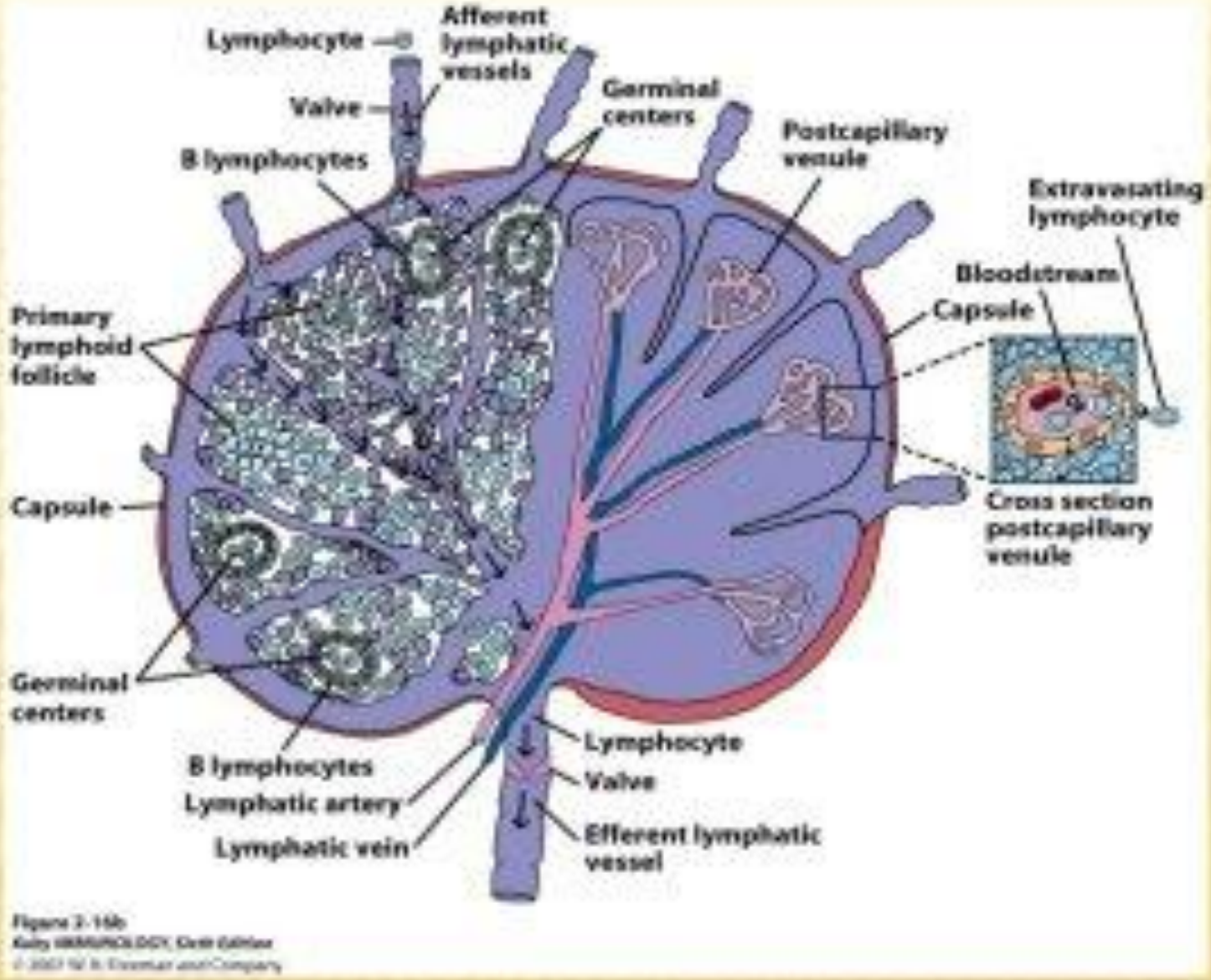
The secondary lymphoid organs are concern with immune reactions. The lymphocytes are made functional . They are the army camps of the immune system.

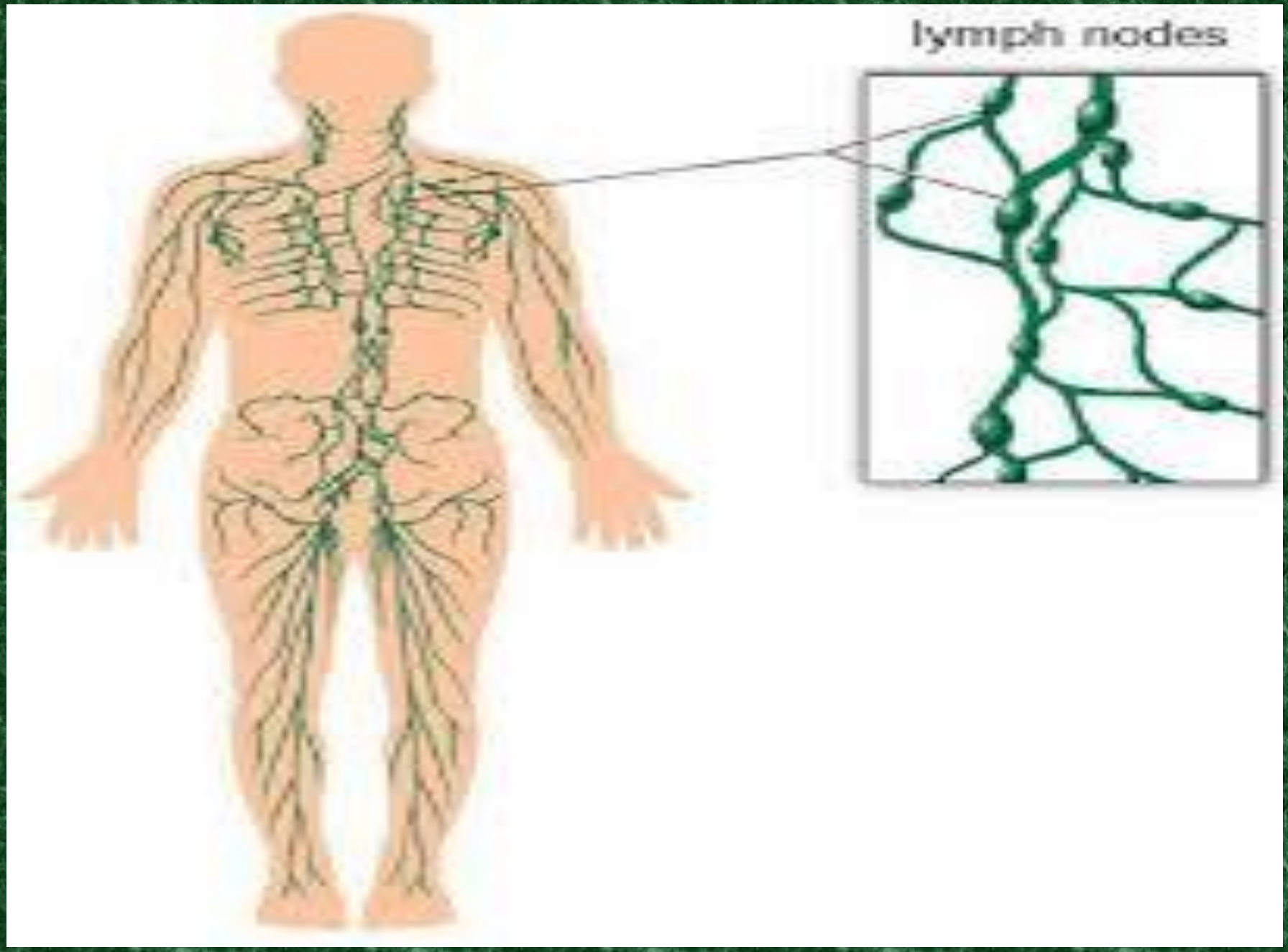
THE SECONDARY LYMPHOID ORGANS INCLUDE:

1. Lymph nodes
2. Spleen
3. MALT
   a) peyer's patches
   b) Tonsils .

LYMPH NODES

- They are bean shaped.
- One side of the lymph node has a hilus.
- The lymph nodes are present along the lymphatic ducts.
- It is covered by a capsule.
- Capsule penetrates in to the lymph node to form septa called trabeculae.
- It is made up of three regions.
- Outer cortex contains B cells.
- Middle paracortex contains T cells.
- Inner medulla contains B and T cells.
- Cortex and medulla are bursa and B dependent areas.
- Paracortex is the thymus and T dependent area.
- The lymph nodes contain T cells, B cells, dendritic cells and macrophages.


Lymphocyte
Afferent lymphatic vessels
Valve
Germinal centers
Postcapillary venule
B lymphocytes
Extravasating lymphocyte
Bloodstream
Capsule
Primary lymphoid follicle
Capsule
Cross section postcapillary venule
Germinal centers
Lymphocyte
Valve
B lymphocytes
Lymphatic artery
Lymphatic vein
Efferent lymphatic vessel


lymph nodes

FUNCTIONS OF LYMPH NODES

- They function as importent centres of phagocytosis.
- Lymph nodes are also responsible for the initiation and development of humoral and cell mediated immune responses.

SPLEEN

❖Spleen is located in the upper part of the abdominal cavity behind the stomach and close to the diaphragm.
❖It is a component of lymphatic system.
❖It is deep red in colour.
❖It is surrounded by a capsule.
❖The capsule penetrates into the tissues as septa called trabeculae.

Spleen has two regions.

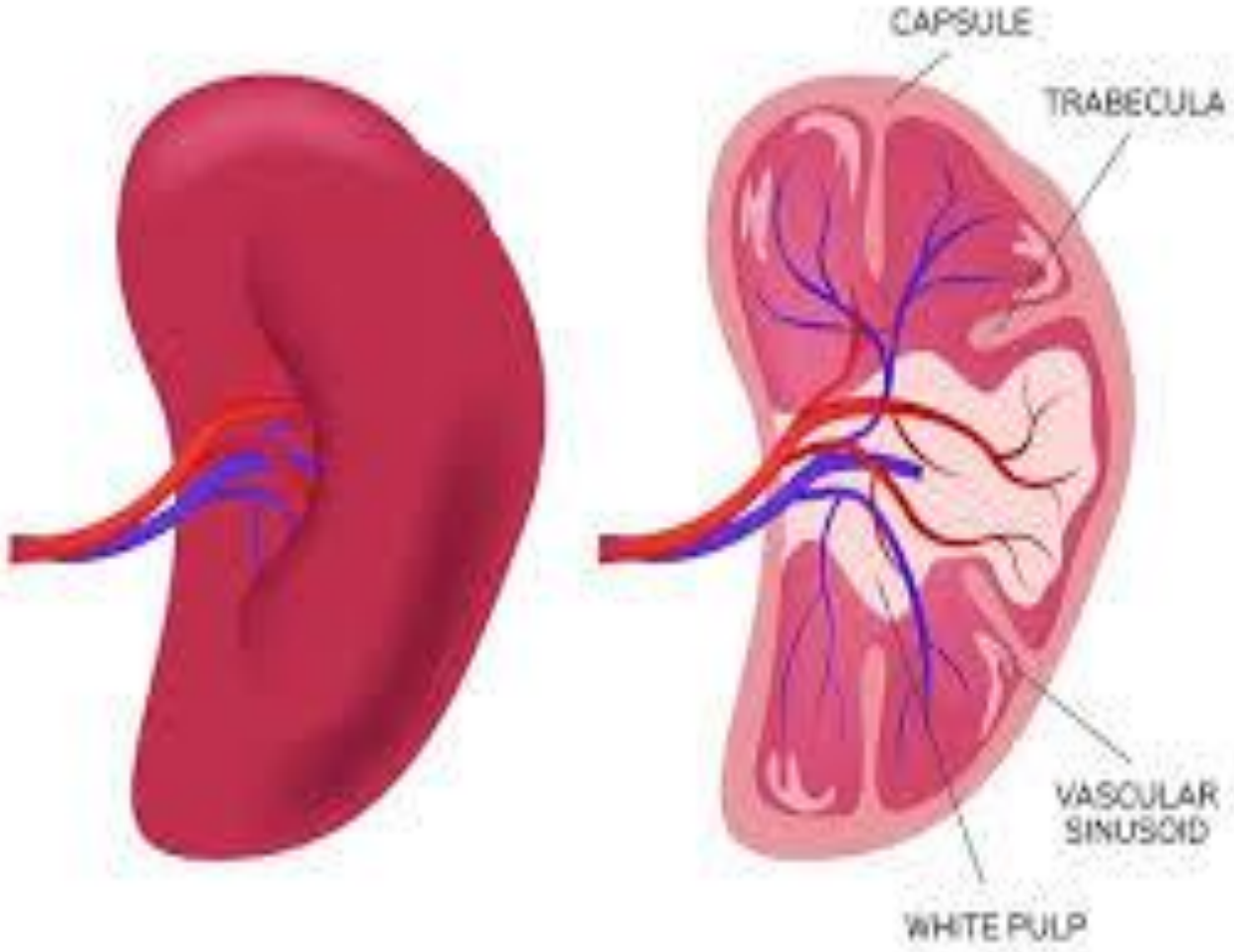
- **Red pulp**
- **White pulp**

❖spleen contains B cells and T cells.

FUNCTIONS:

Graveyard for worn out blood cells.
Formation of RBC at time of necessity.
Filters blood.
It brings about humoral and cell mediated immunity.

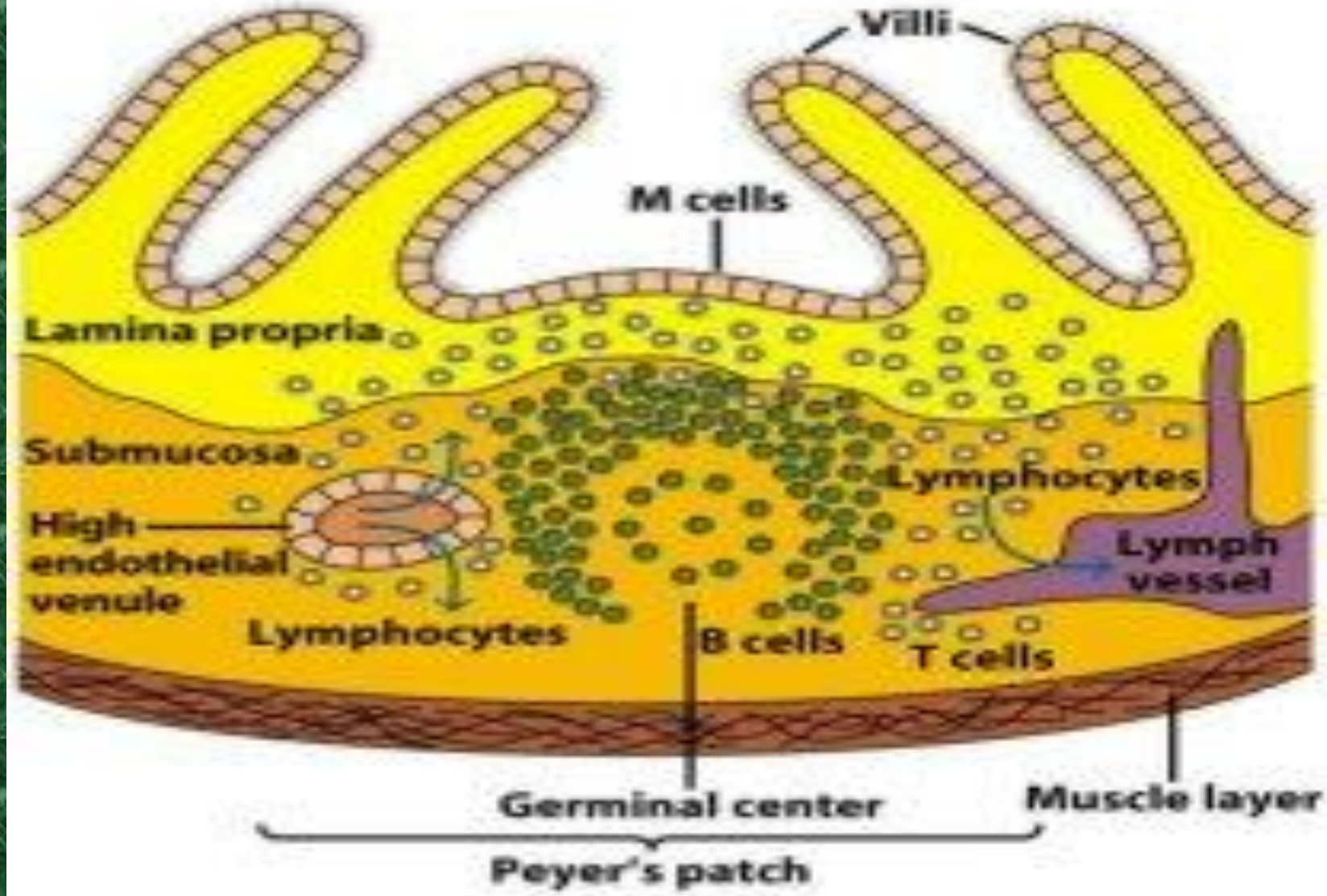
SPLEEN



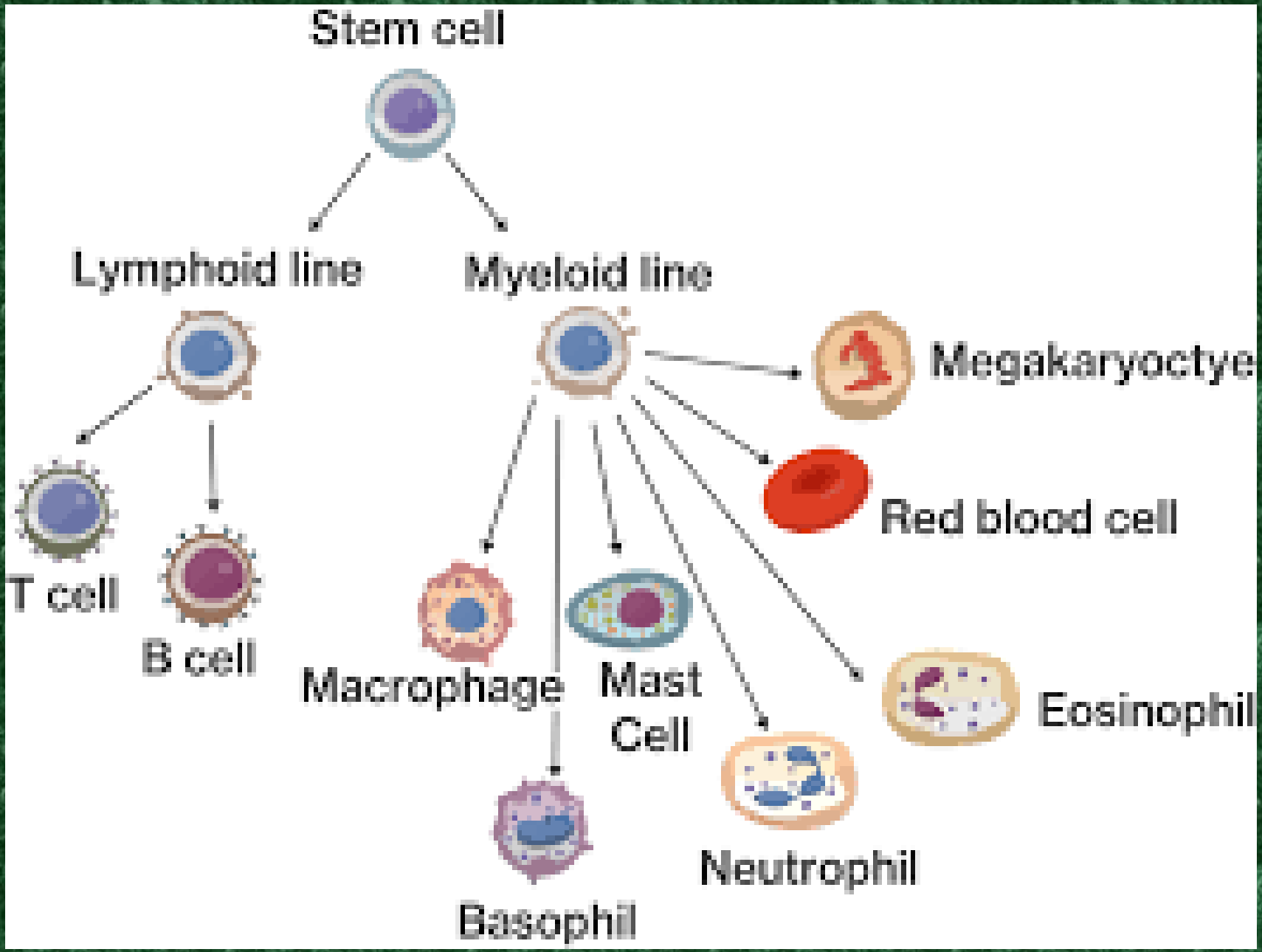
MALT

MALT is the Mucosa Associated Lymphoid Tissue. The mucosal layer of the alimentary canal,respiratory and urinogenital tracts is provided with dispersed groups of lymphoid tissues known as MALT.

These tissues are usually without a capsule. In human beings the peyer's patches , the tonsils and appendix are good examples of lymphoid tissues found in the mucosal layer of the alimentary canal.


Villi
M cells
Lamina propria
Submucosa
High endothelial venule
Lymphocytes
Lymphocytes
Lymph vessel
B cells
T cells
Germinal center
Muscle layer
Peyer's patch

CELLS OF THE IMMUNE SYSTEM

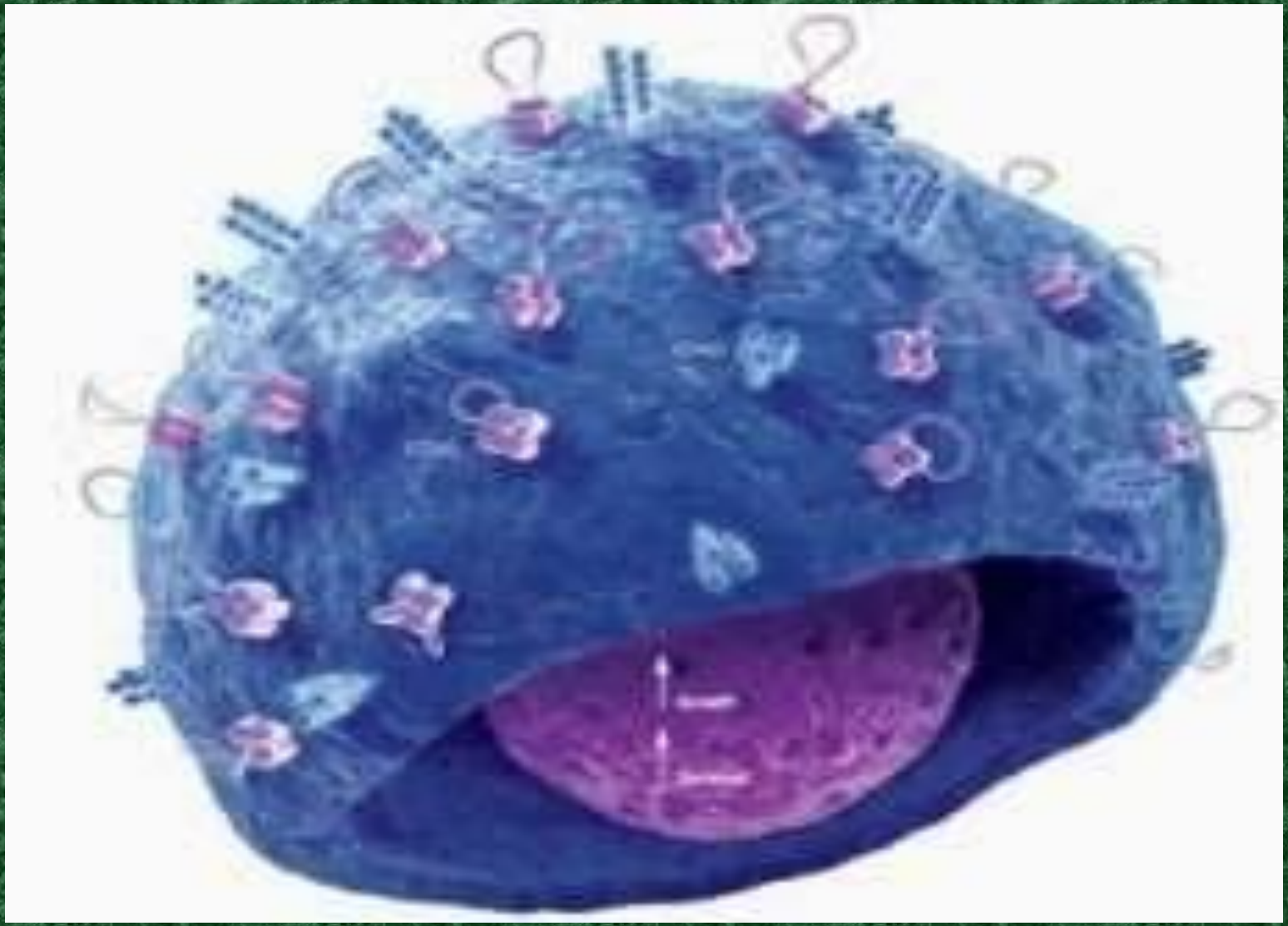

Stem cell
Lymphoid line
Myeloid line
T cell
B cell
Megakaryoctye
Red blood cell
Macrophage
Mast Cell
Eosinophil
Neutrophil
Basophil

definition

The cells concerned with the defence of the body are called immune cells. The immune cells develope from stem cells.

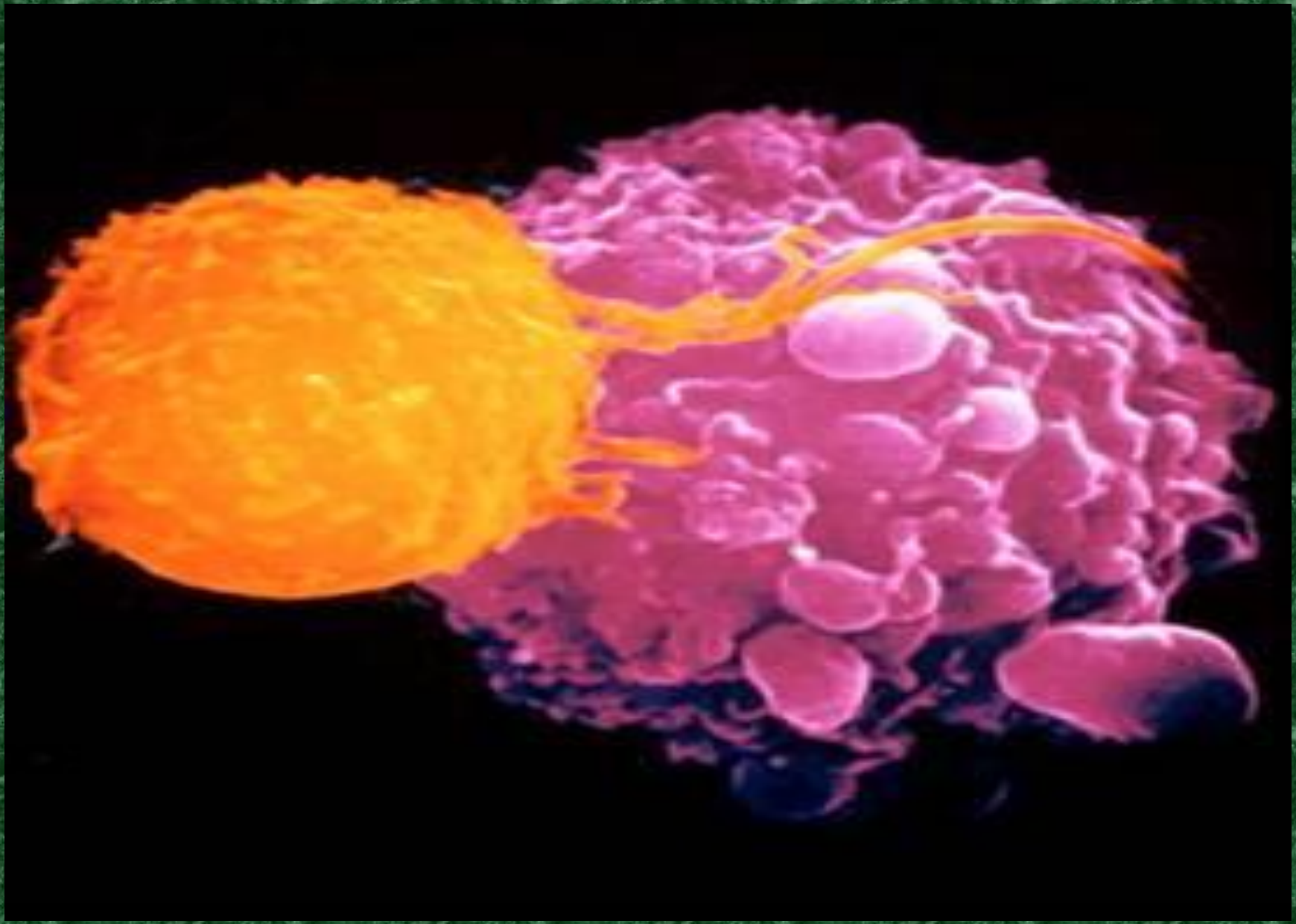
B lymphocytes

- The lymphocytes that matures in bursa of fabricious or bone marrow and that brings about humoral immunity is called B lymphocyte.the B lymphocytes are bursa or bone marrow dependent cells.
- The B lymphocytes are mononucleate non-granular leukocytes.they have a large nucleus and a rim of cytoplasm. They are found in the blood and lymph. But they are highly concentrated in the lymph nodes and spleen.the B lymphocytes contain immunoglobulings on their surface.these are called surface immunoglobulins(Sig).



T lymphocytes

- The lymphocytes that matures in thymus and that brings about cell mediated immunity is called T lymphocyte.
- The lymphocytes are thymus dependent cells. They mature under the influence of thymic hormones.
- It has a large nucleus and a rim of cytoplasm.
- They zre highly concentrated in the blood and spleen.



MACROPHAGES

- Macrophages are large, mononuclear phagocytic cells derived from monocytes.
- Macrophages are components of the reticuloendothelial system.
- The macrophages are distributed throughout the body; but they are concentrated in lymph nodes,spleen and liver.
- They are amoeba like.
- They are mononuclear.
- They have large nucleus.
- The cytoplasm has no granules. So they are called agranulocytes.
- They have long life span.

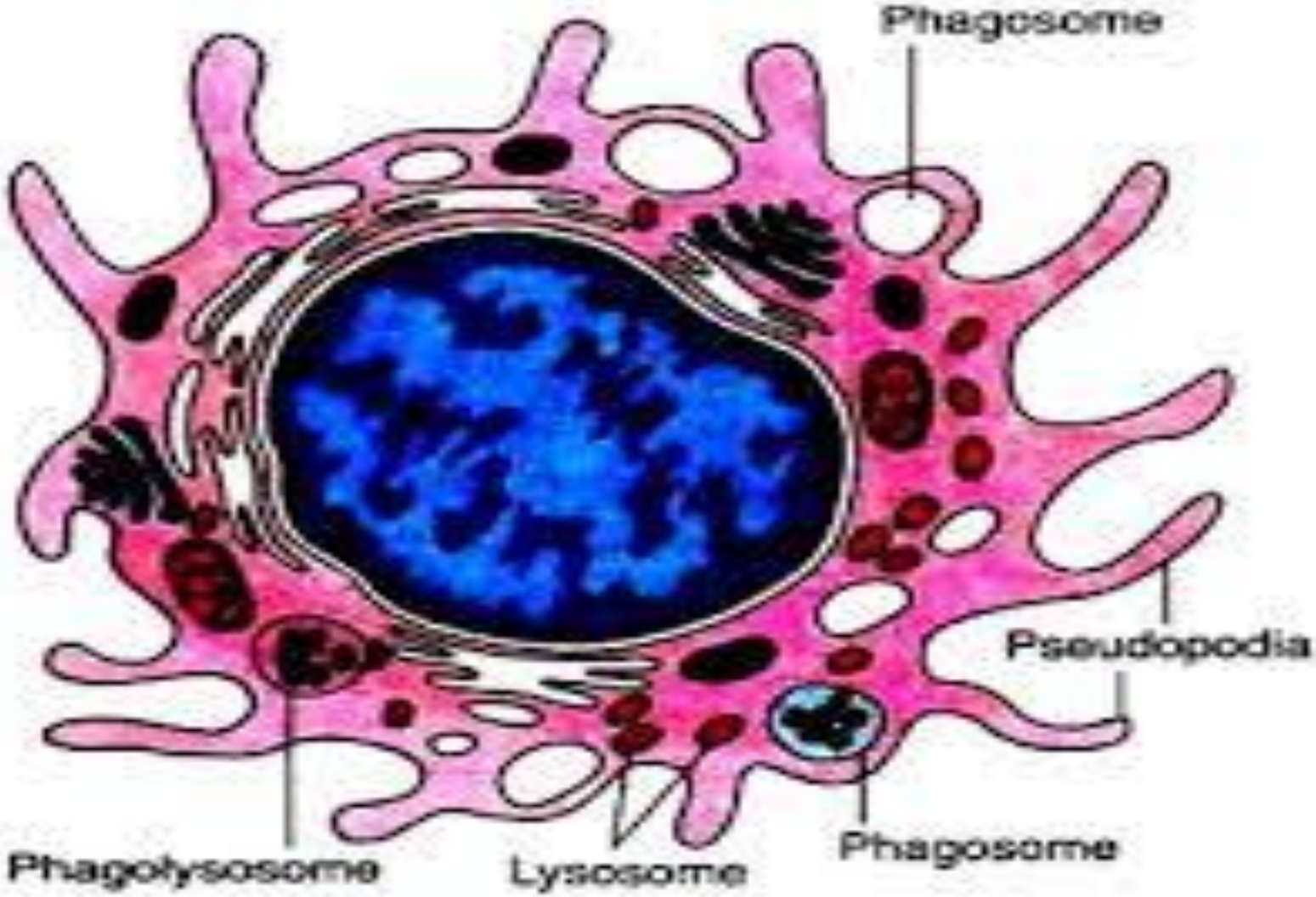


Fig. 6.35 : Typical morphology of a macrophage with lysosomes, pseudopodia, phagosome and phagolysosome


Thank you