Hemato-lymphoid system

Practical Part

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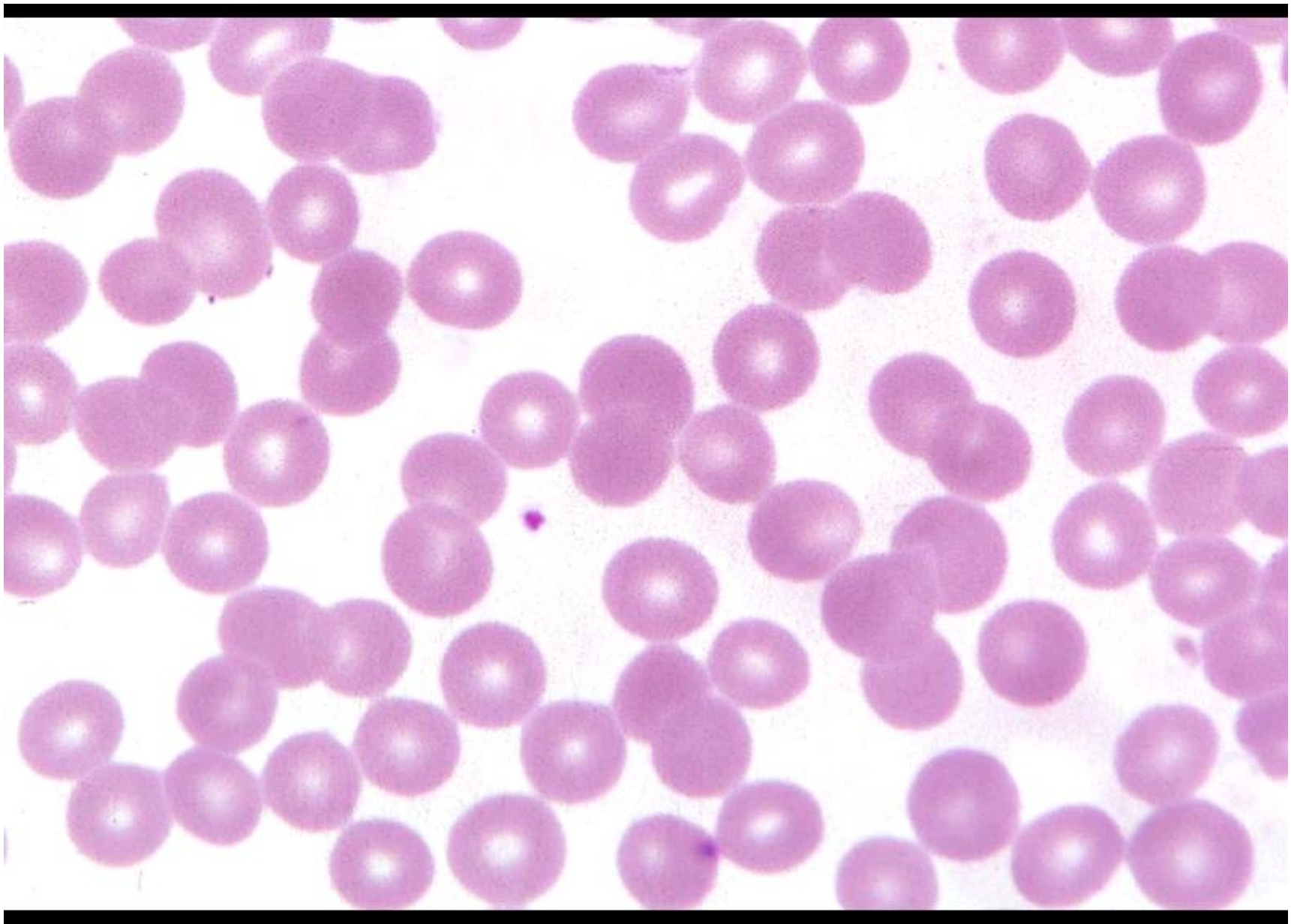
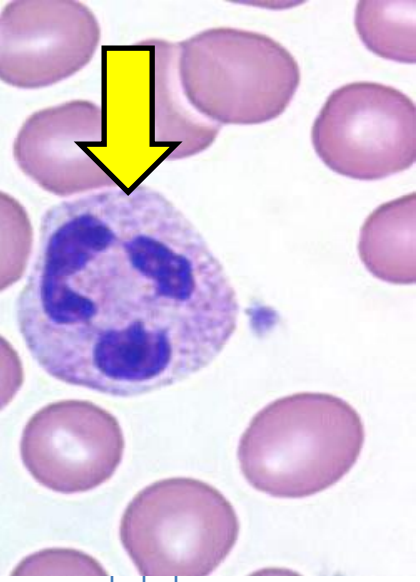
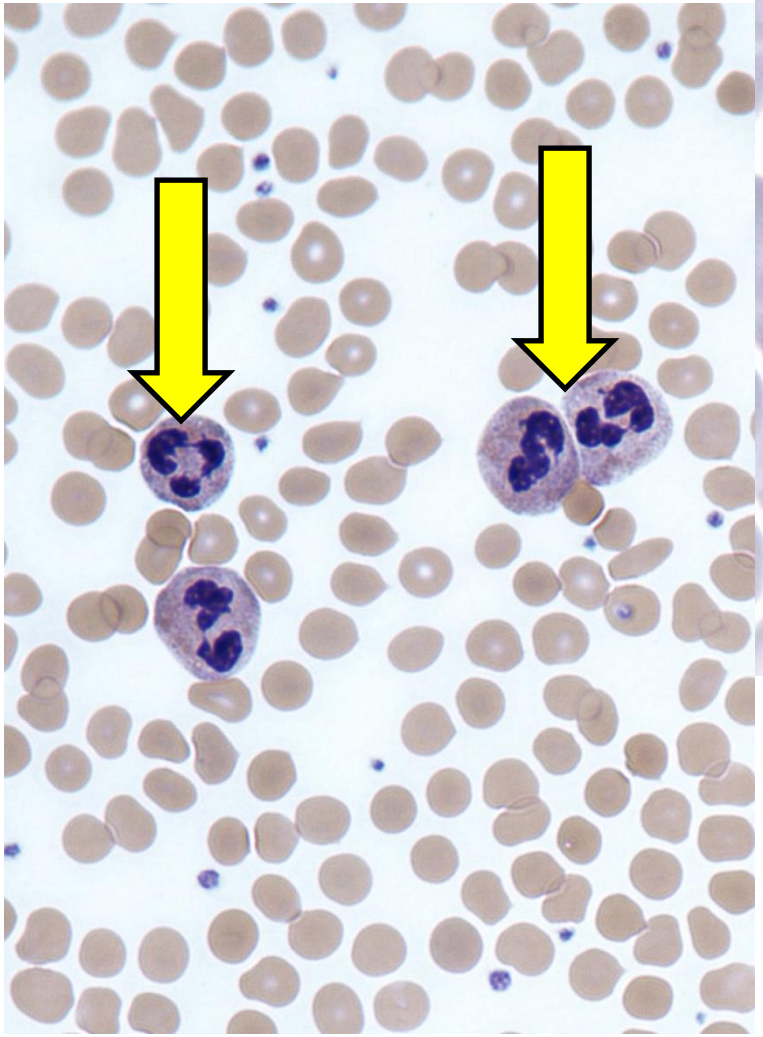
Blood

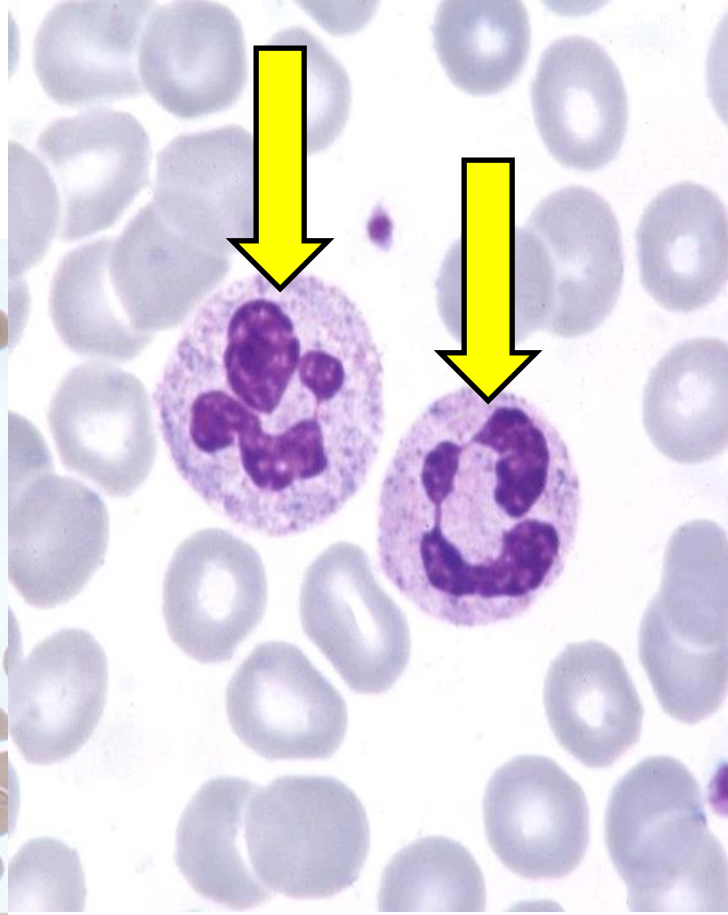
Erythrocytes



Neutrophils

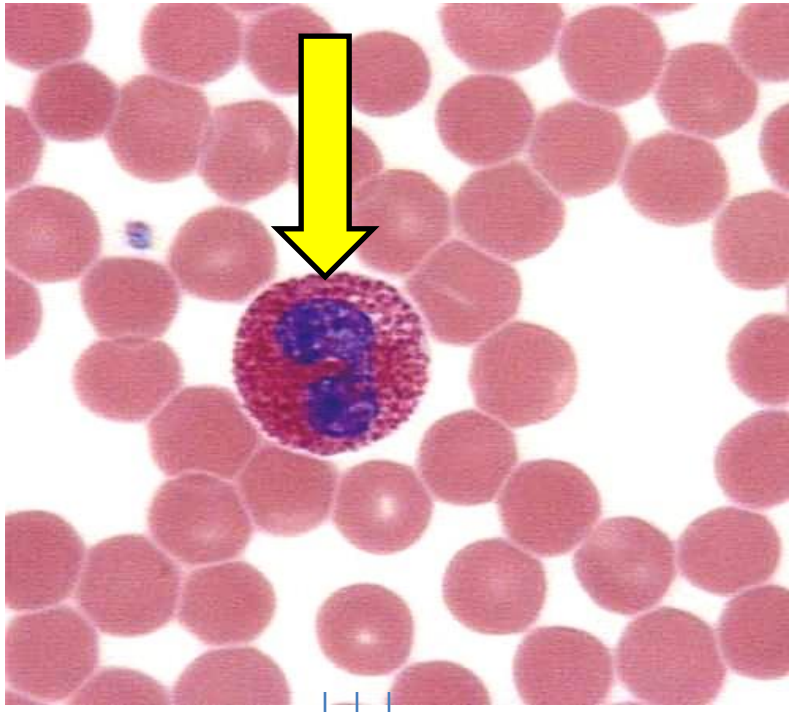


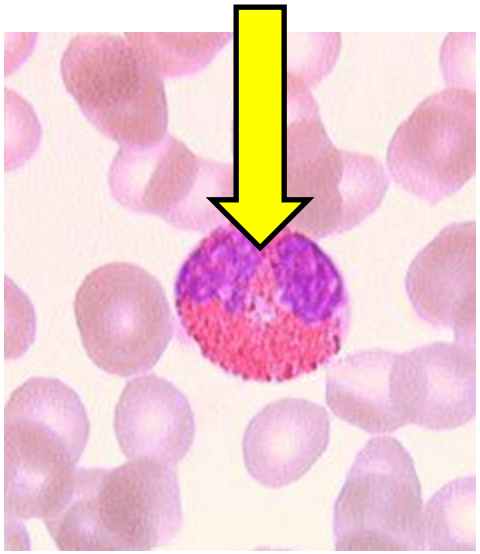


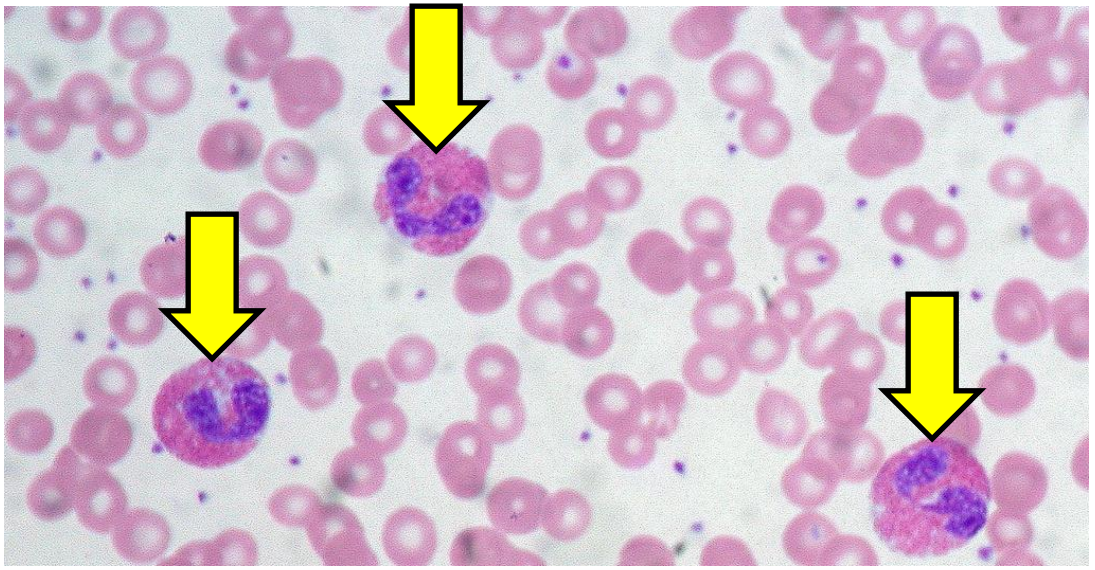


This shows a neutrophil in a blood smear. The neutrophils are 12-14 µm diameter, and so look bigger than the surrounding red blood cells. There is a single nucleus, which is multilobed, and can have between 2 and 5 lobes.

Eosinophils

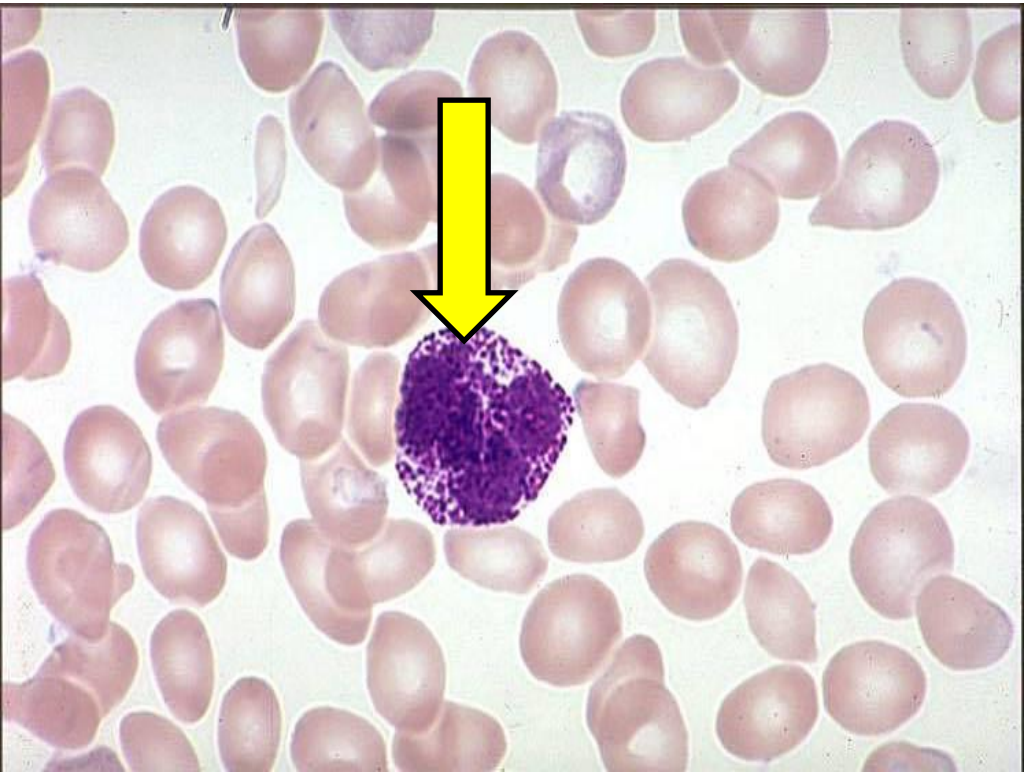


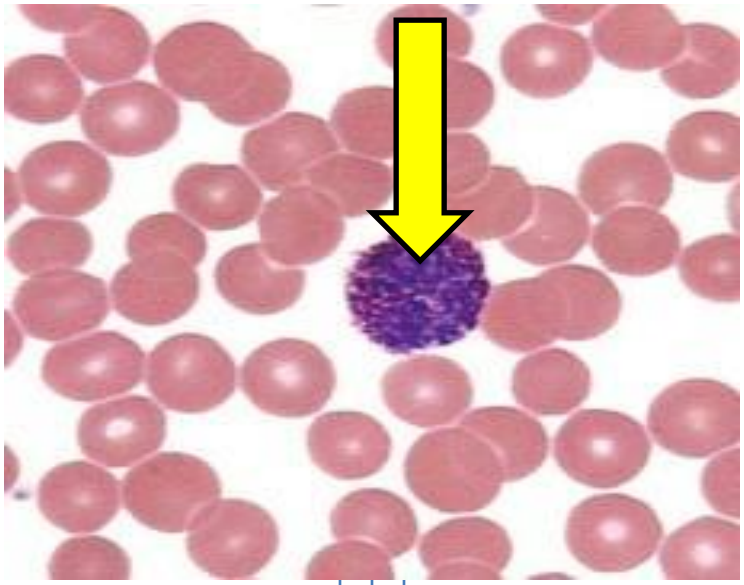




This shows an eosinophil in a blood smear. You can see that eosinophil has a bilobed nucleus.
These cells have large acidophilic specific granules - these stain bright red, or reddish-purple.

Basophils

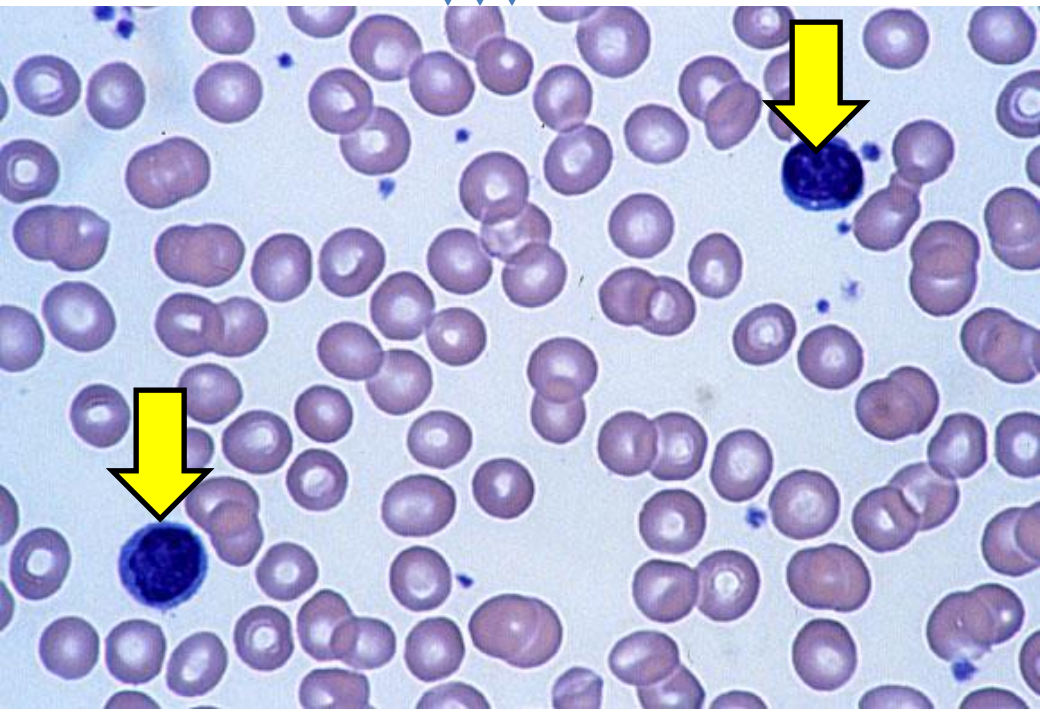


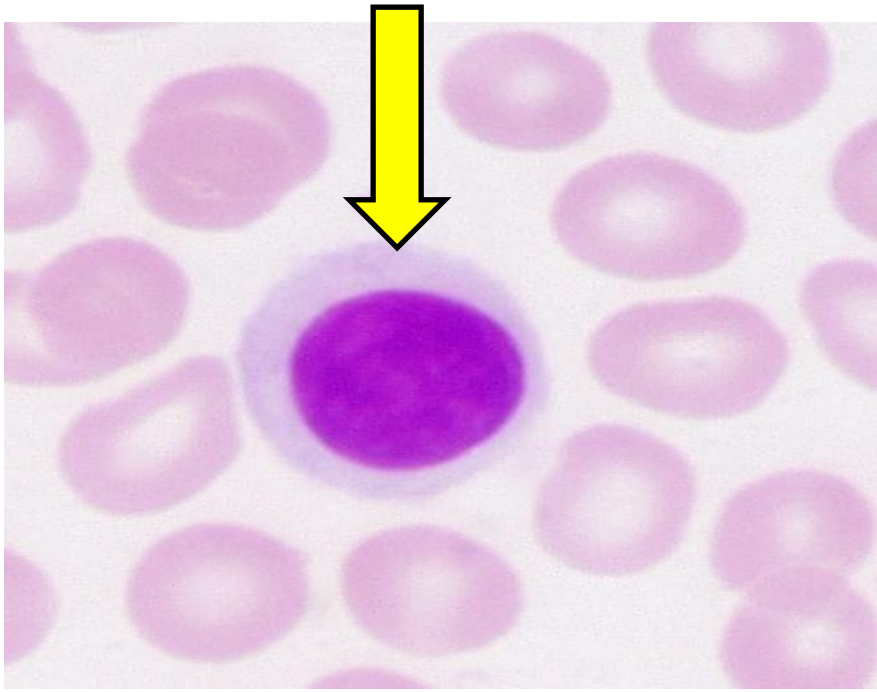


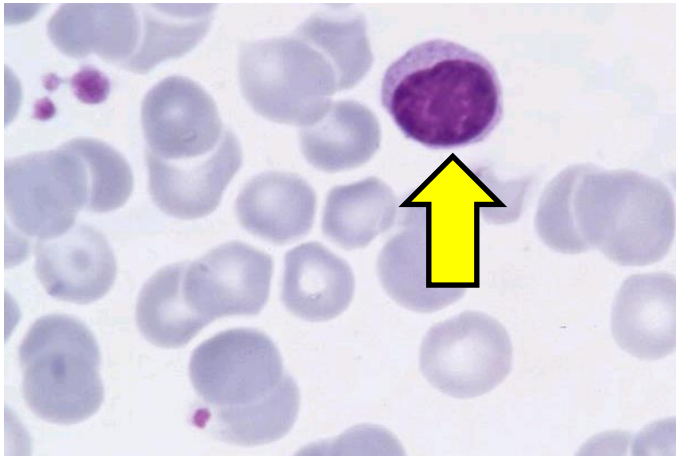
This shows a basophil in a blood smear. The basophil contains lots of deep blue staining granules (basic) and a bilobed irregular nucleus, that is often difficult to see.

Lymphocytes

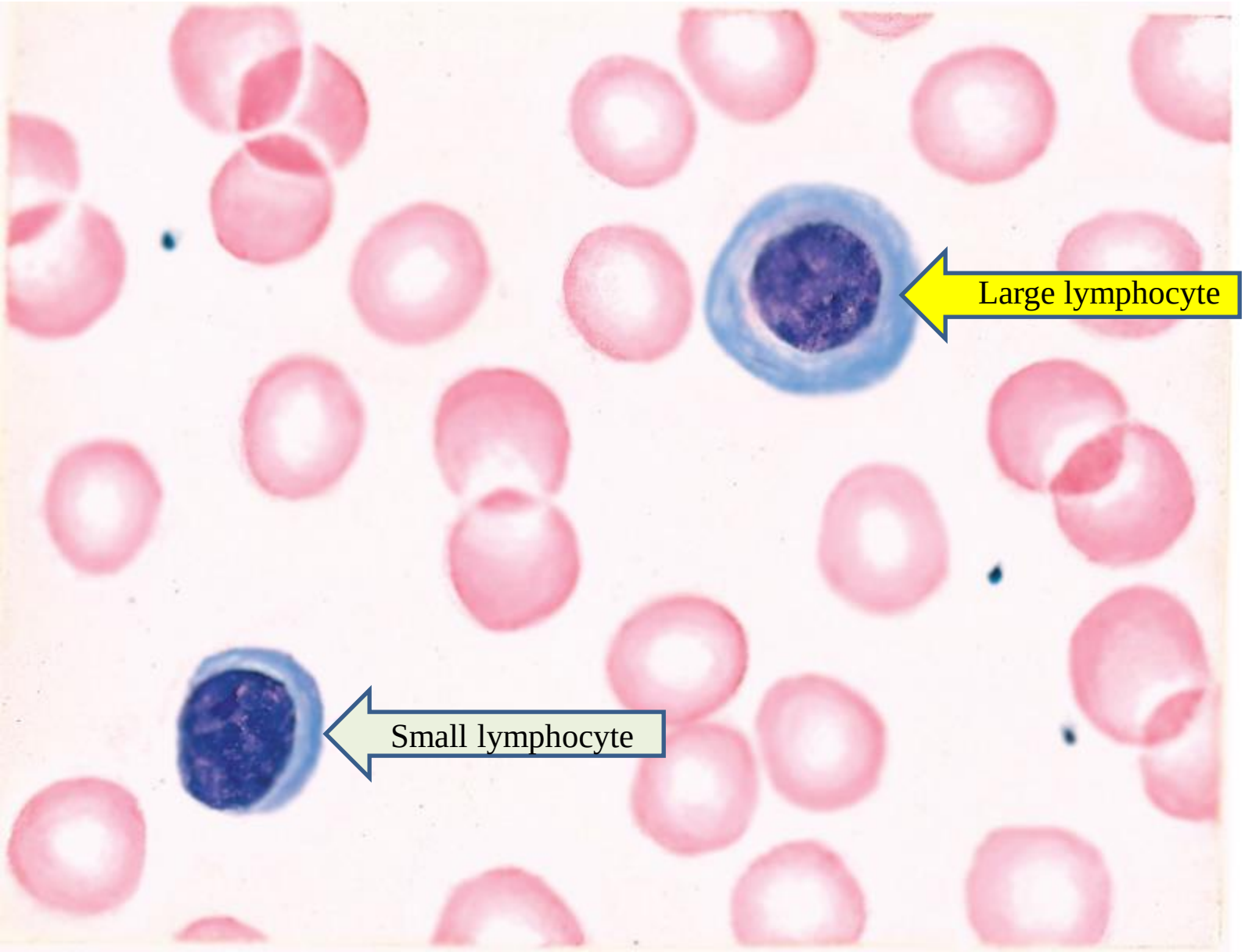
This shows lymphocytes in a blood smear. Most of the lymphocytes are small; a bit bigger than red blood cells, at about 6-9µm in diameter.
Lymphocyte has a small spherical nucleus with dark staining condensed chromatin. Not much cytoplasm can be seen, and it is basophilic (pale blue/purple staining).



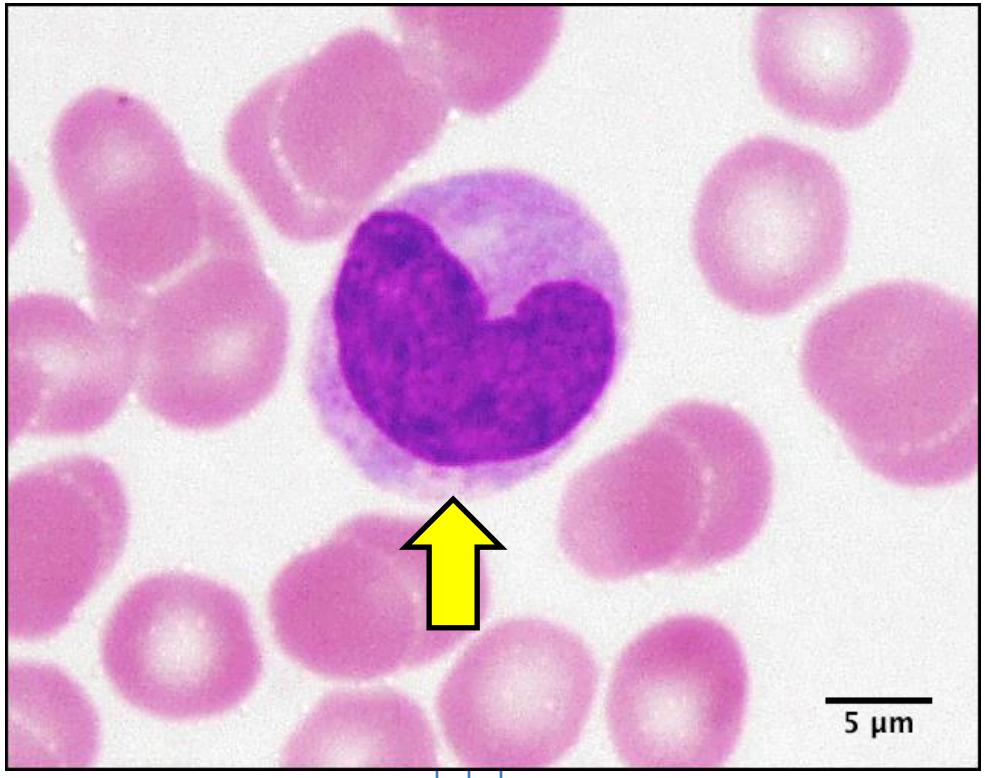


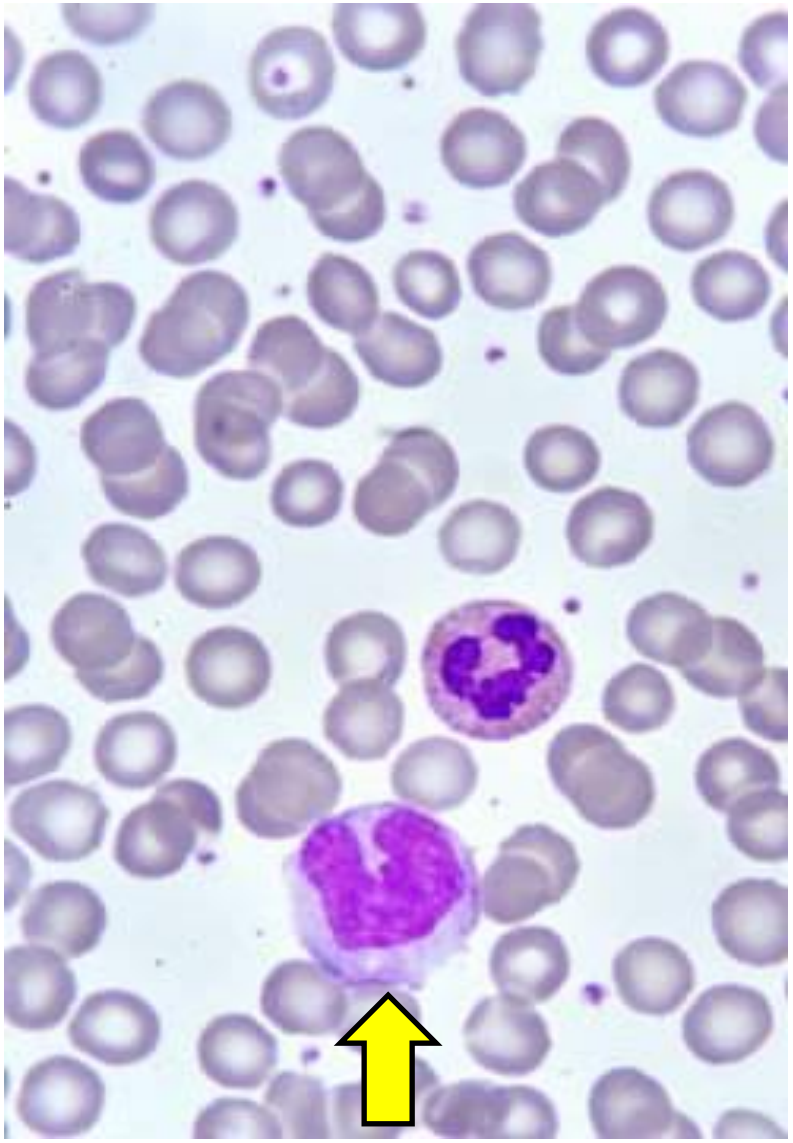


The rest of lymphocytes (around 10%) are larger. These larger cells have more cytoplasm and more euchromatic nucleus. Larger lymphocytes are commonly activated lymphocytes.



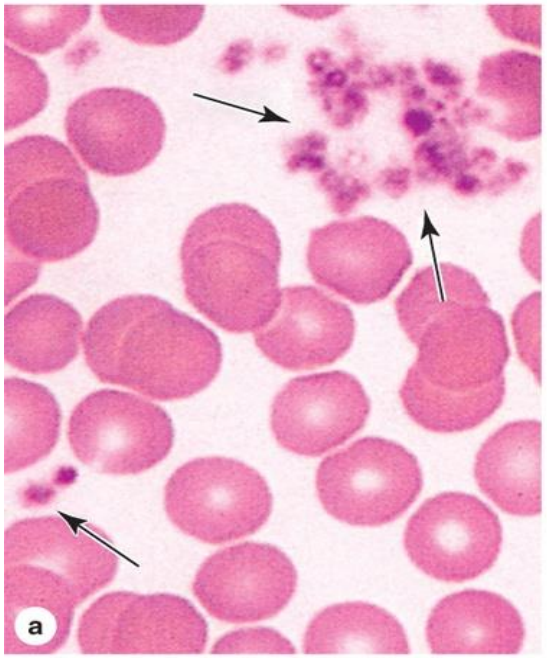
Monocytes

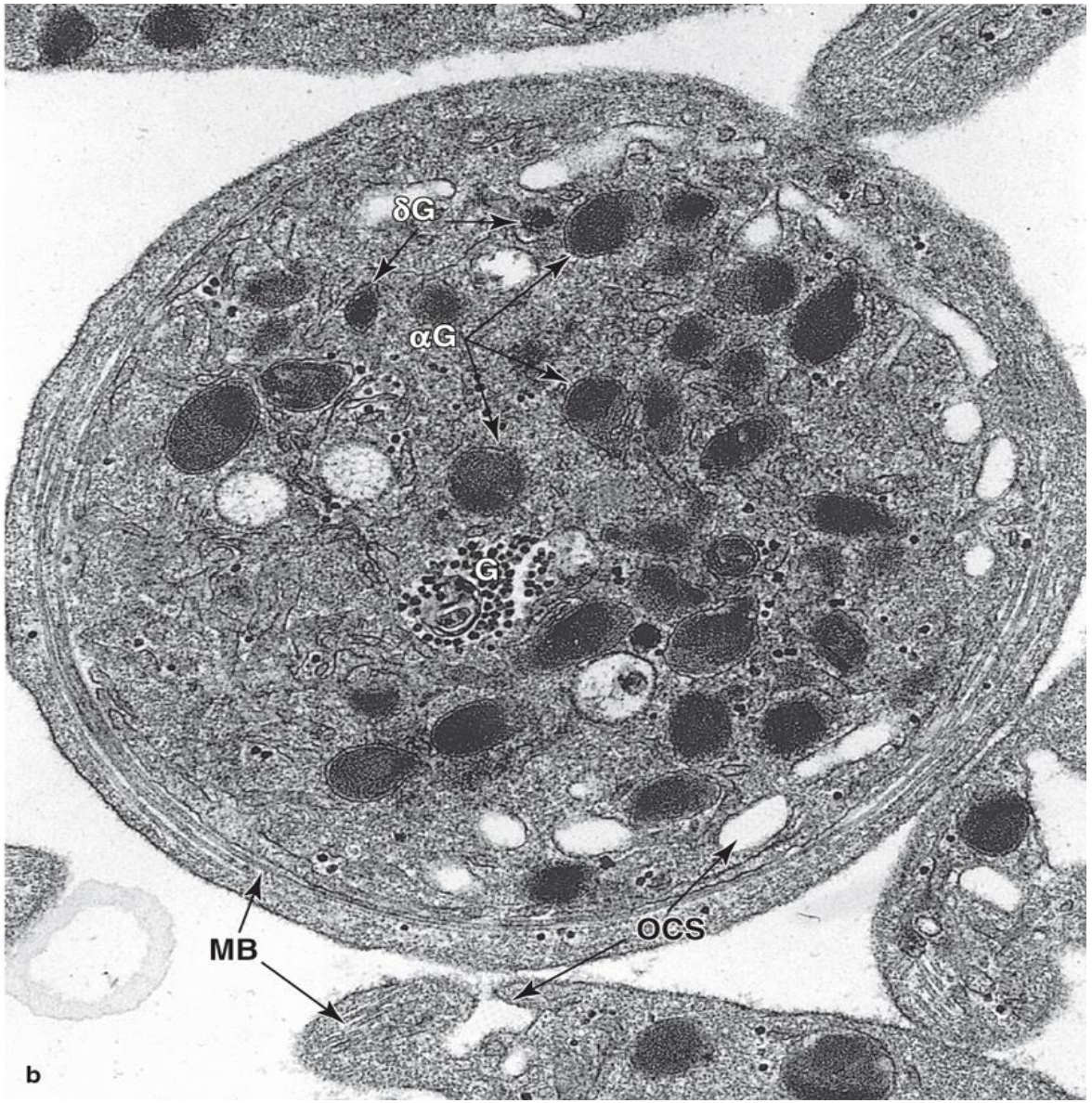




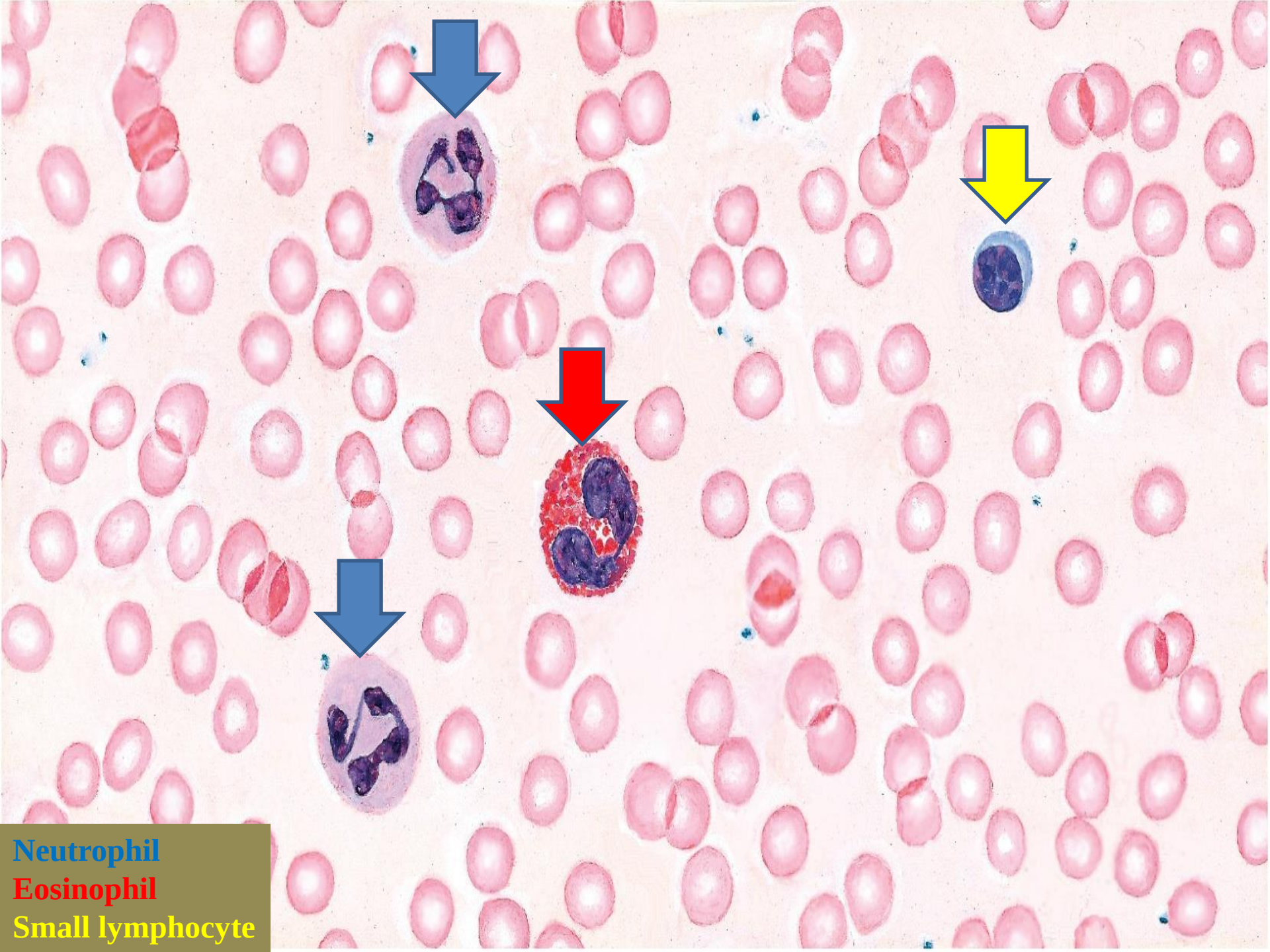
This shows a monocyte in a blood smear. Monocytes are the largest type of white blood cells, and can be up to 20µm in diameter. They have a large eccentrically placed nucleus, which is C or kidney bean shaped. They have abundant cytoplasm, and some fine purple granules in cytoplasm (frosted glass appearance).

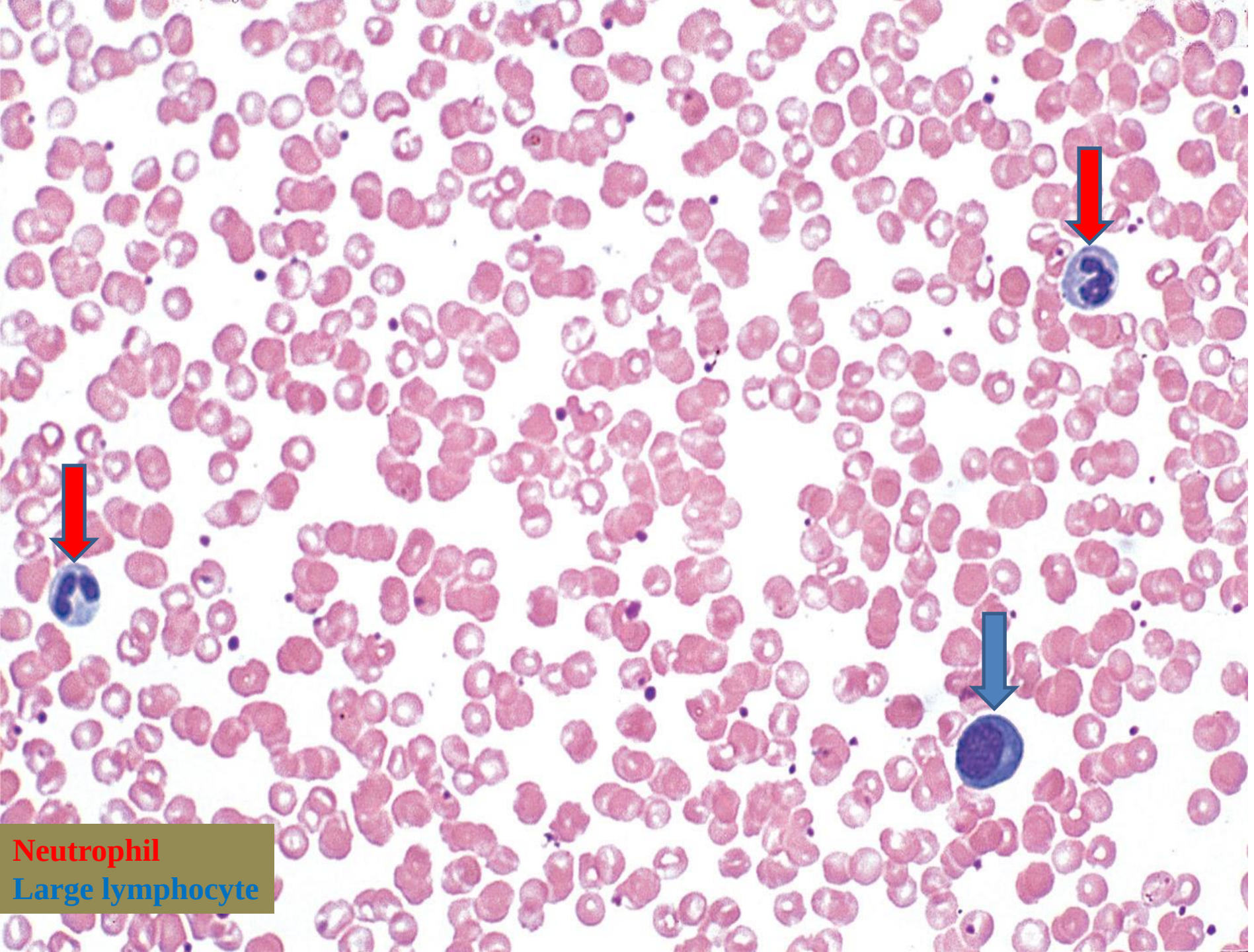
Platelets

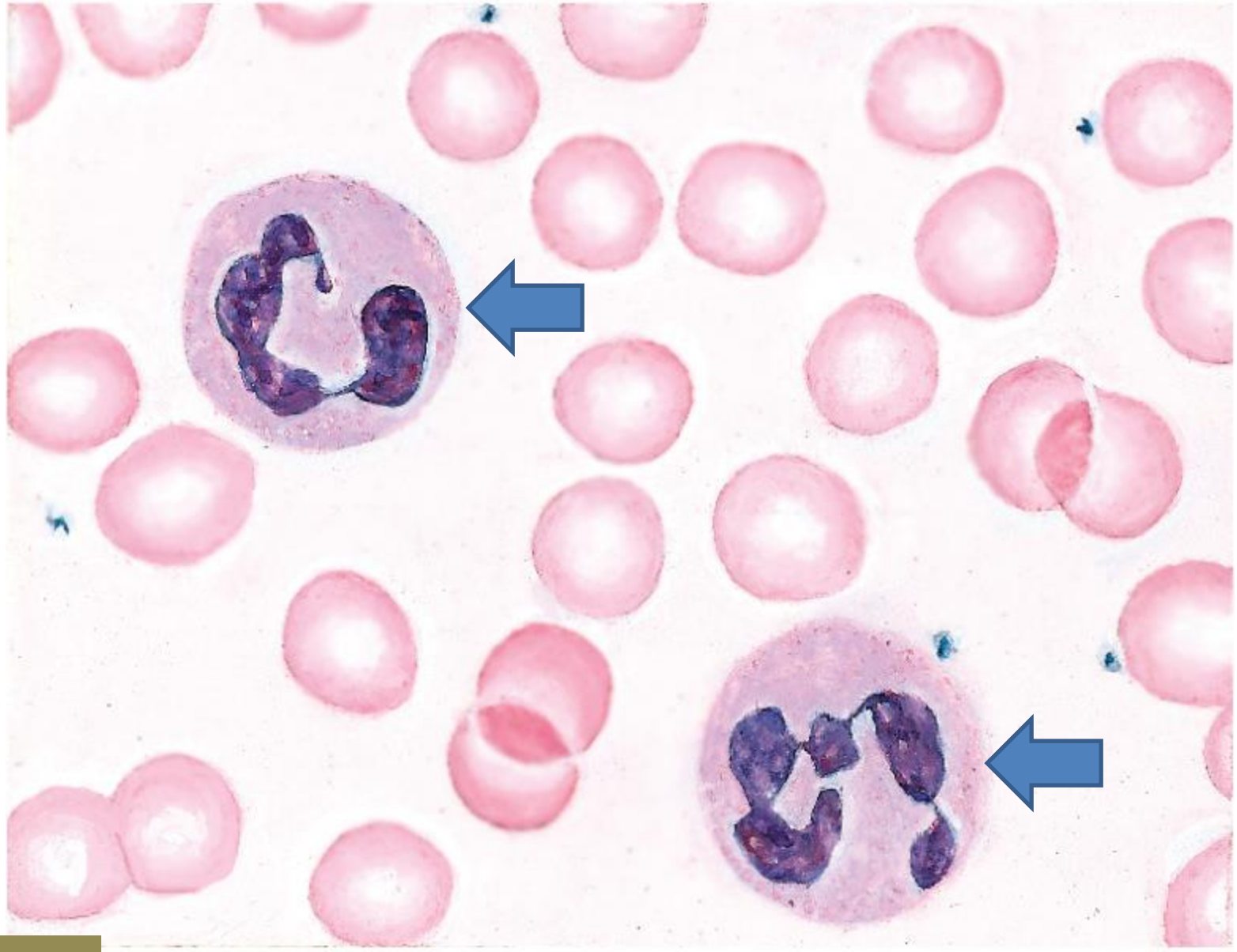




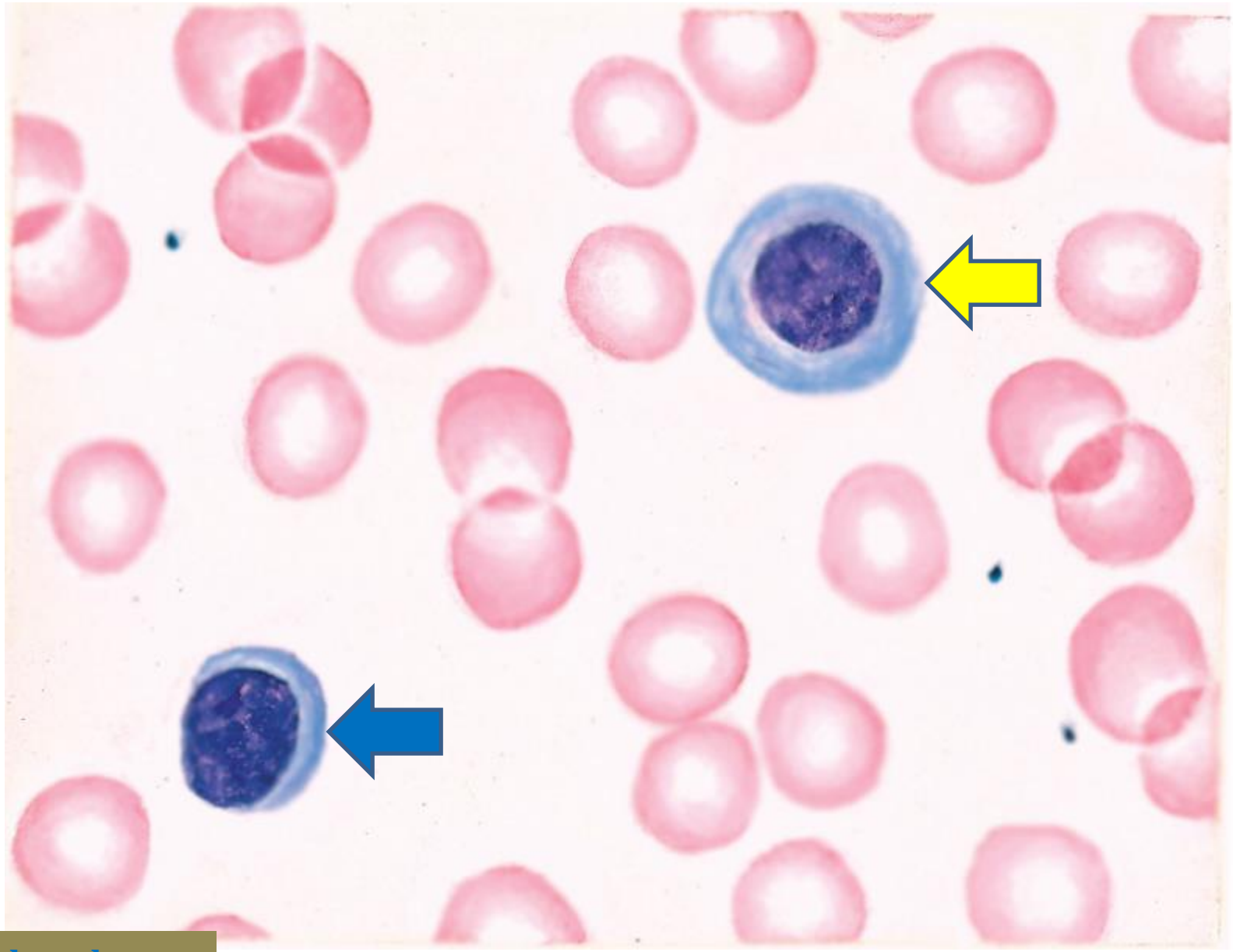
Identify


Neutrophil
Eosinophil
Small lymphocyte

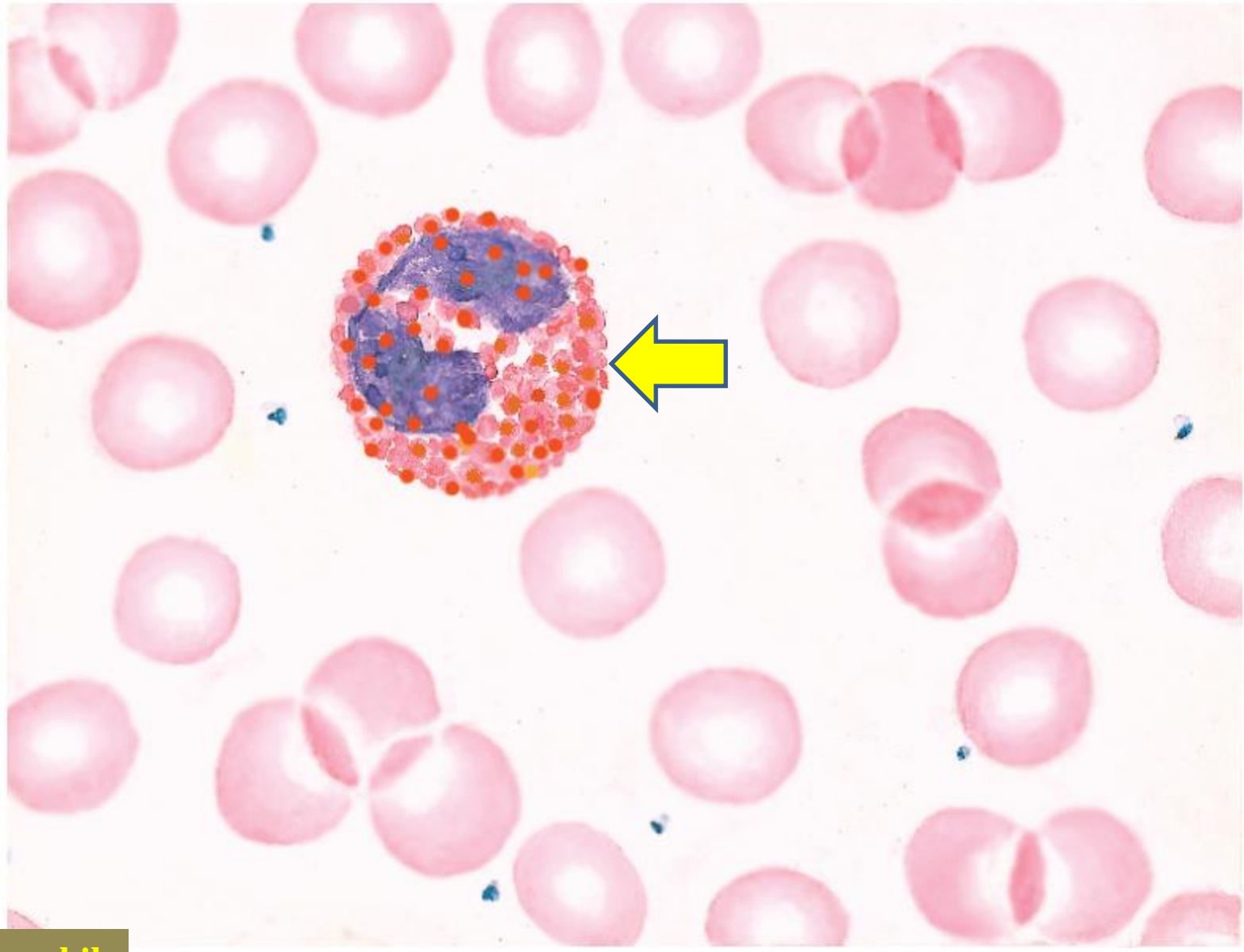

Neutrophil
Large lymphocyte



Neutrophil

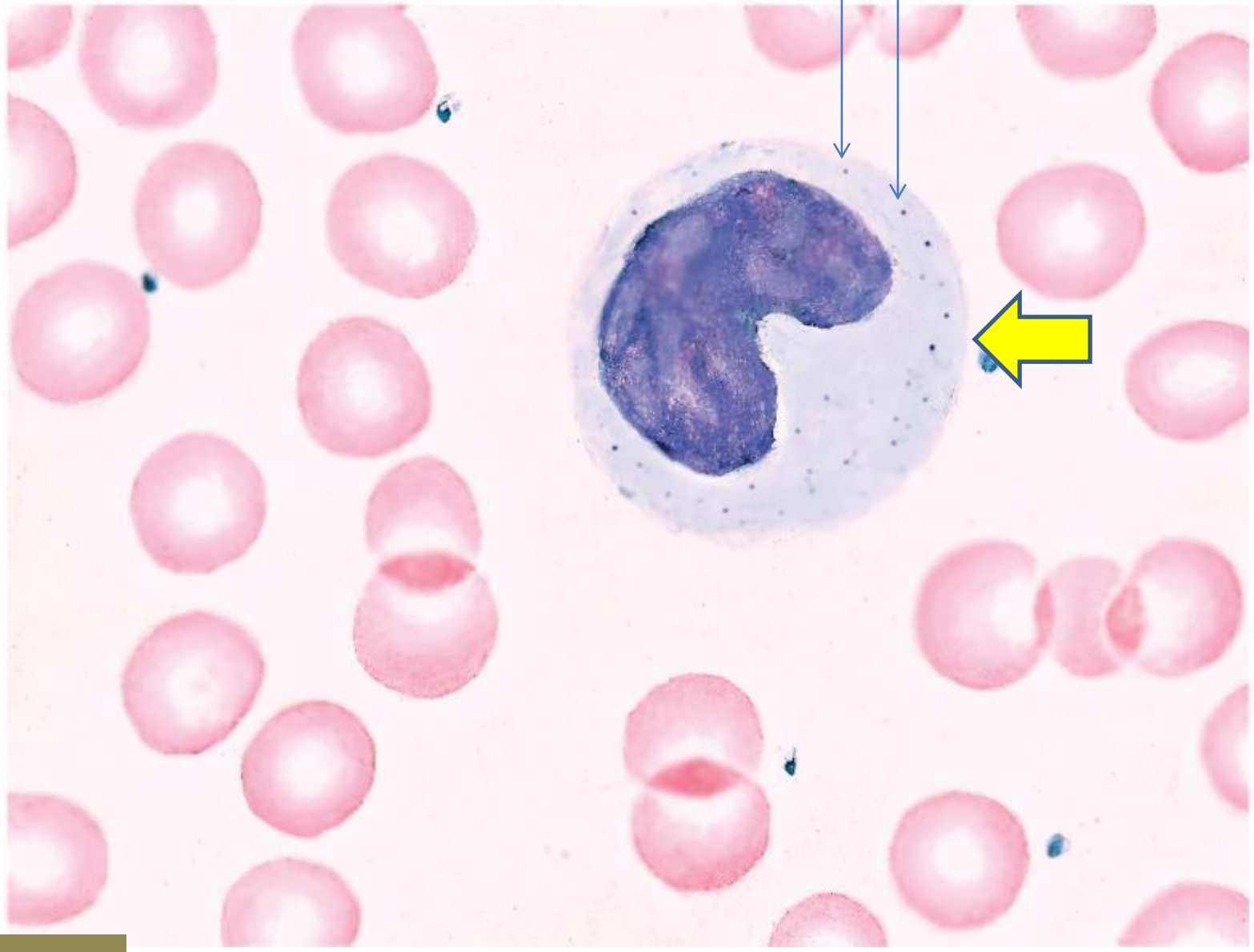


Small lymphocyte
Large lymphocyte

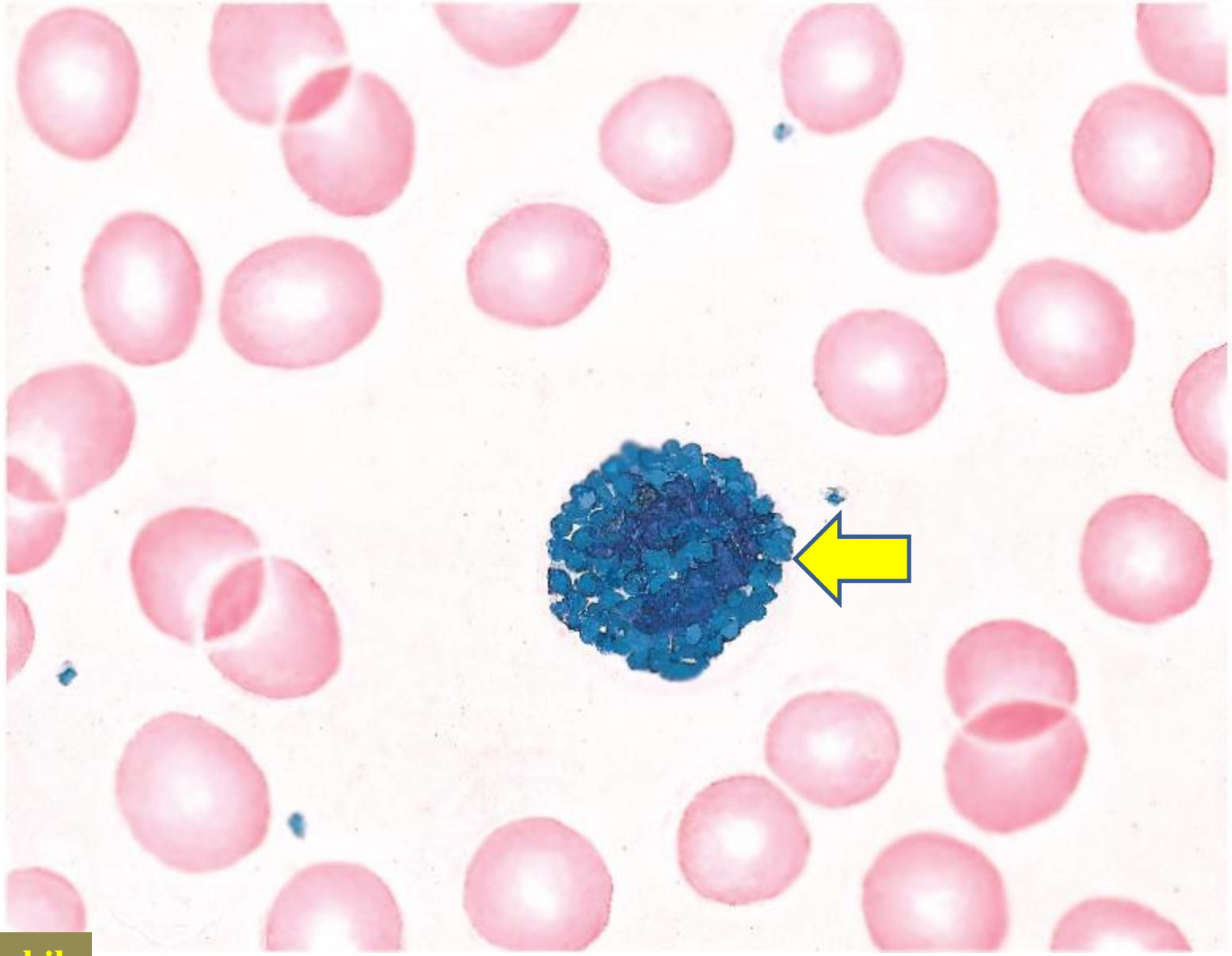


Eosinophil

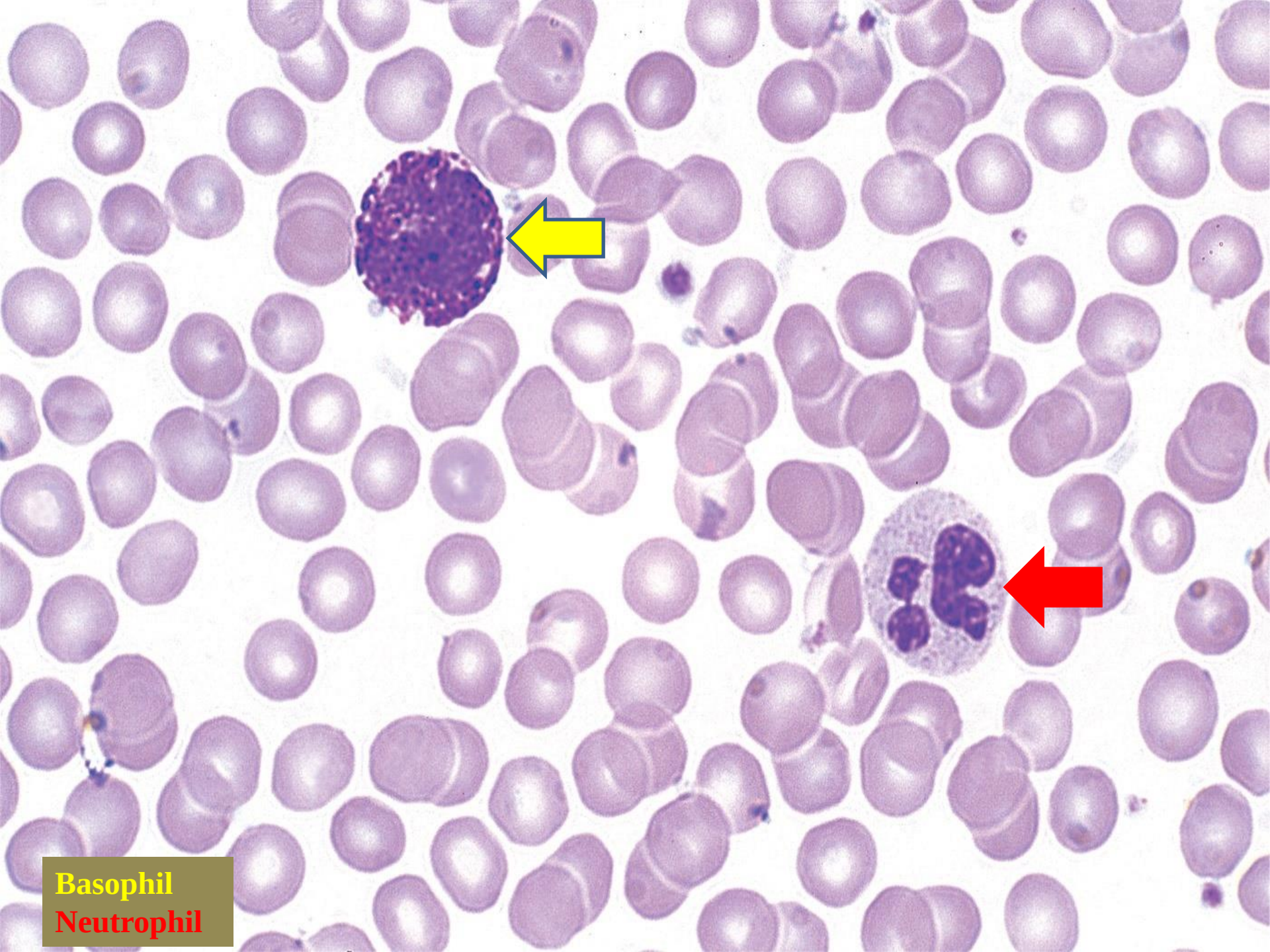
These are azurophilic non specific granules not specific granules

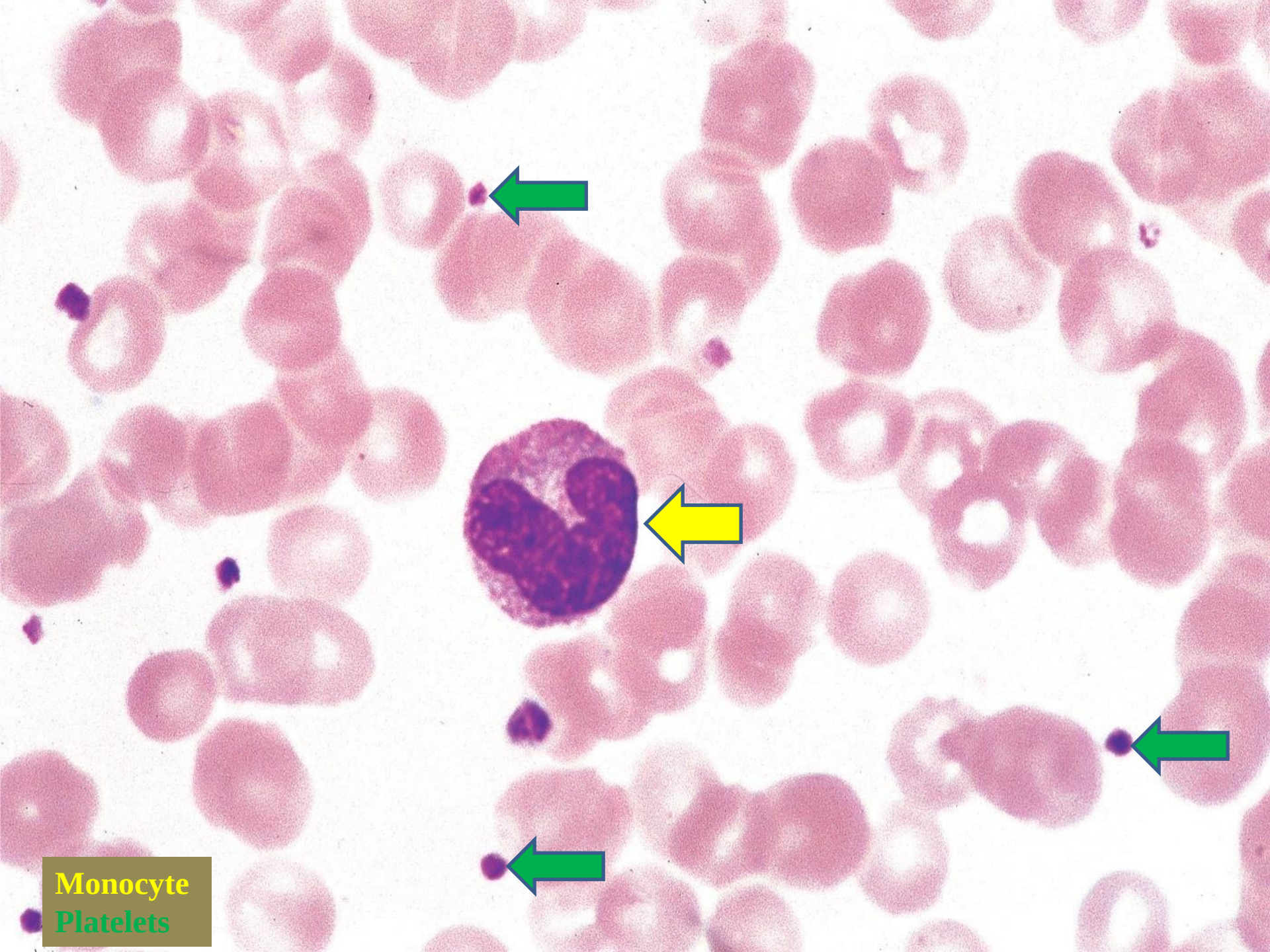


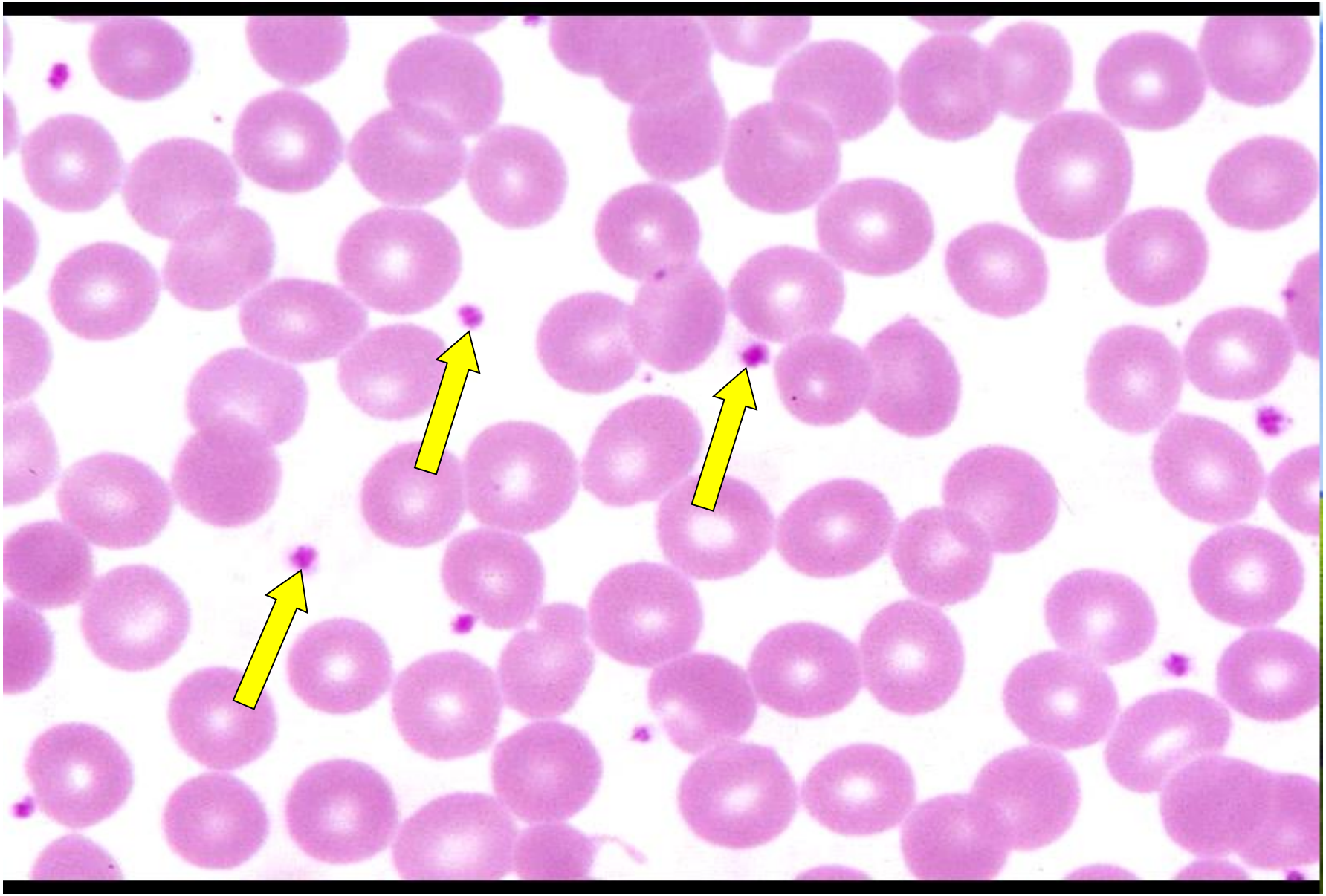
Monocyte



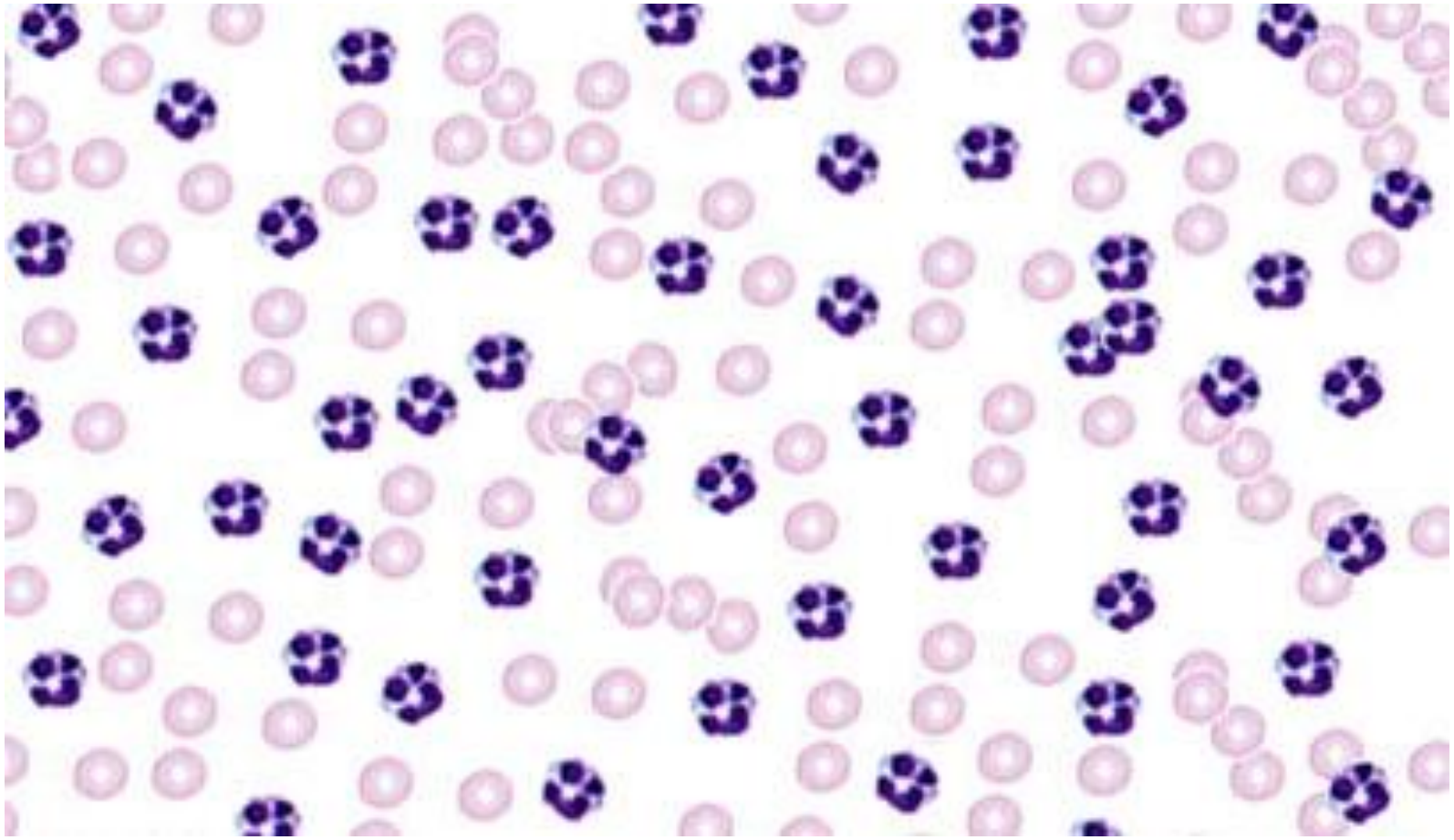
Basophil


Basophil
Neutrophil


Monocyte
Platelets



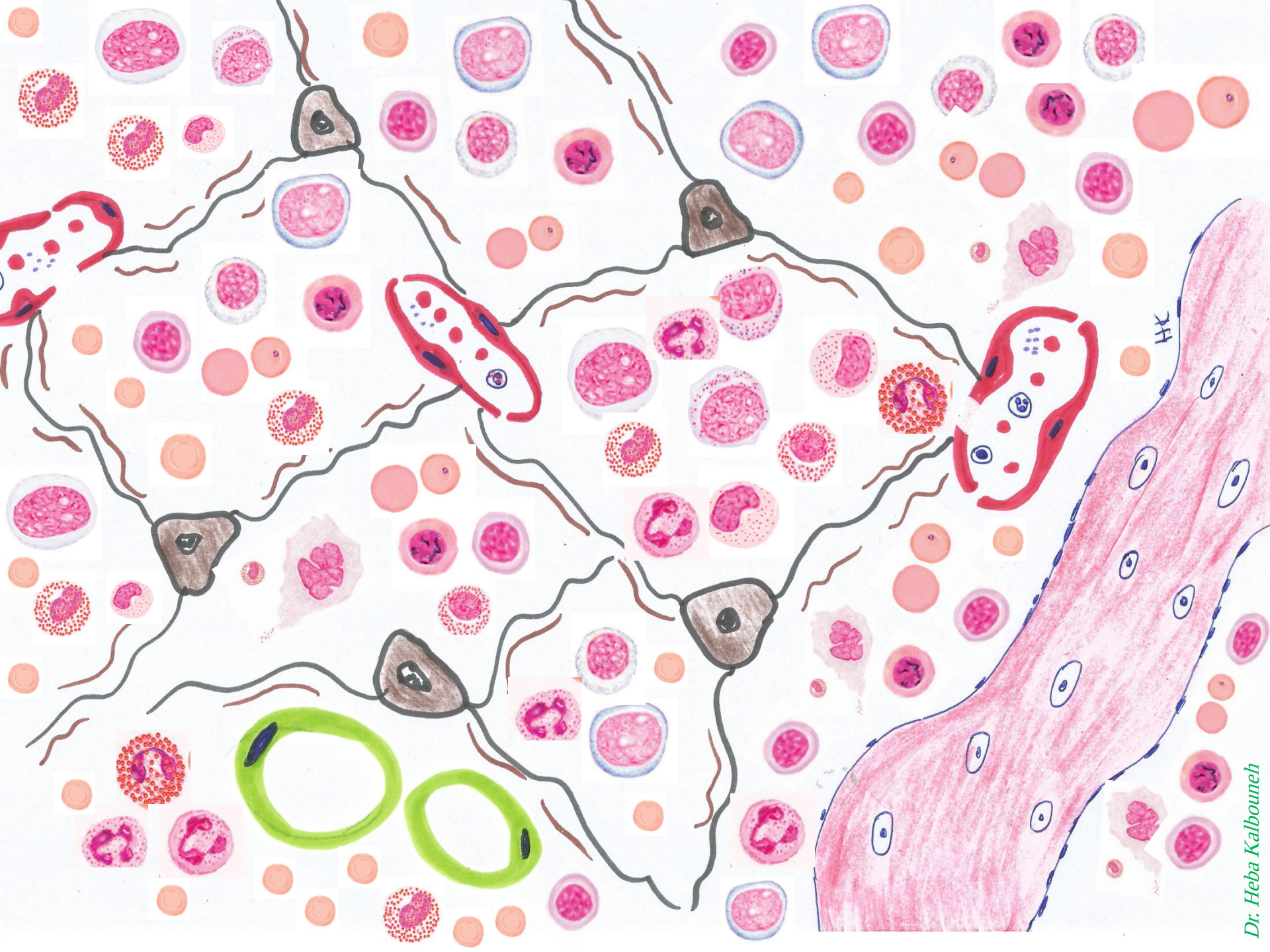
Platelets

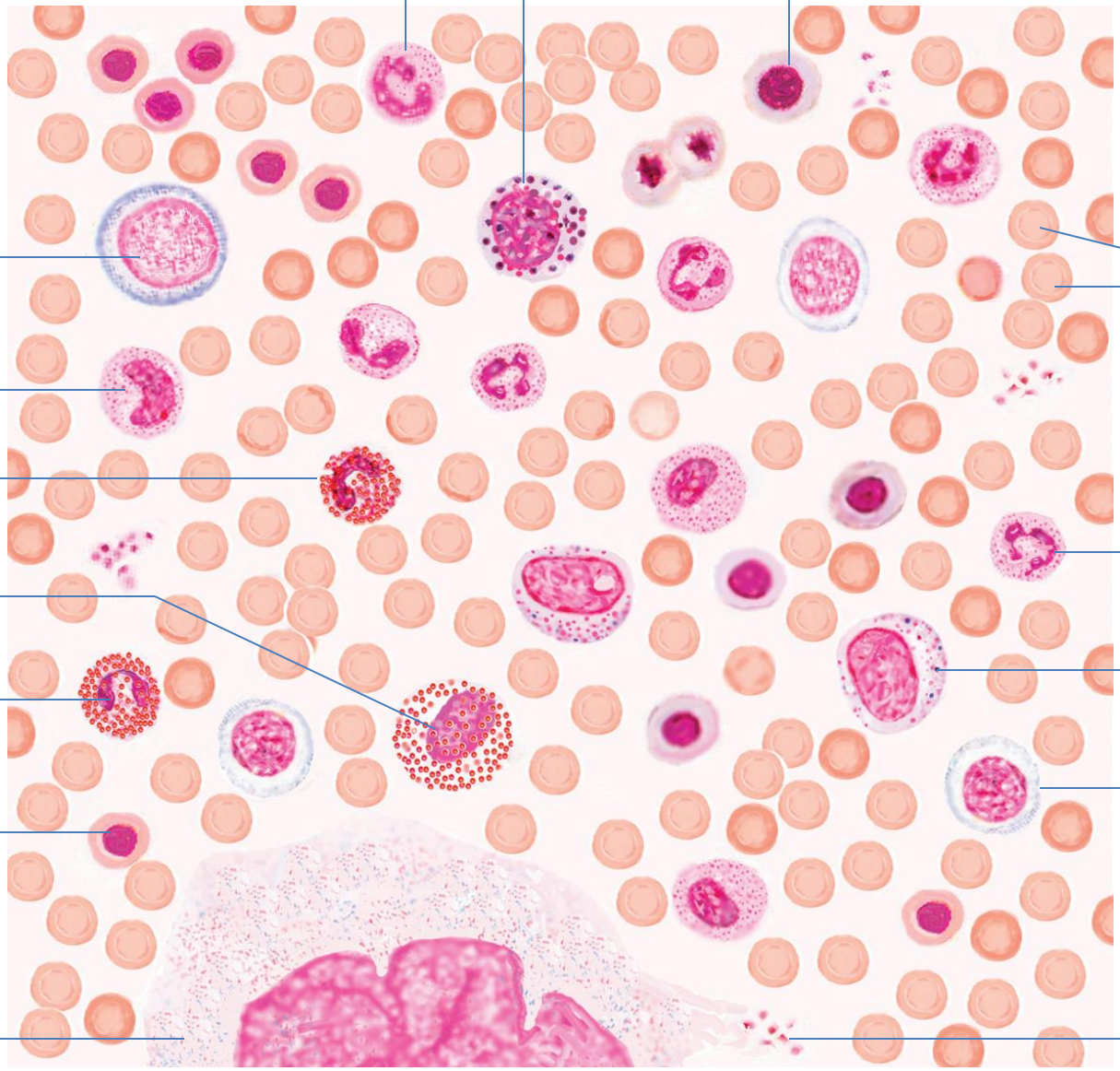


Don’t Worry, Be Happy! ☺

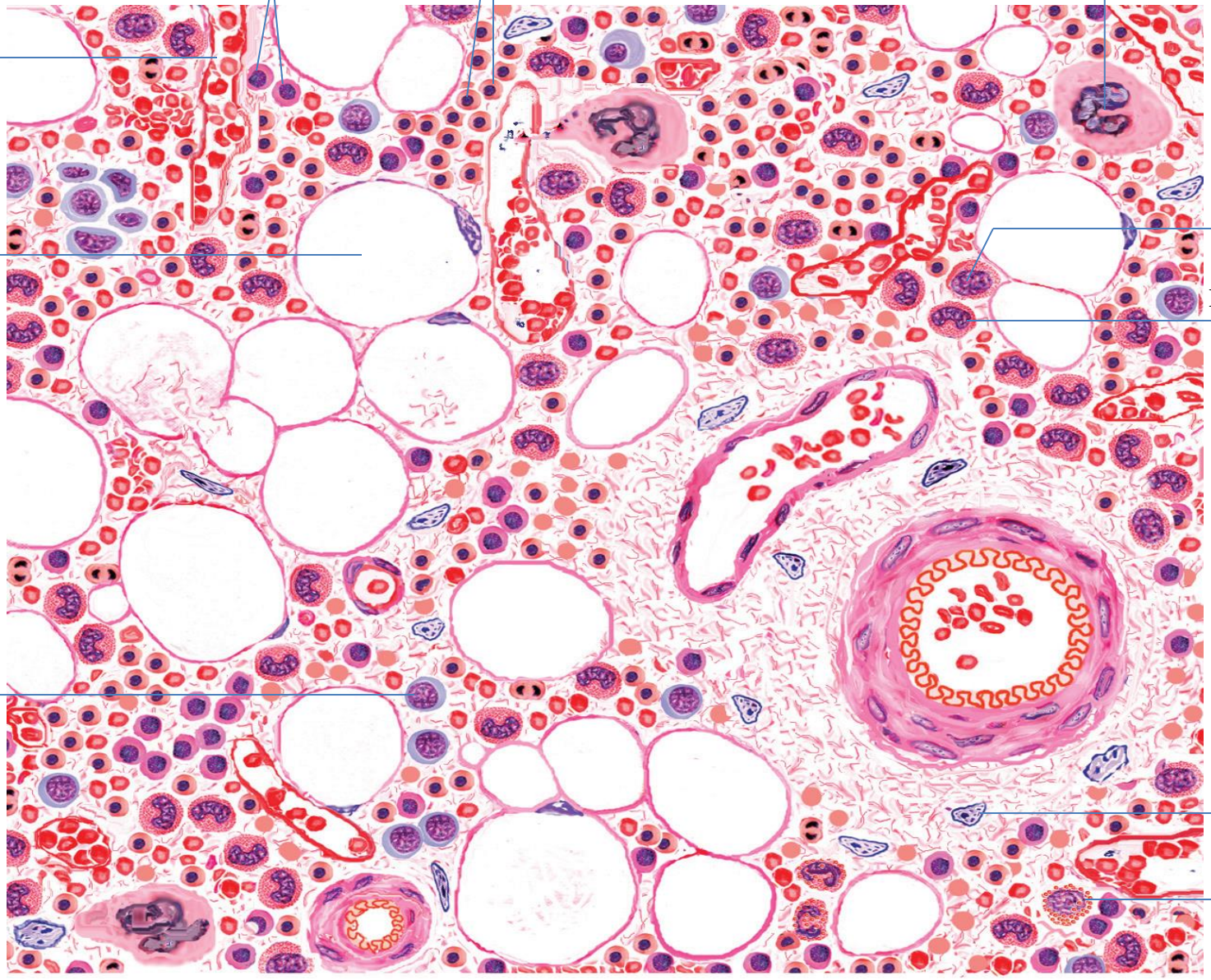
Bone marrow

Red bone marrow consists of hematopoietic cords (blood forming cells) and blood sinusoids supported by a reticular tissue.
While yellow bone marrow consists mainly of adipocytes

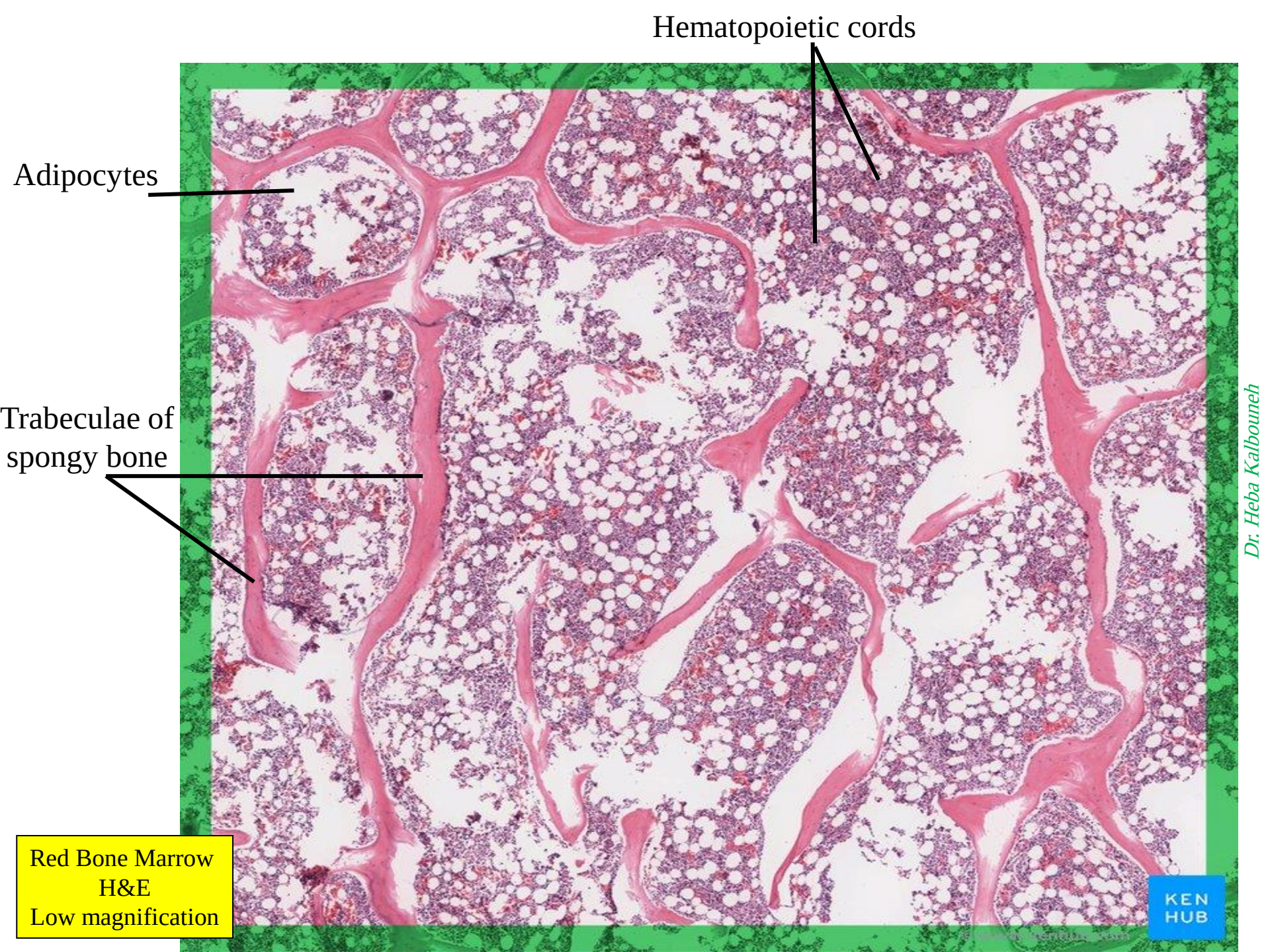

HE
Dr. Heba Kalbouneh

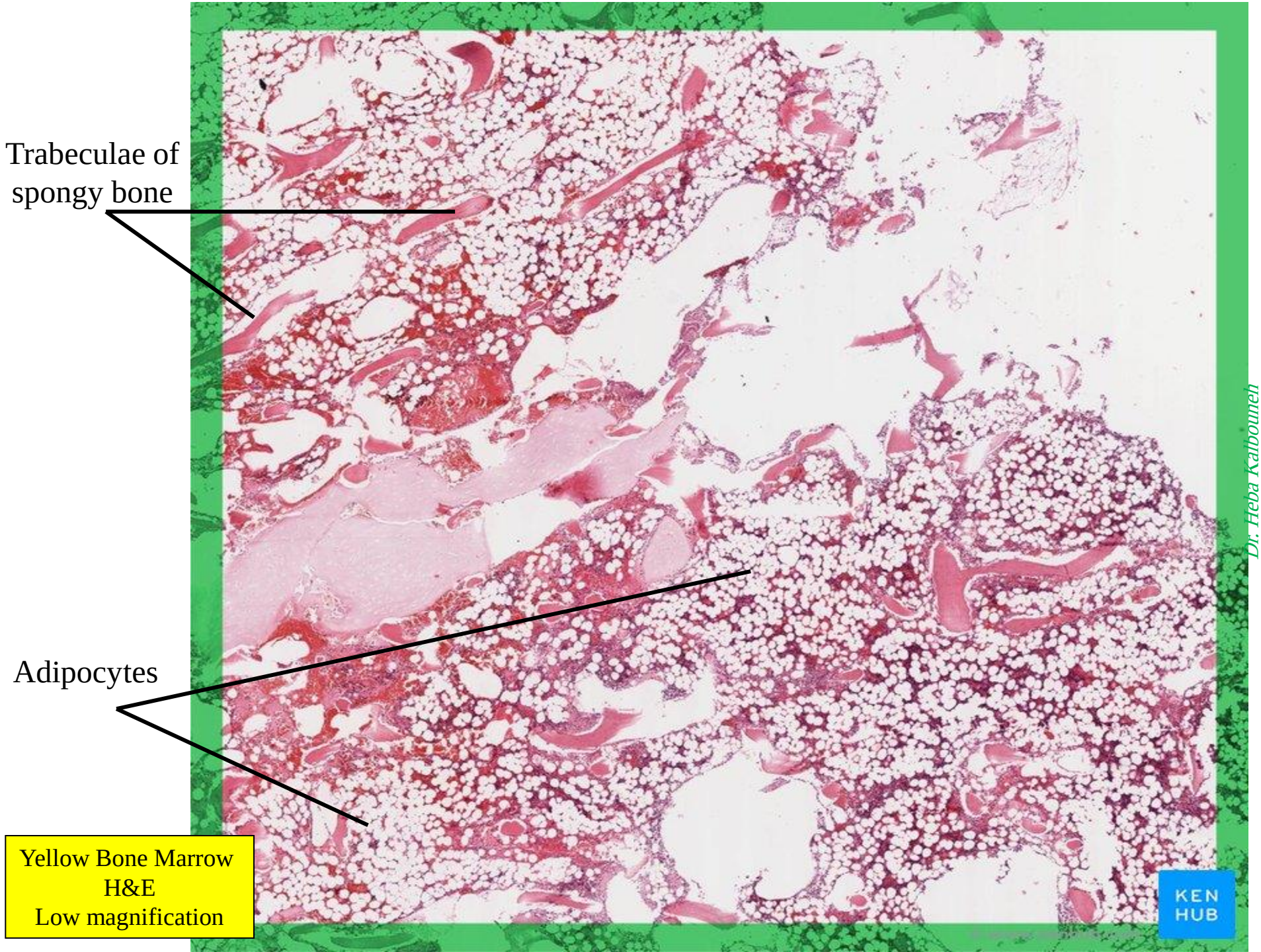


Red Bone Marrow (Giemsa stain)



Red Bone Marrow (H&E)

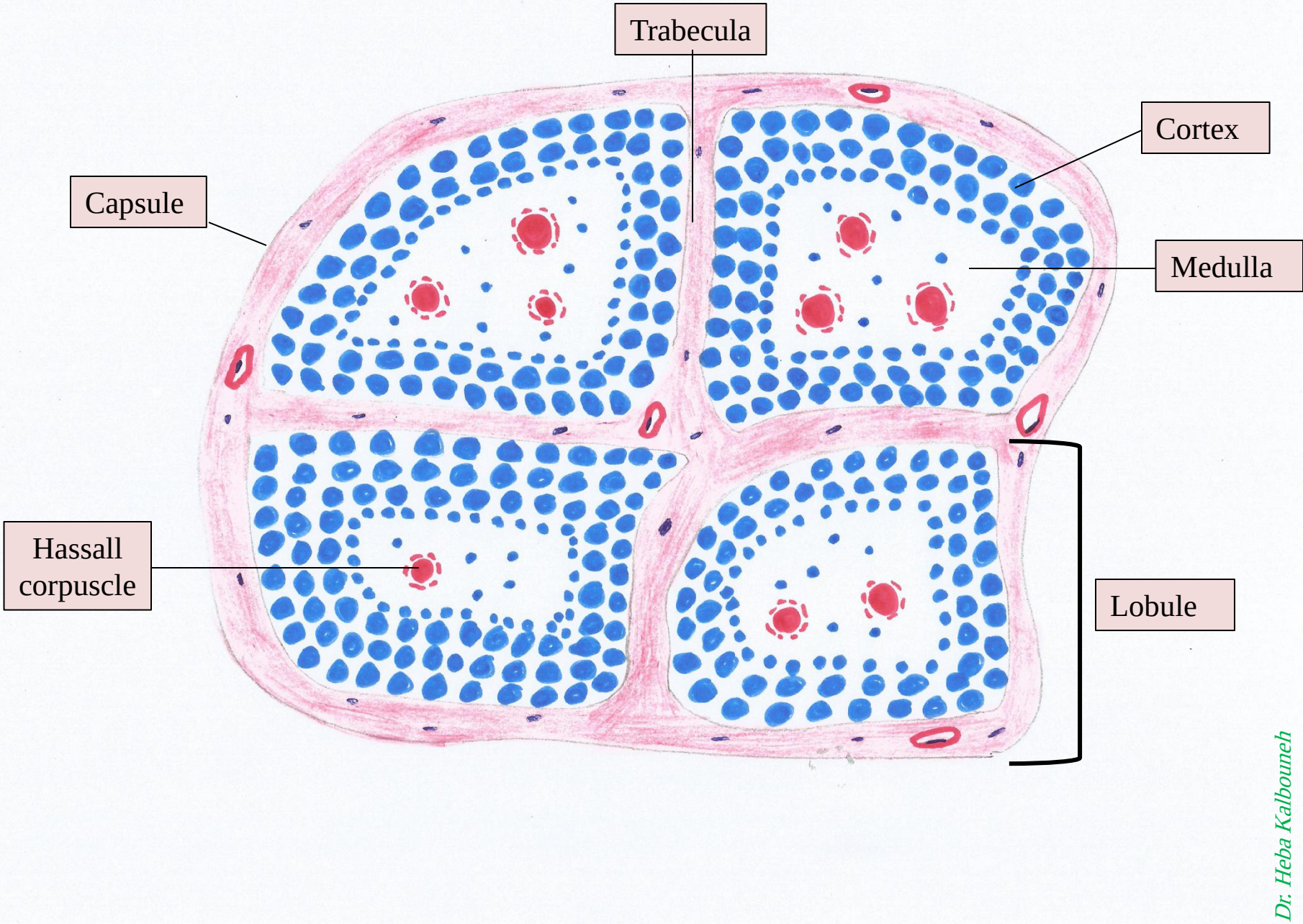

Hematopoietic cords
Adipocytes
Trabeculae of spongy bone
Red Bone Marrow
H&E
Low magnification
KEN HUB
Dr. Heba Kalbouneh

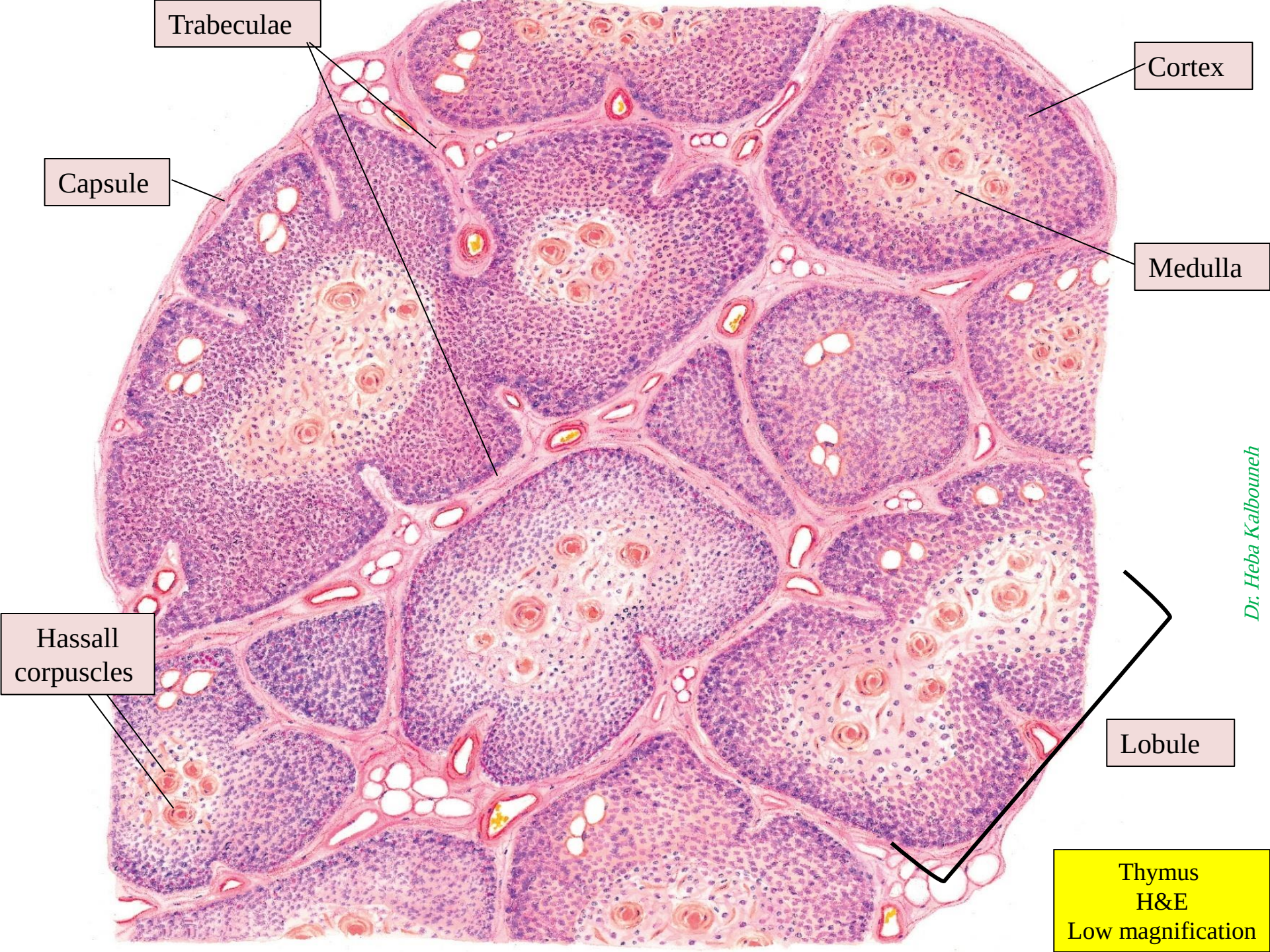

Trabeculae of spongy bone
Adipocytes
Yellow Bone Marrow
H&E
Low magnification
KEN HUB
Dr. Heba Kalbouneh

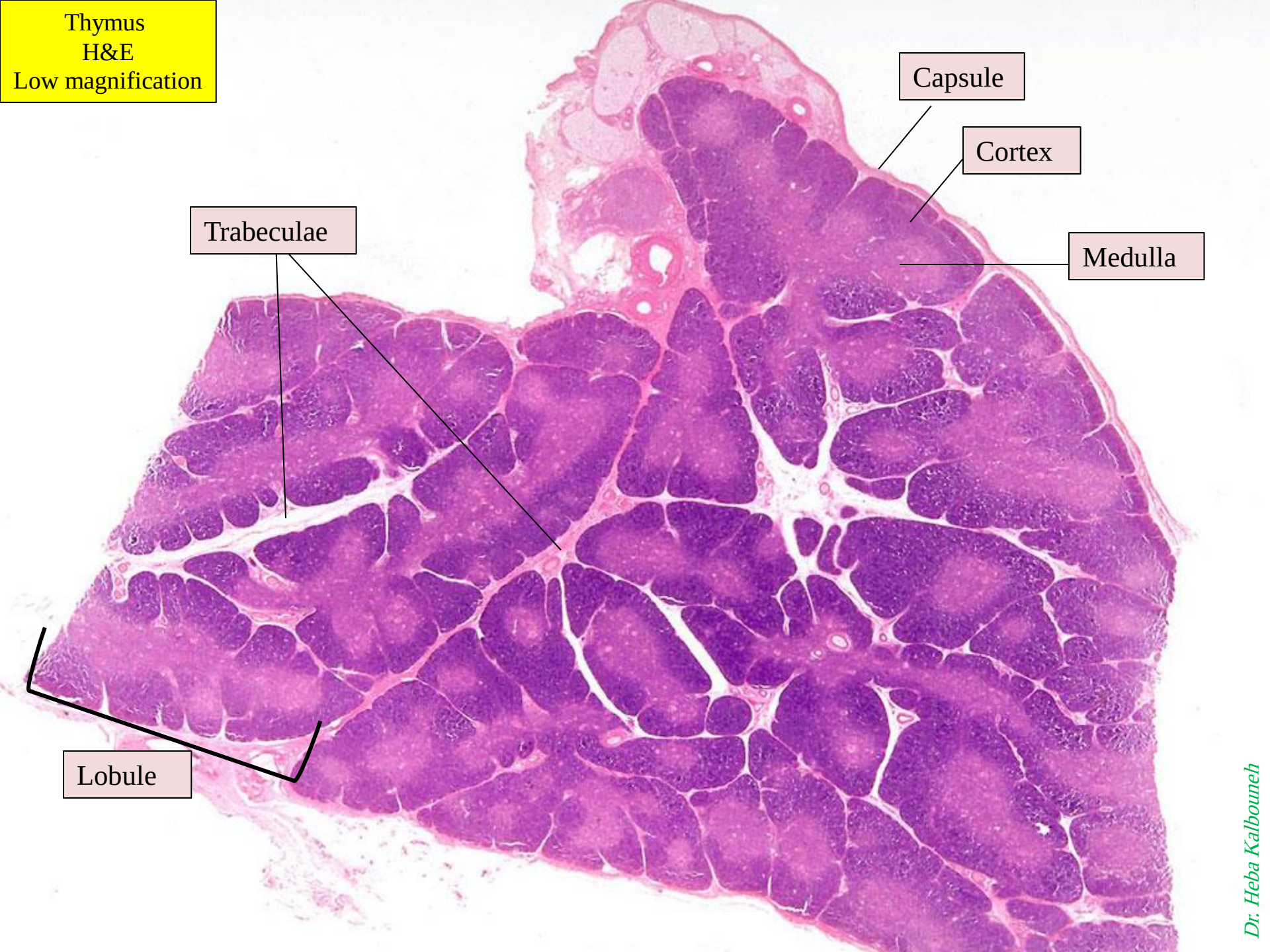
Thymus

Note that the gland is organized into numerous lobules. Each lobule contains a dark-staining outer cortex and inner medulla. Also note the capsule that extends into the thymus to form the interlobular septa (trabeculae) that separate the lobules. The capsule and septa contain blood vessels, lymphatics and nerves.

Note also that thymus has no lymphoid follicles

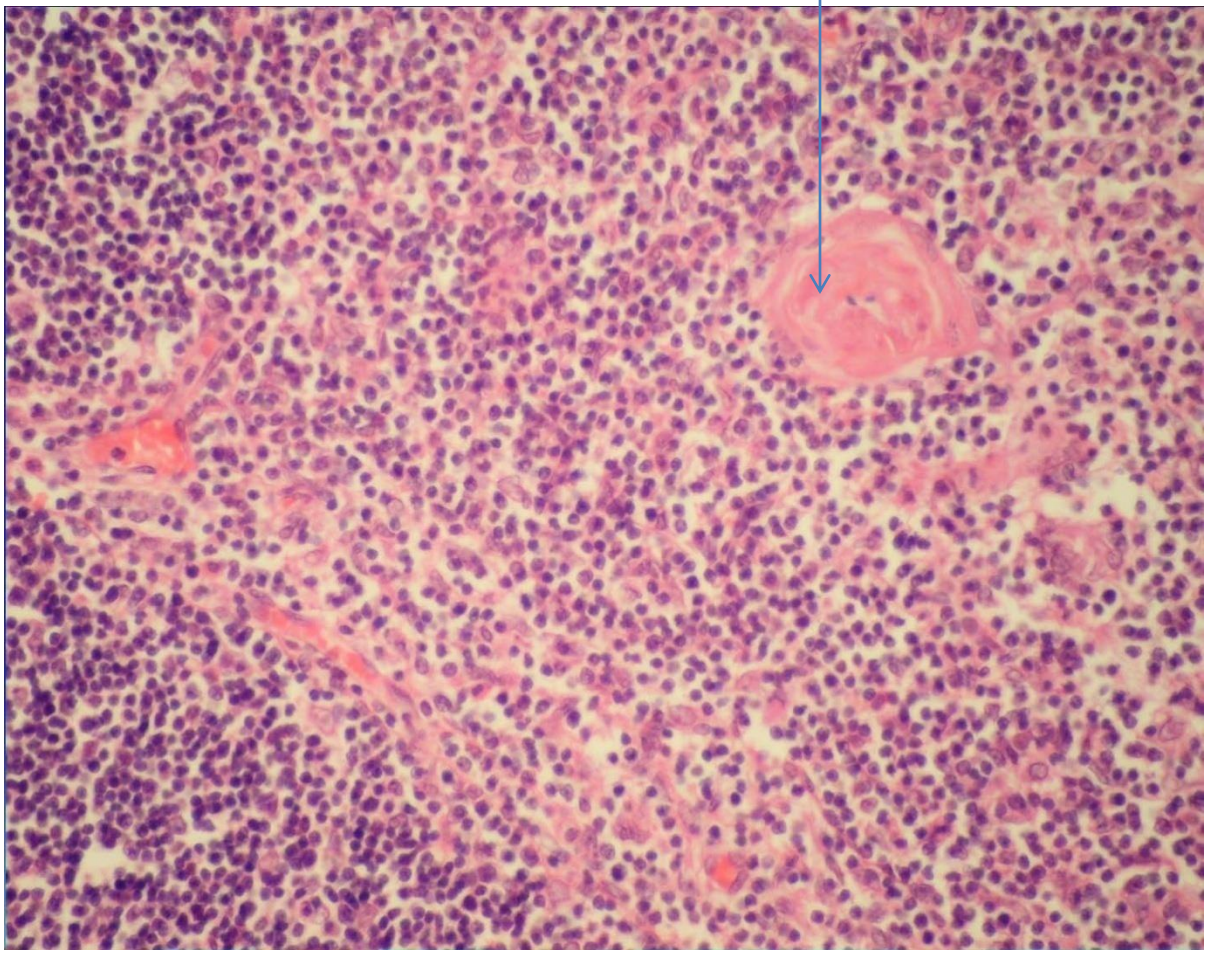



Trabeculae
Cortex
Capsule
Medulla
Hassall corpuscles
Lobule
Dr. Heba Kalbouneh
Thymus
H&E
Low magnification


Thymus
H&E
Low magnification
Capsule
Cortex
Trabeculae
Medulla
Lobule
Dr. Heba Kalbouneh

Thymic medulla
H&E
High magnification

Hassall
Corpuscle in medulla



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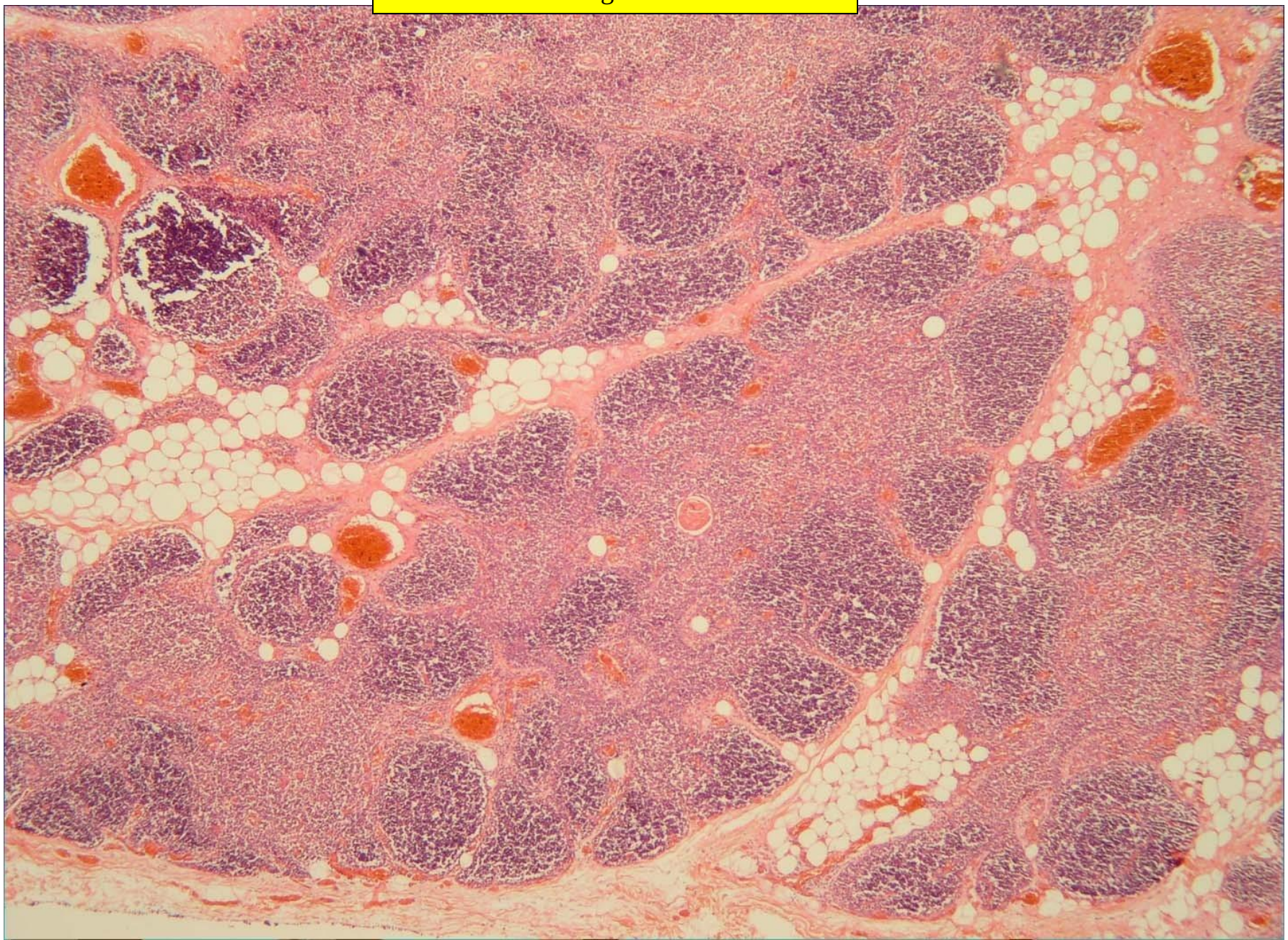
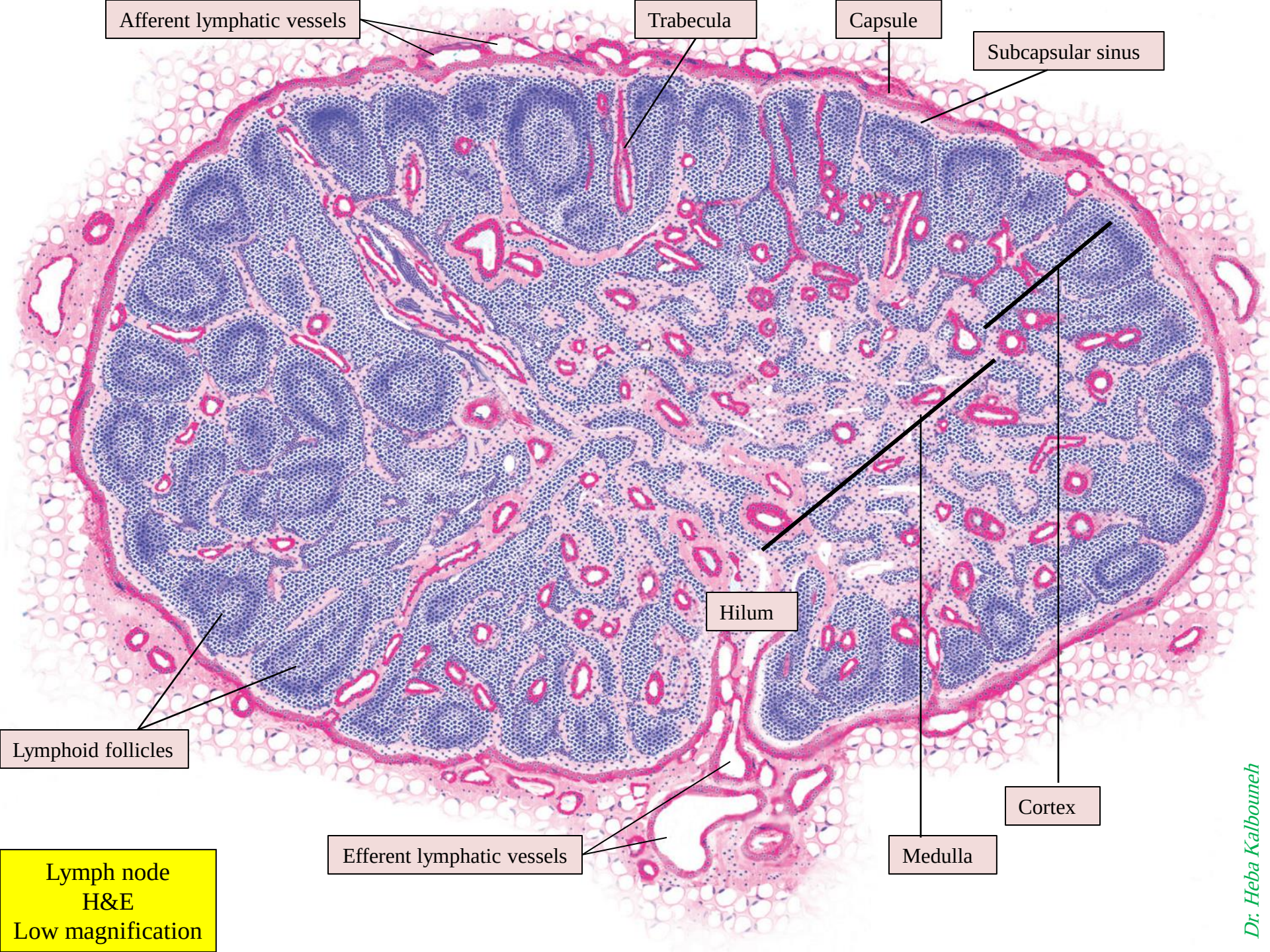
Involuted Thymus
H&E
Low magnification



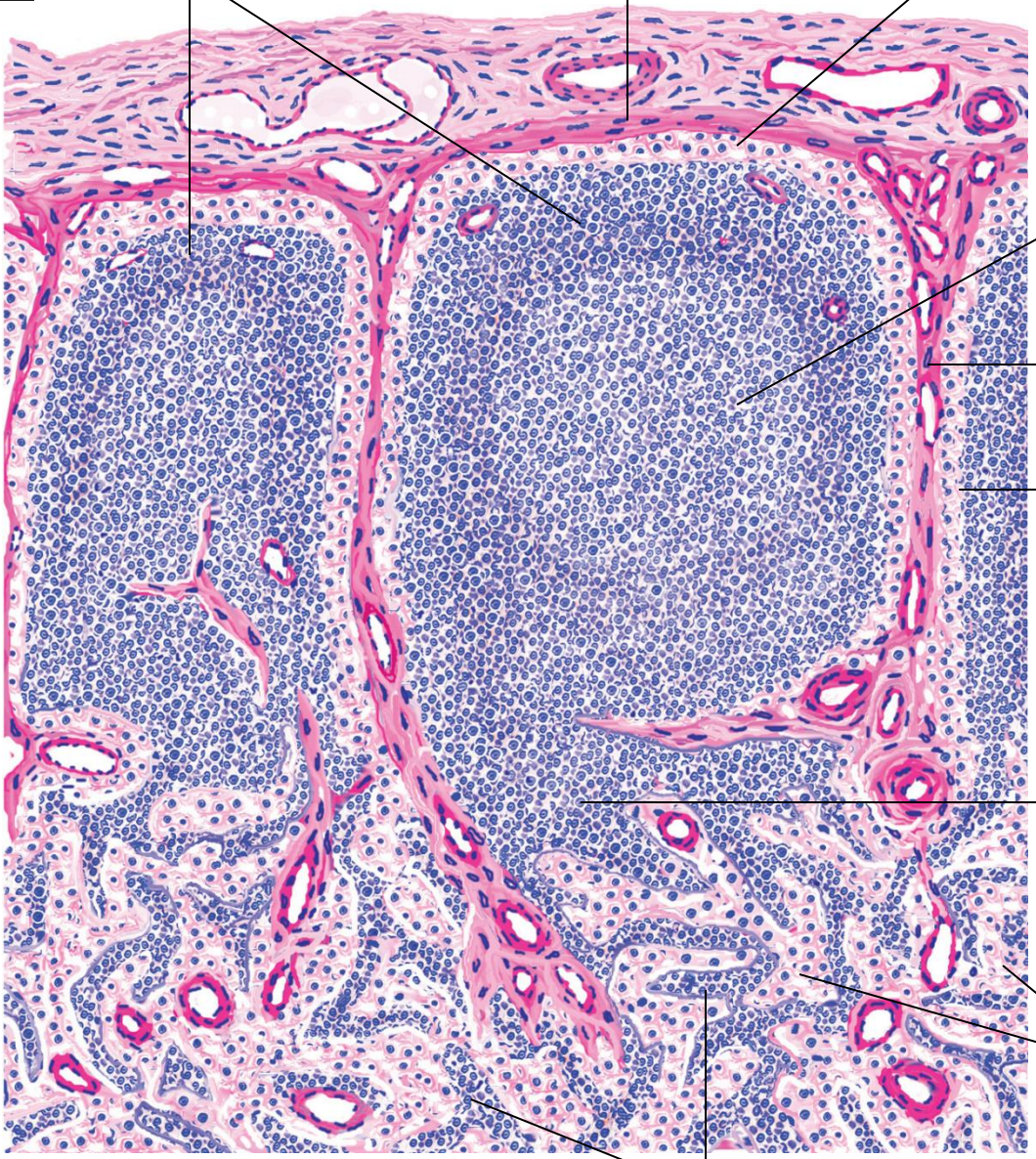
Lymph nodes

The lymph node is encased by a capsule. The lymph enters the node via afferent lymphatic vessels. The capsule and trabeculae, which extend into the node from the capsule, provide the main structural support. Note the B-cell containing lymphoid follicles located in the outer cortex. The medulla contains medullary cords (aggregates of lymphoid tissue) and medullary sinuses (lymphatic channels). Between the outer cortex and medulla lies an ill-defined region called the paracortex (inner cortex). The hilum of the lymph node is the location where blood vessels enter and exit the node. It is also where the medullary sinuses merge into efferent lymphatic vessels, which carry the lymph away from the node.

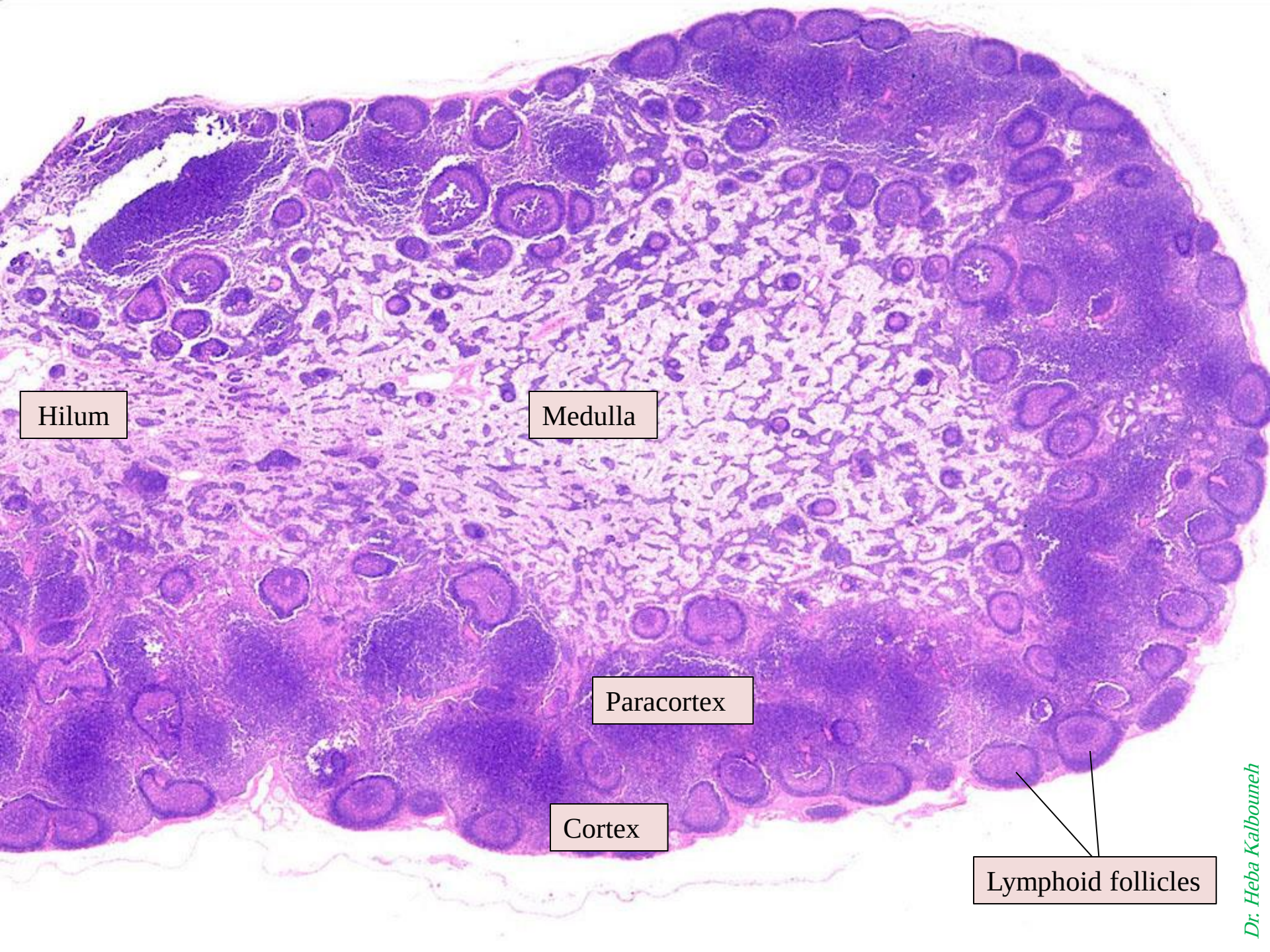


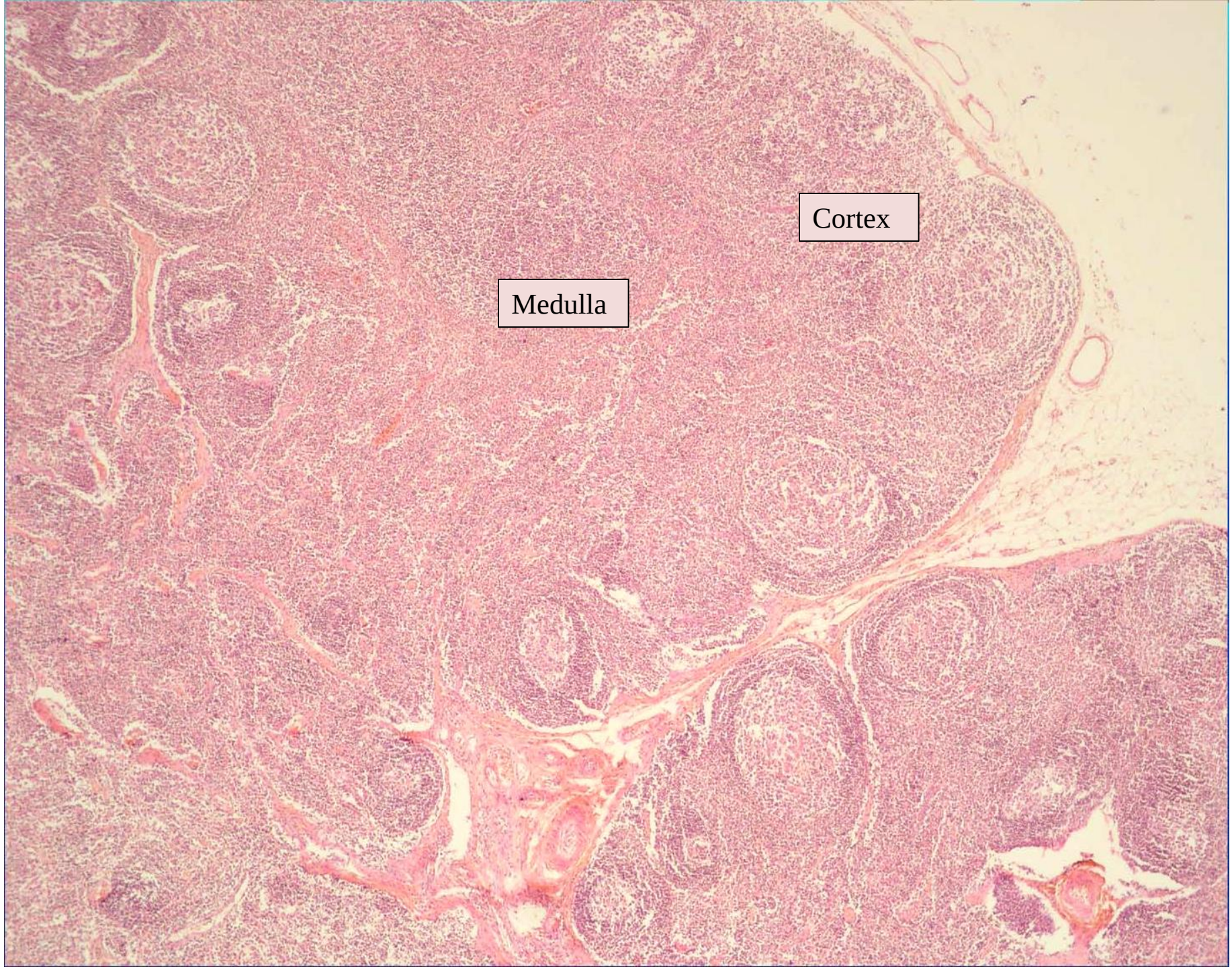
Lymph node
H&E
Low magnification

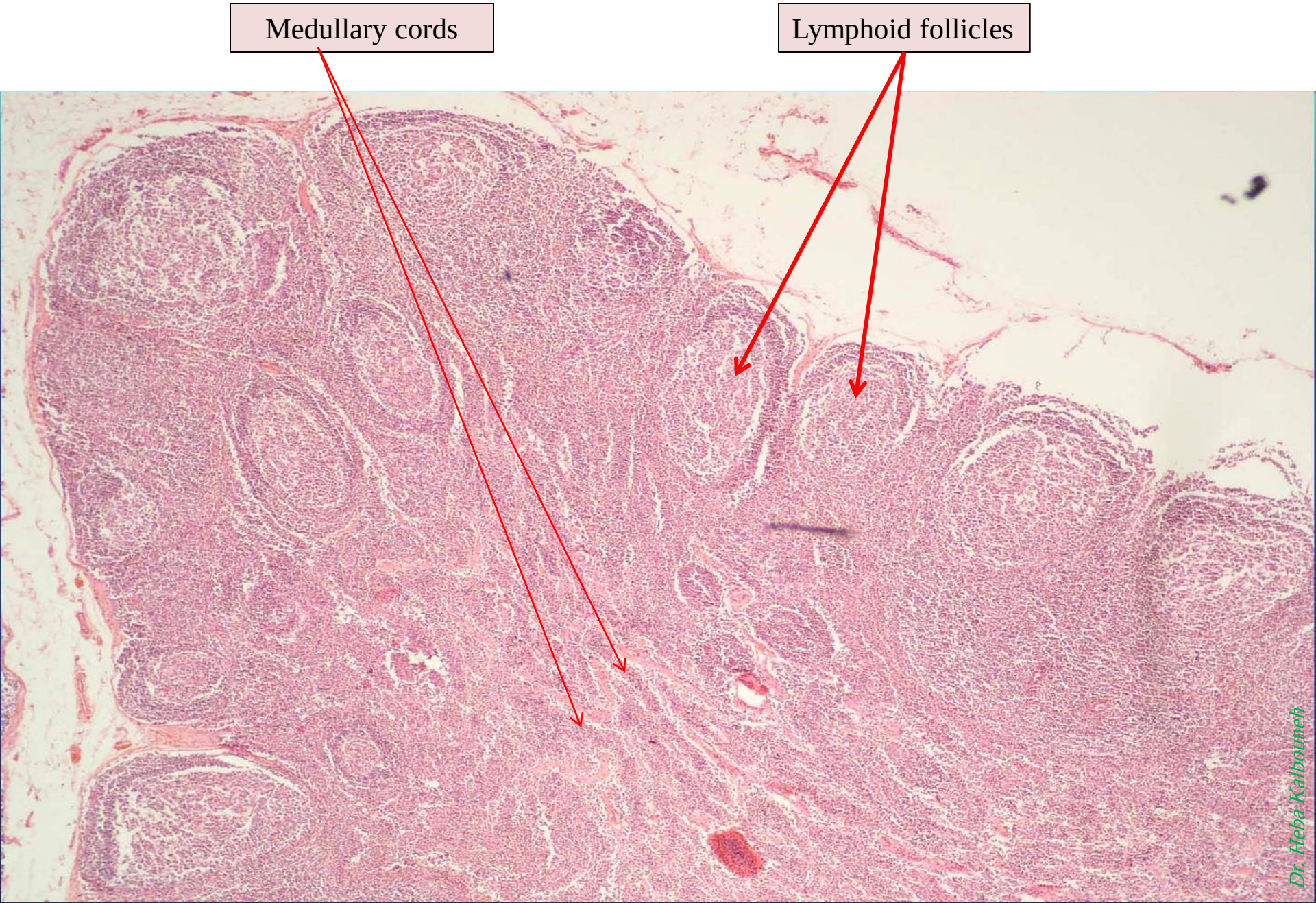
Lymph node
H&E
Higher magnification



Lymphoid follicles
Capsule
Subcapsular sinus
Germinal center
Trabecula
Subtrabecular sinus
Cortex
Paracortex
What type of cells would you expect to find in the paracortex?
Medulla
Medullary sinuses
Medullary cords






Medullary cords
Lymphoid follicles
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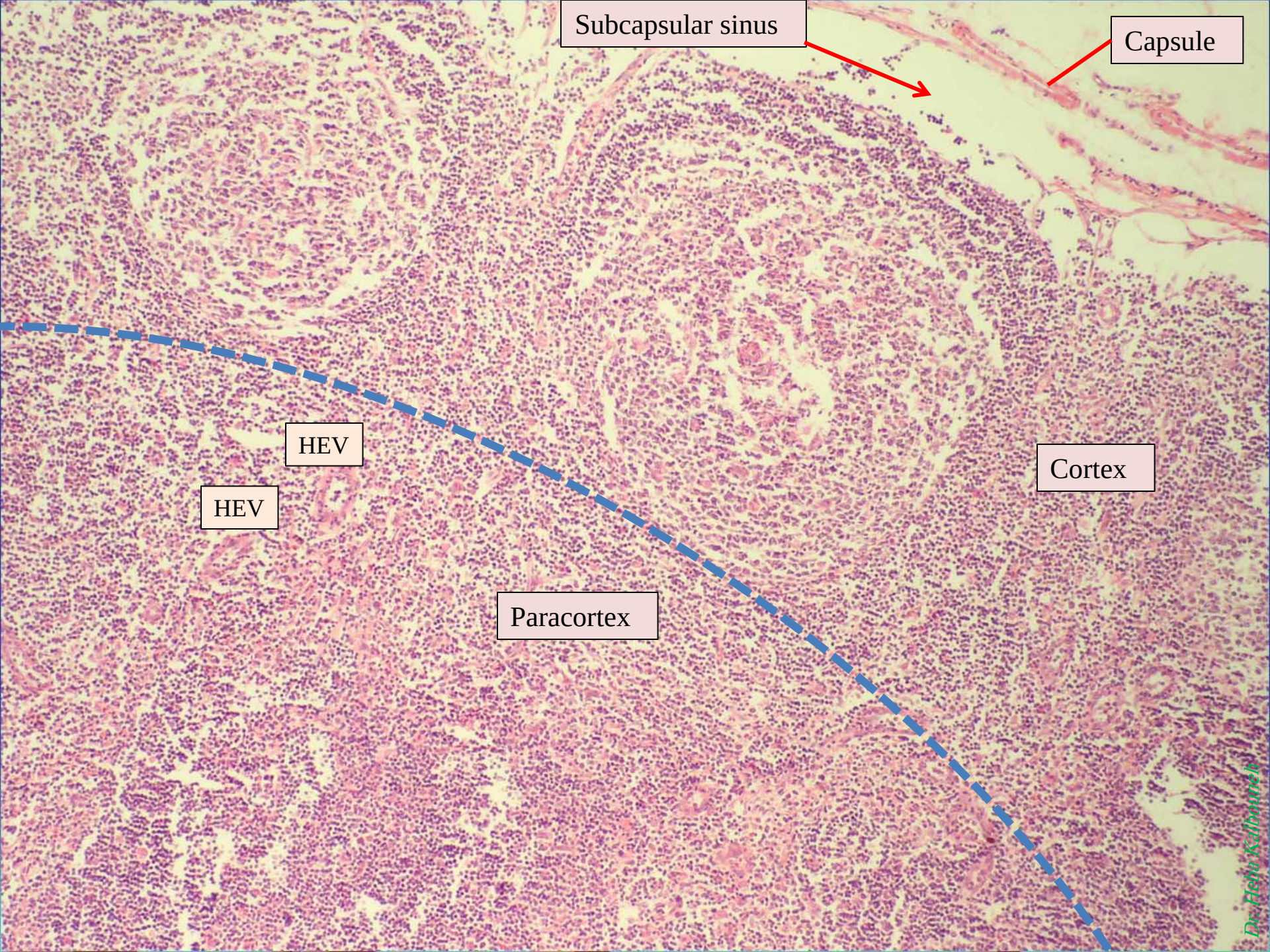
Subcapsular sinus
Capsule
HEV
HEV
Cortex
Paracortex
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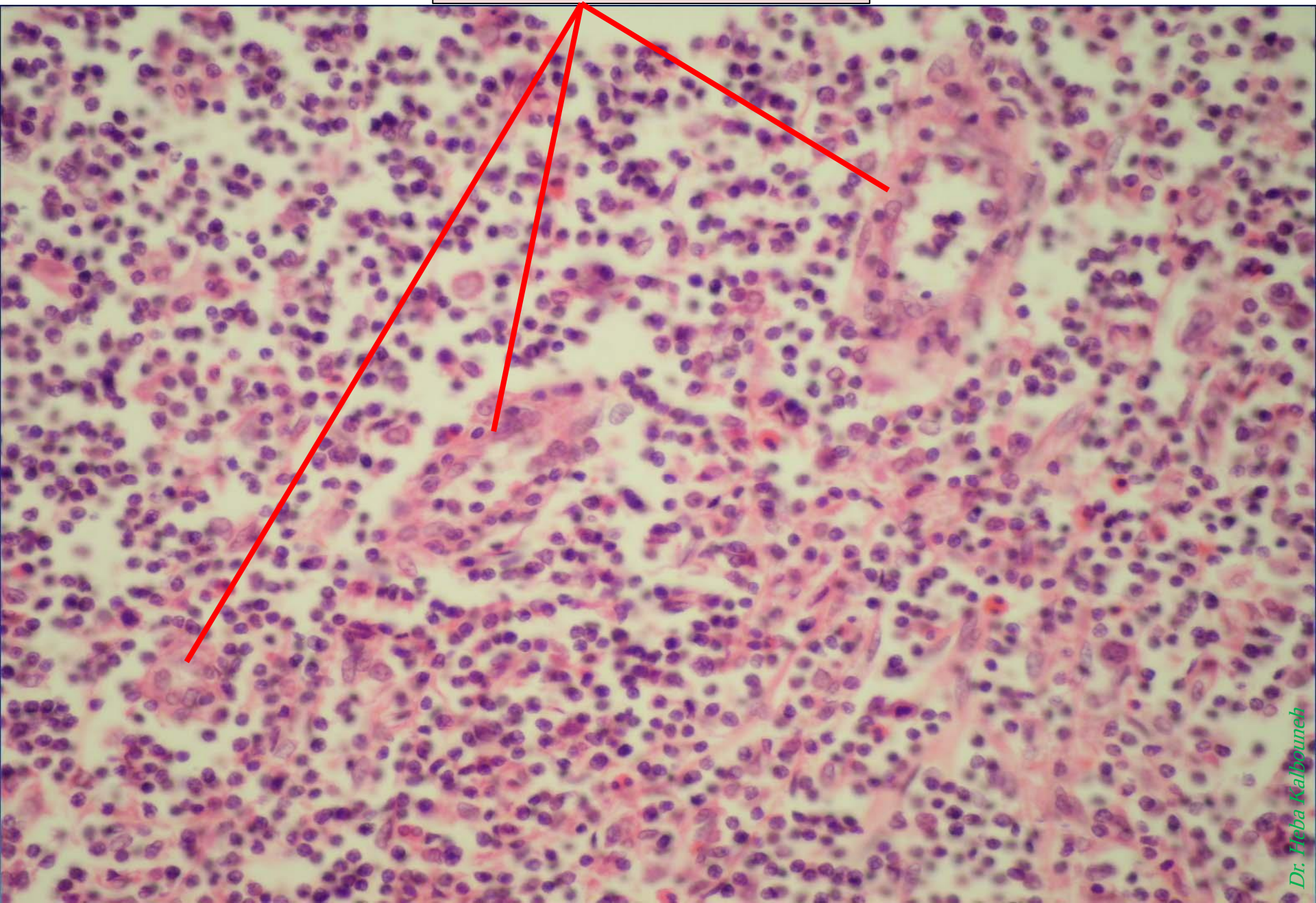
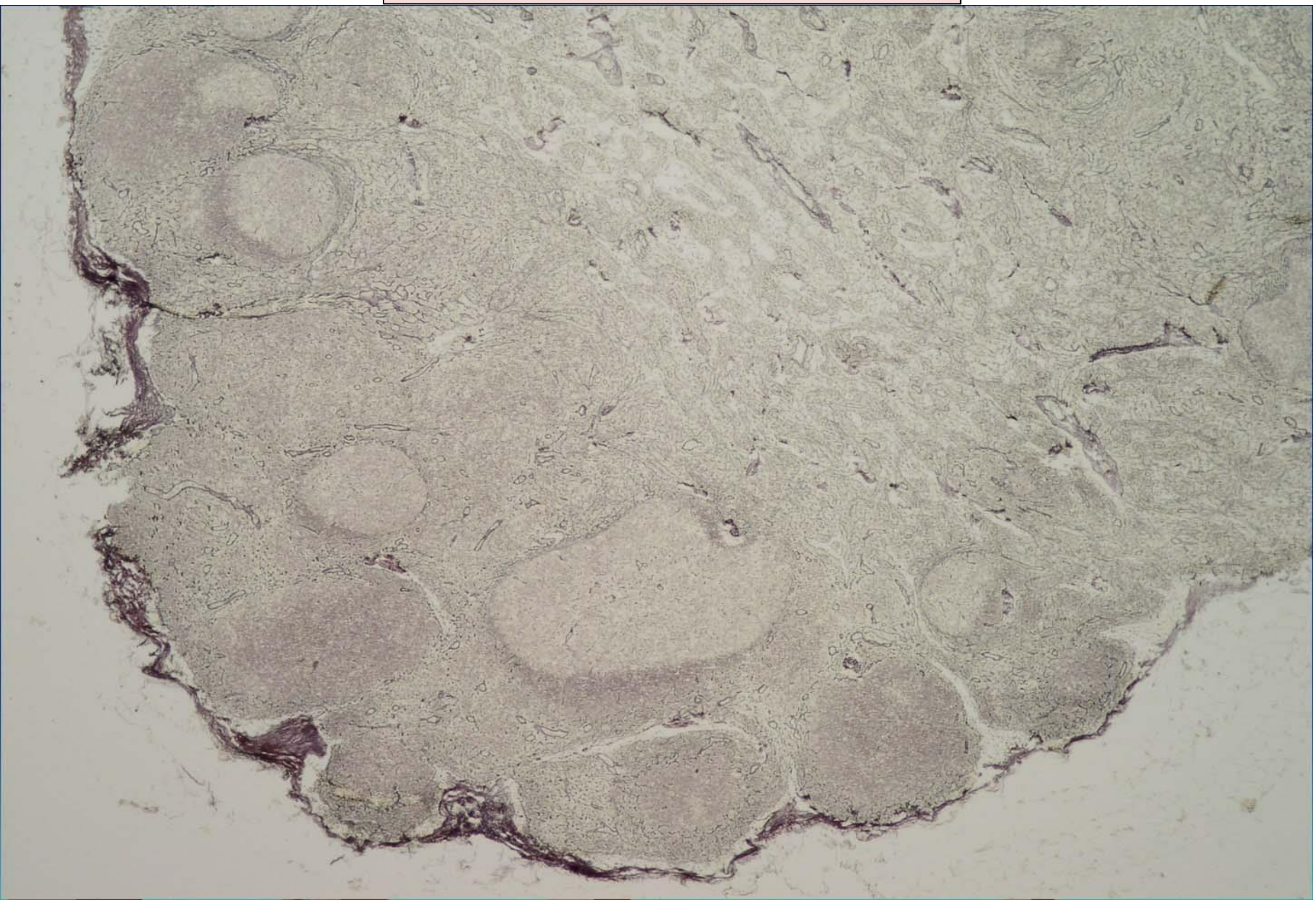
HEVs in paracortex



Lymph node- Silver Stain

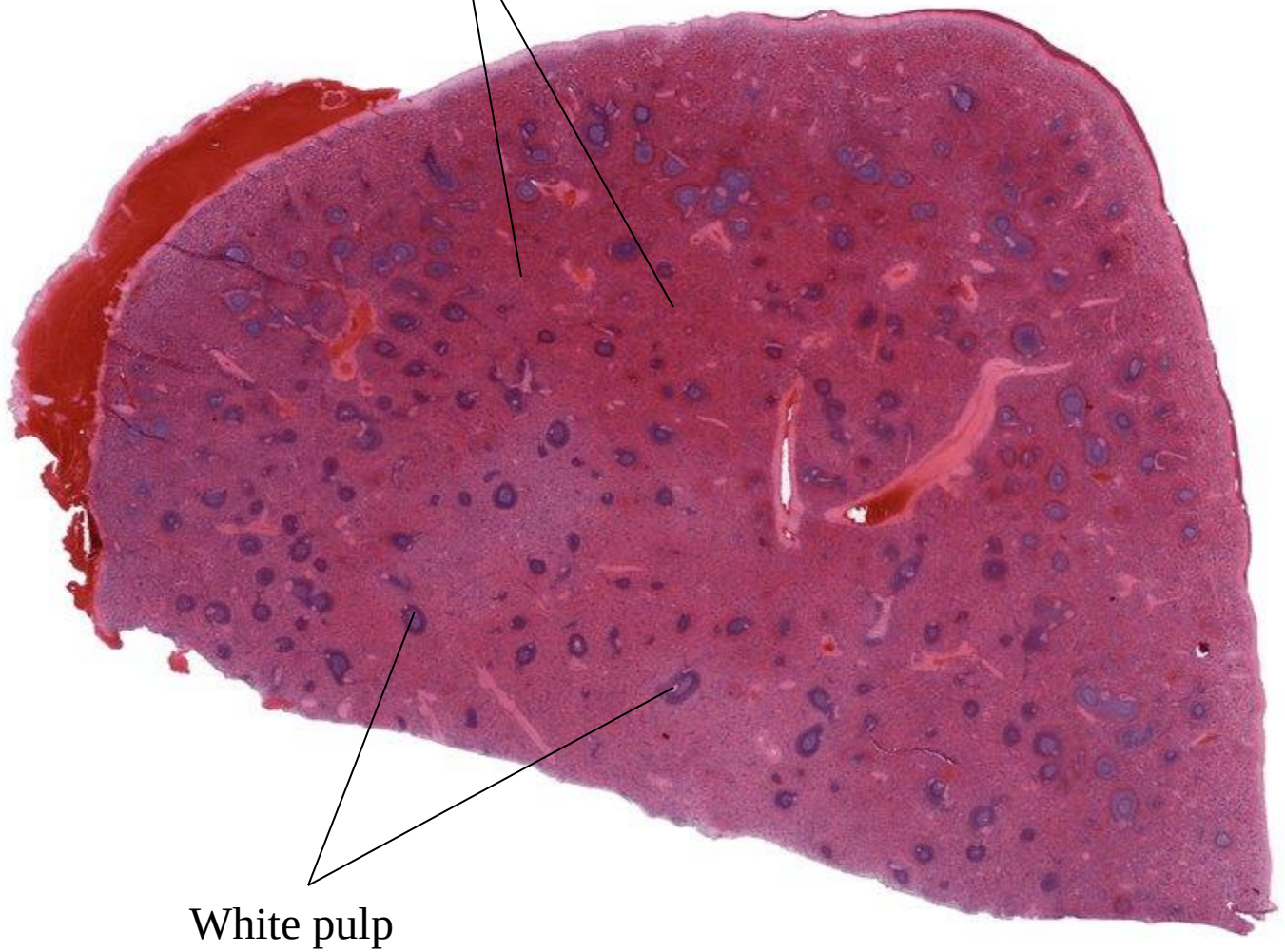
Remember: reticular fibers are argyrophilic

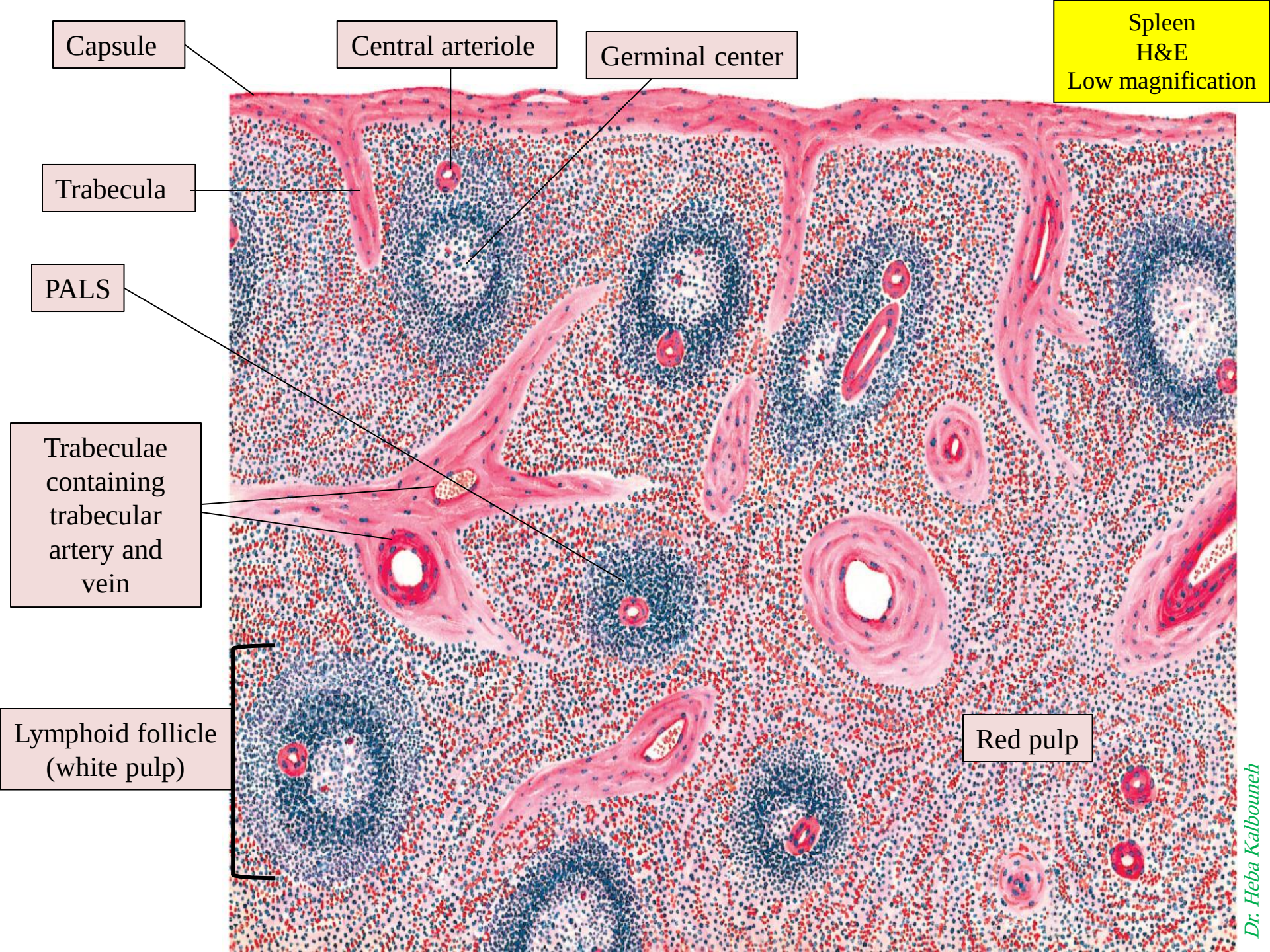


Spleen

On the outer edge of spleen, note the presence of a capsule from which short trabeculae (containing a trabecular artery and trabecular vein) extend into the parenchyma. In contrast to lymph nodes and thymus, the spleen is not arranged into cortex and medulla. Instead, the majority of the spleen consists of well-vascularized red pulp (pale-stained due to lower cell density) with white pulp (lymphoid aggregations) scattered throughout. Note the presence of sinuses within the red pulp.

Spleen
Gross observation




Capsule
Central arteriole
Germinal center
Spleen
H&E
Low magnification
Trabecula
PALS
Trabeculae containing trabecular artery and vein
Lymphoid follicle (white pulp)
Red pulp
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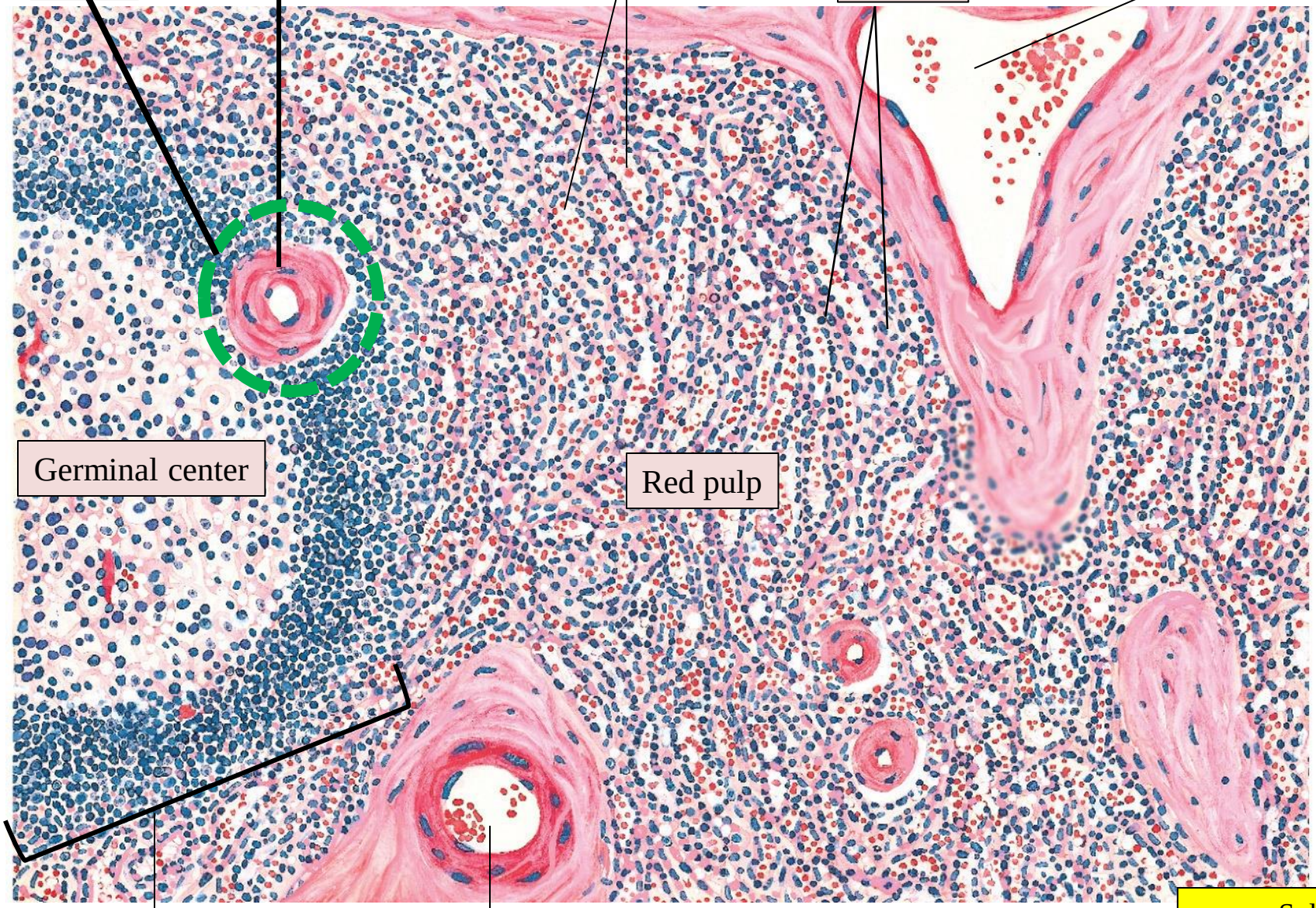

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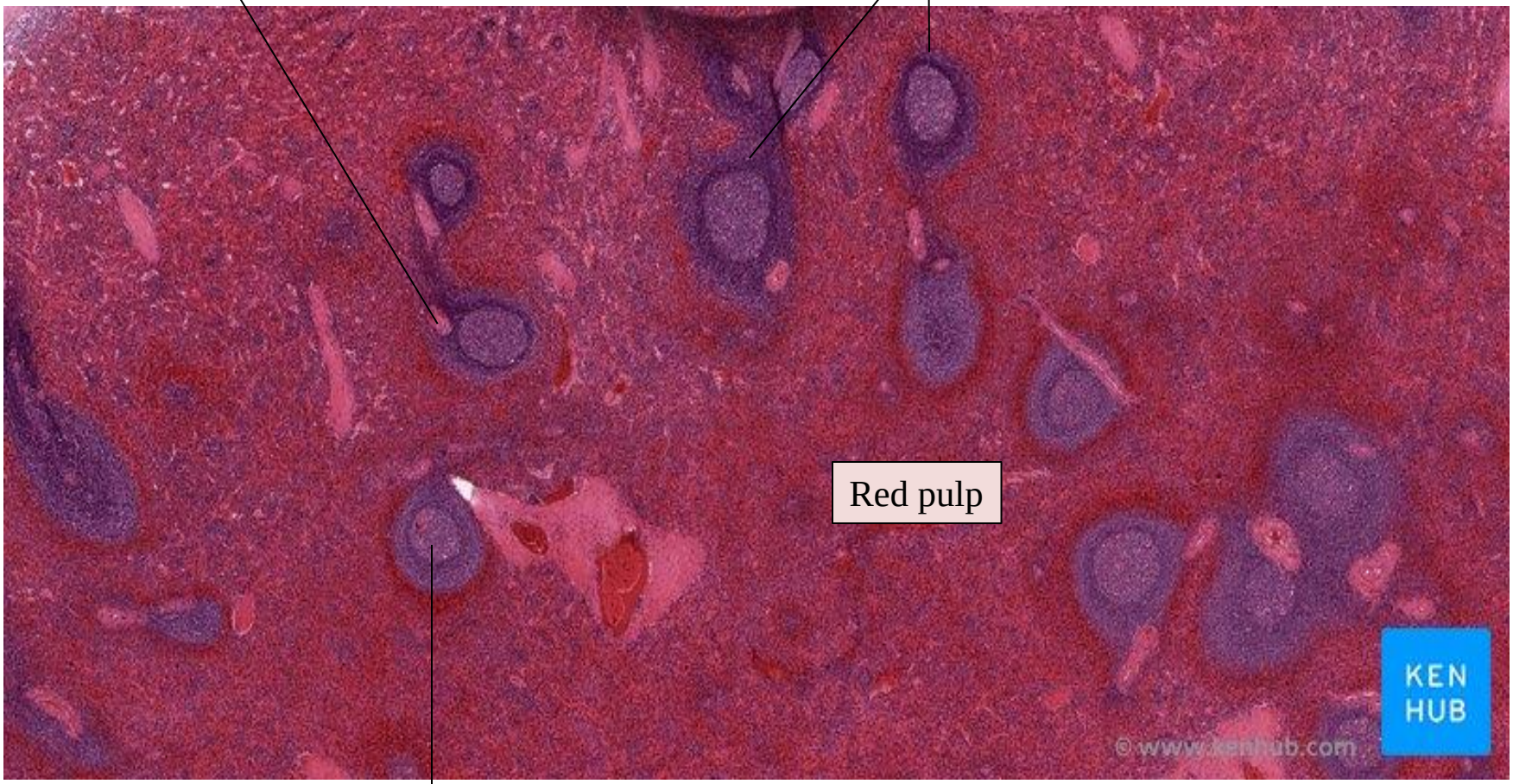
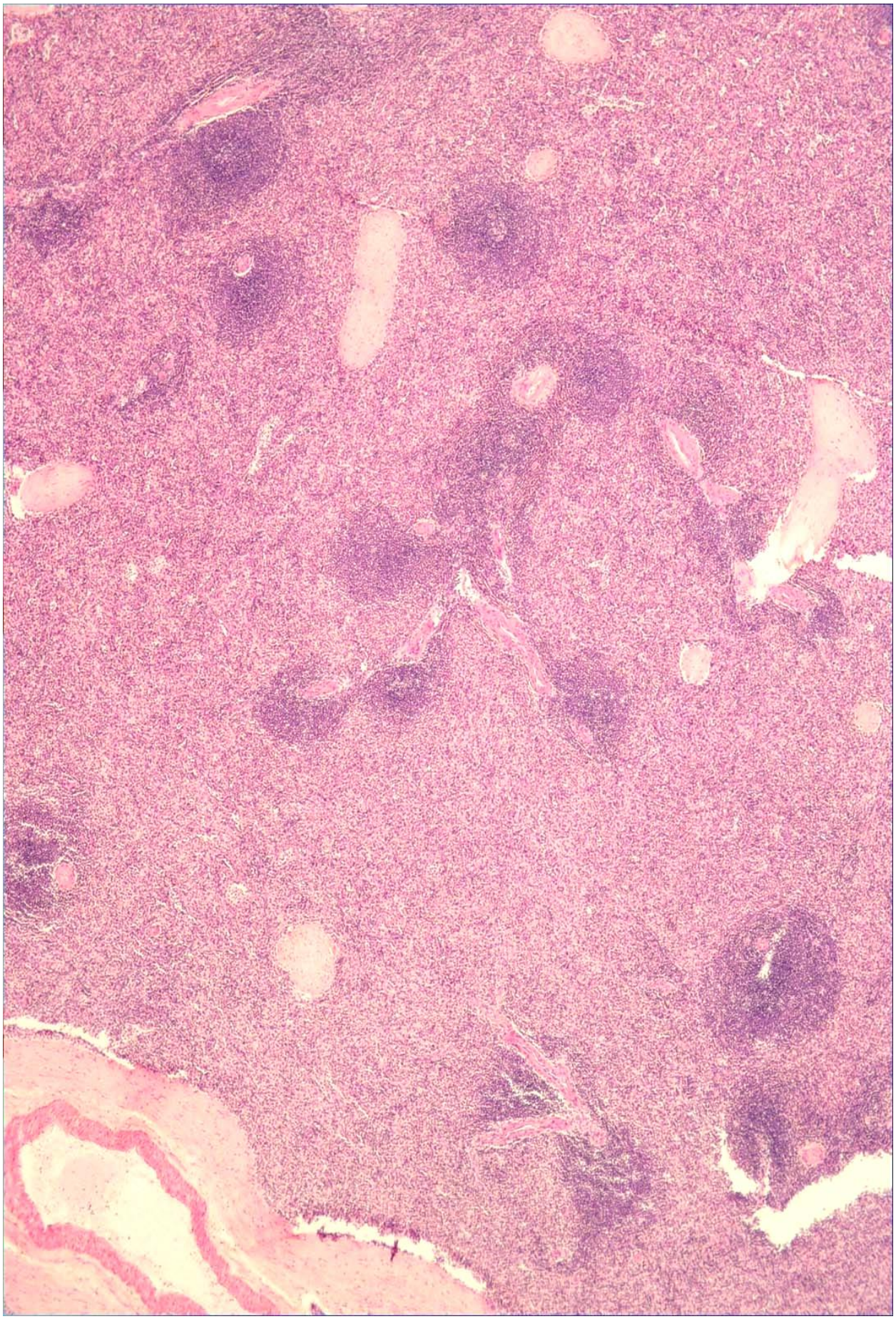
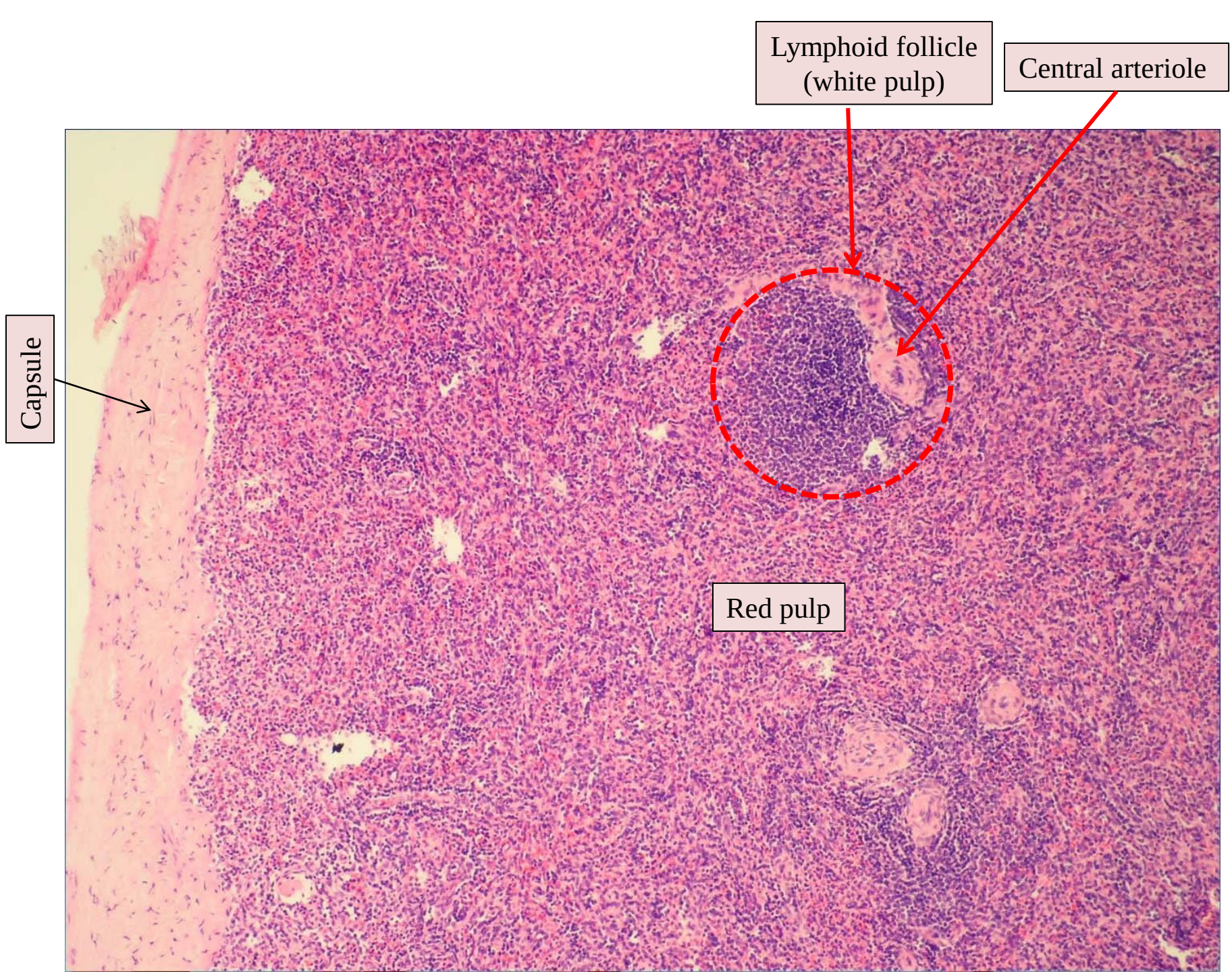
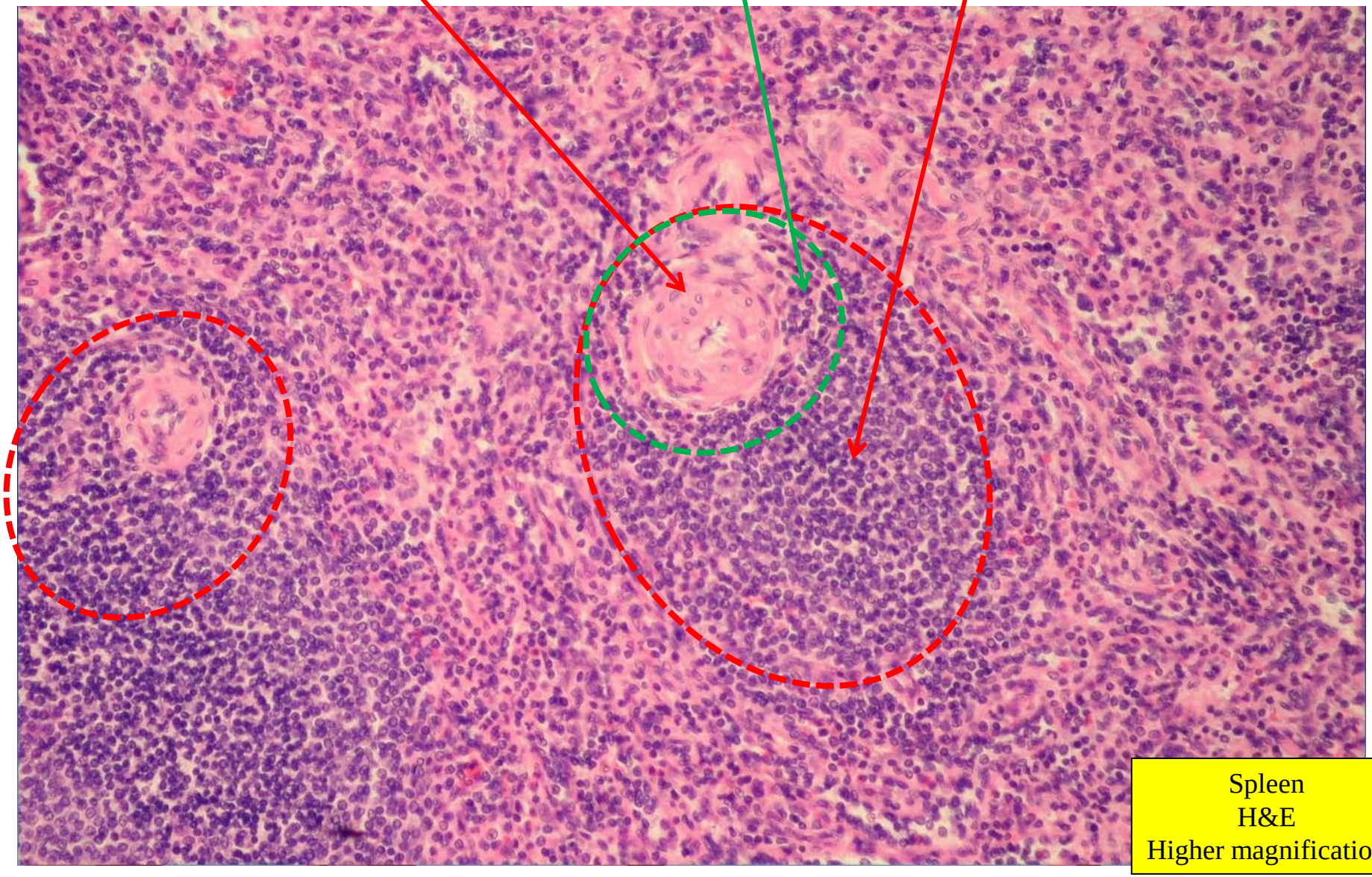
Spleen
H&E
Higher magnification





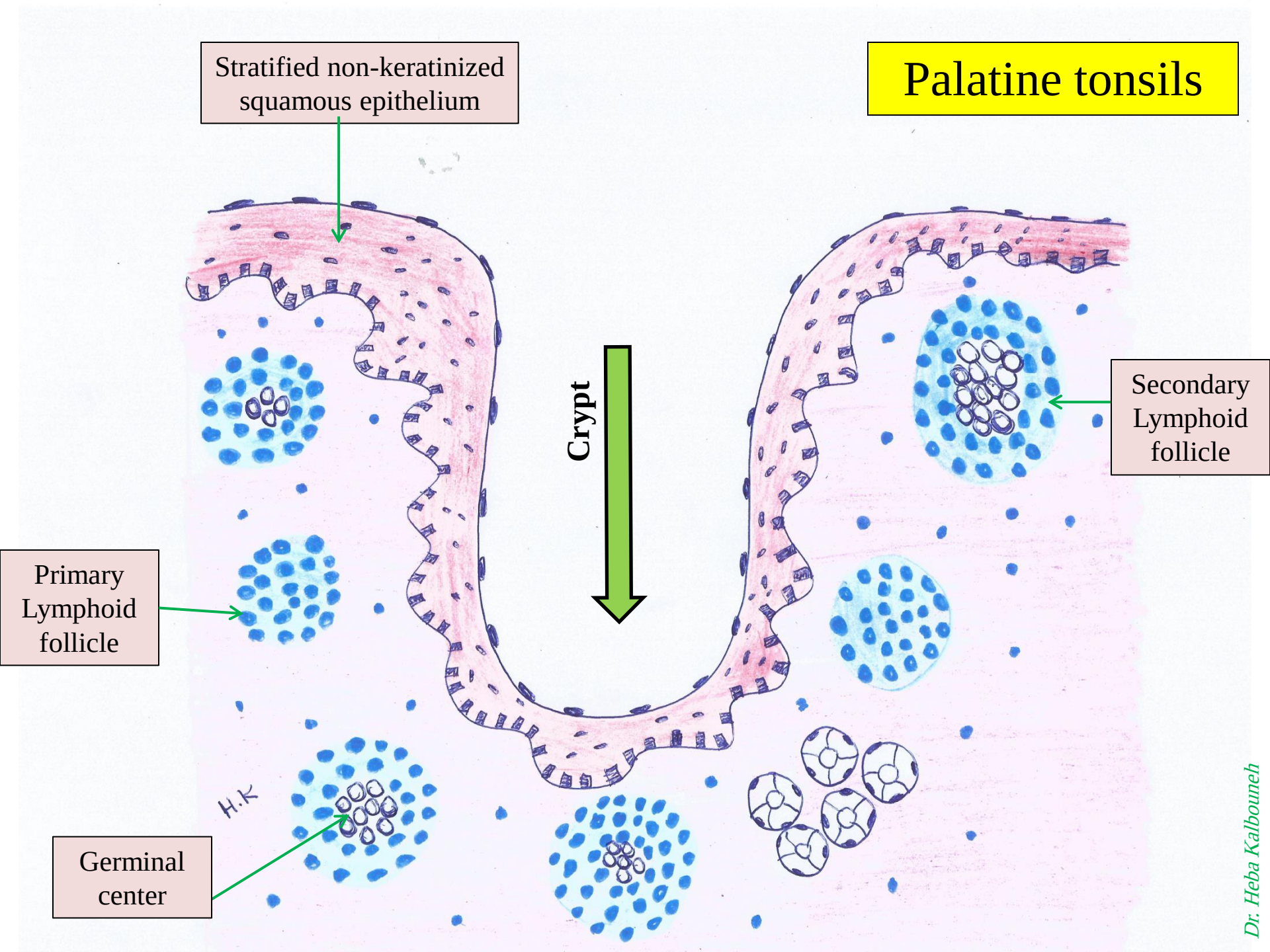


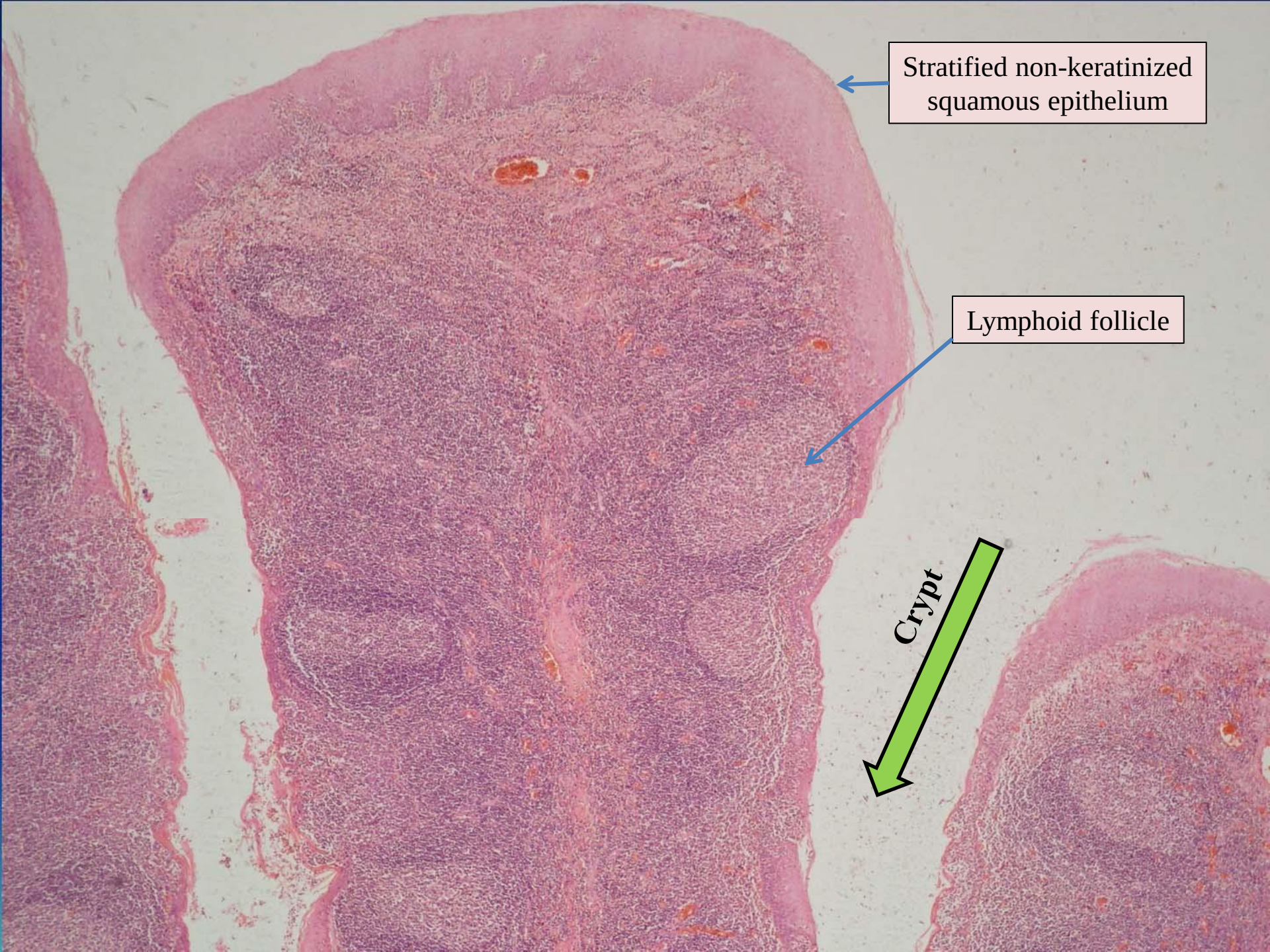


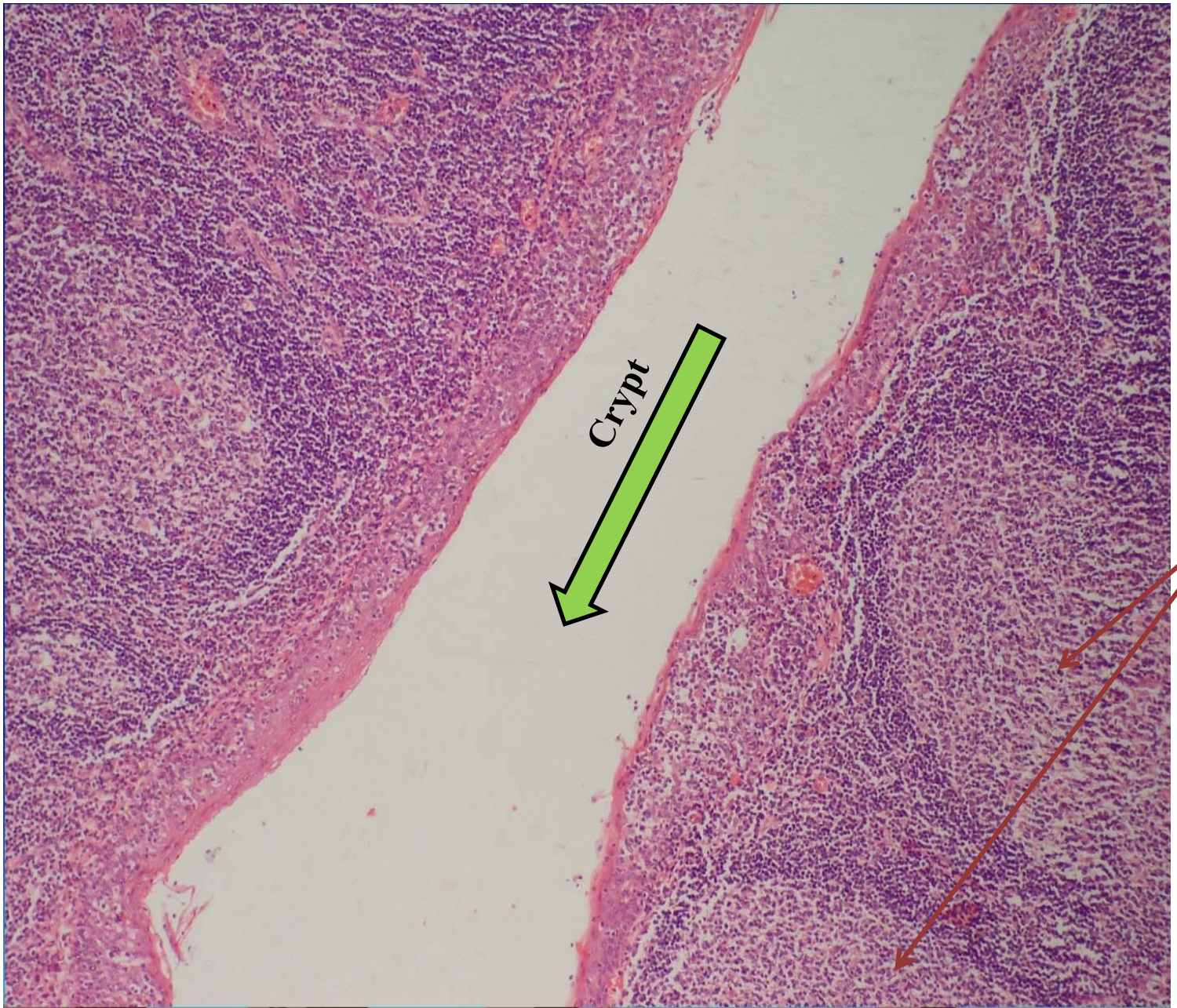
Spleen
H&E
Higher magnification

Palatine tonsils

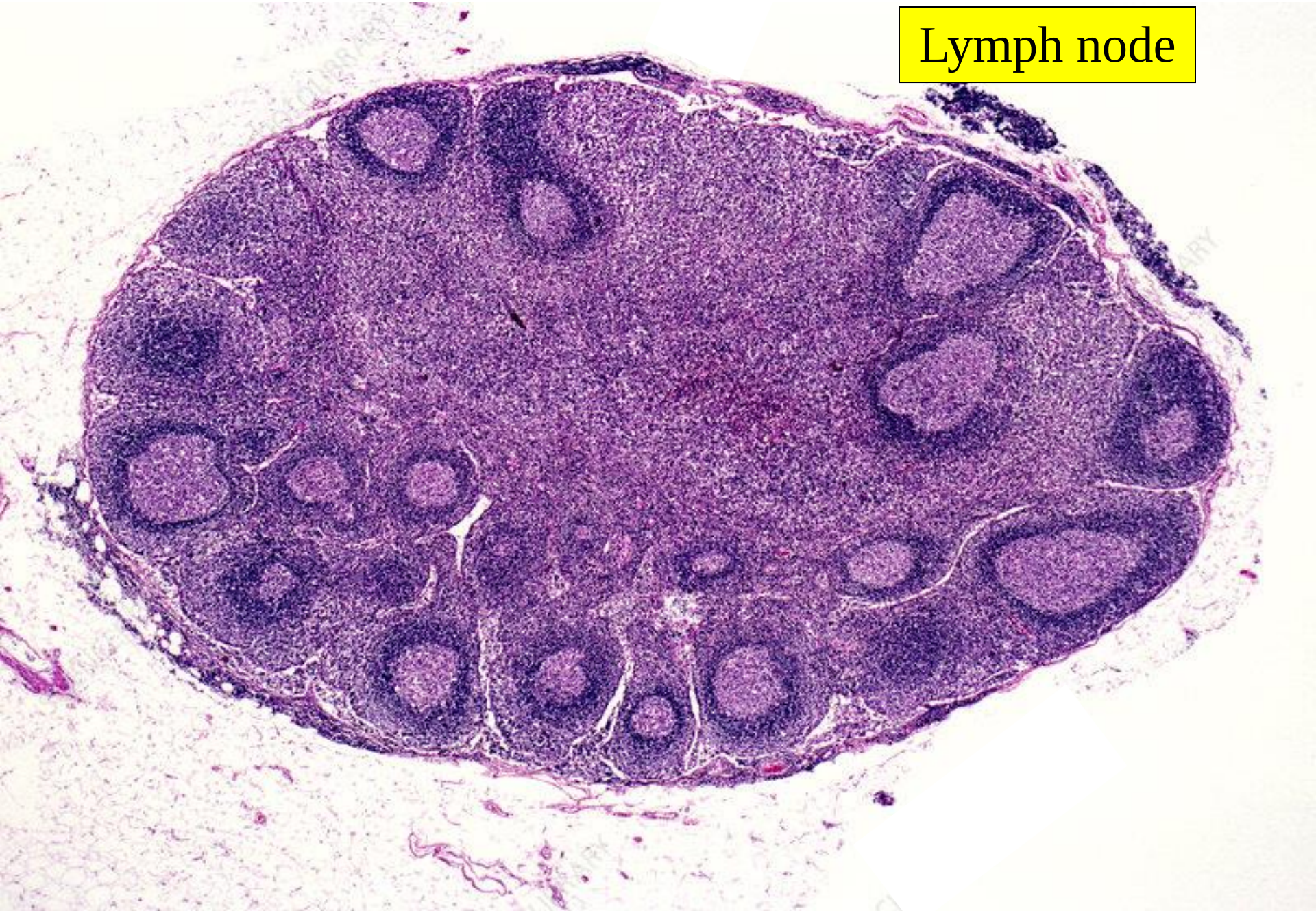
Palatine tonsils



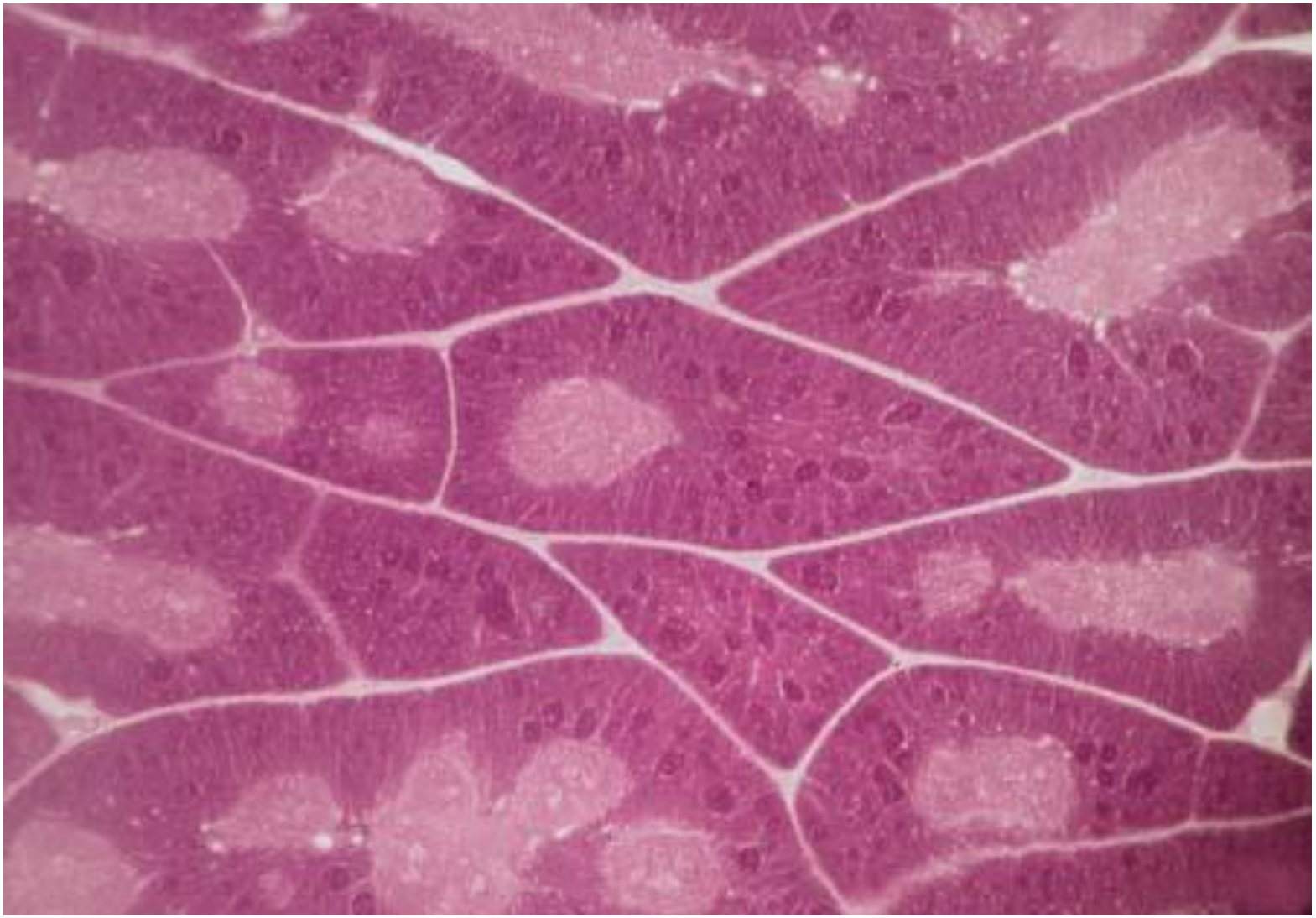

Stratified non-keratinized squamous epithelium
Lymphoid follicle
Crypt



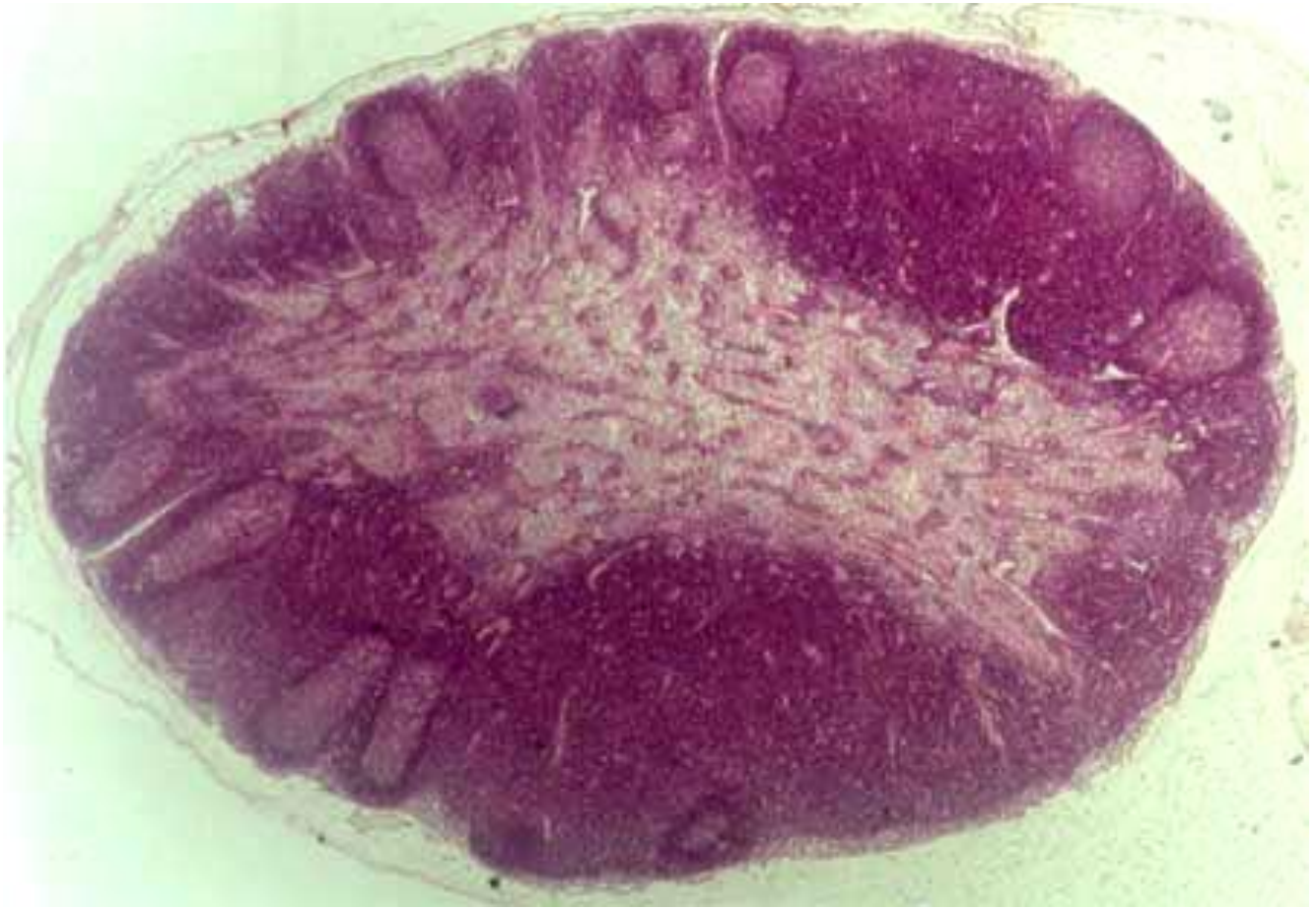
Identify


Lymph node

Thymus

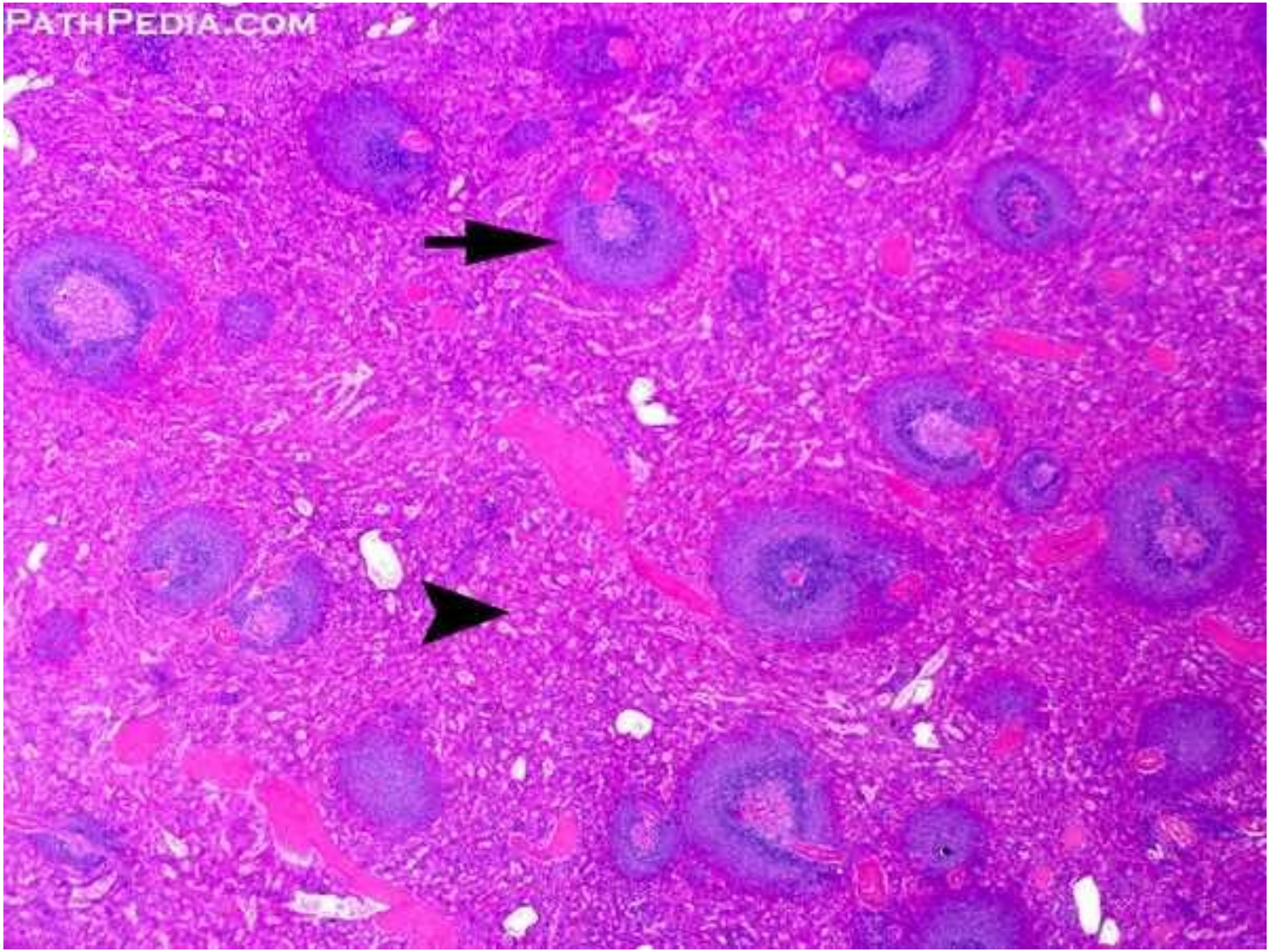


Lymph node



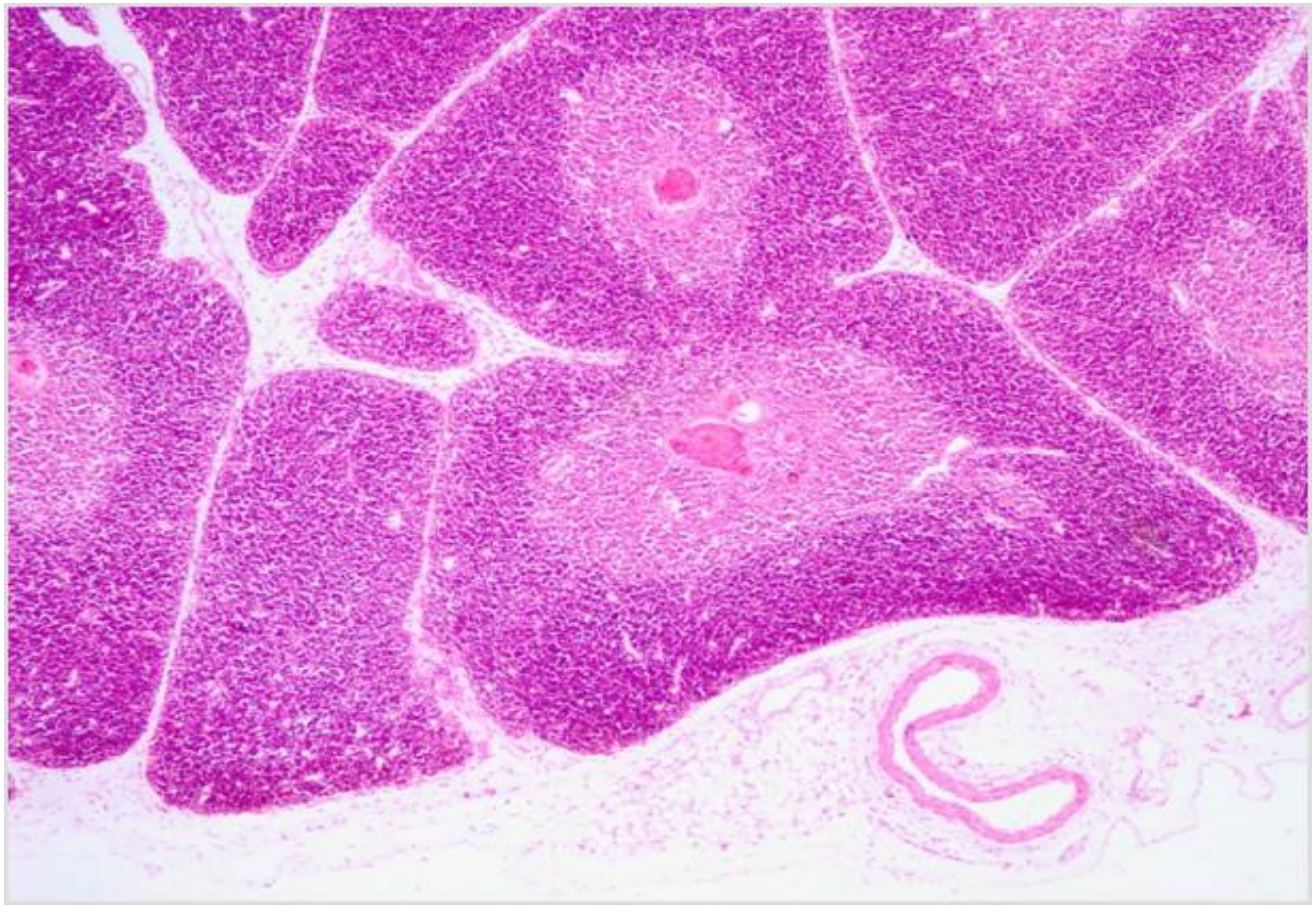
Palatine tonsils

Spleen

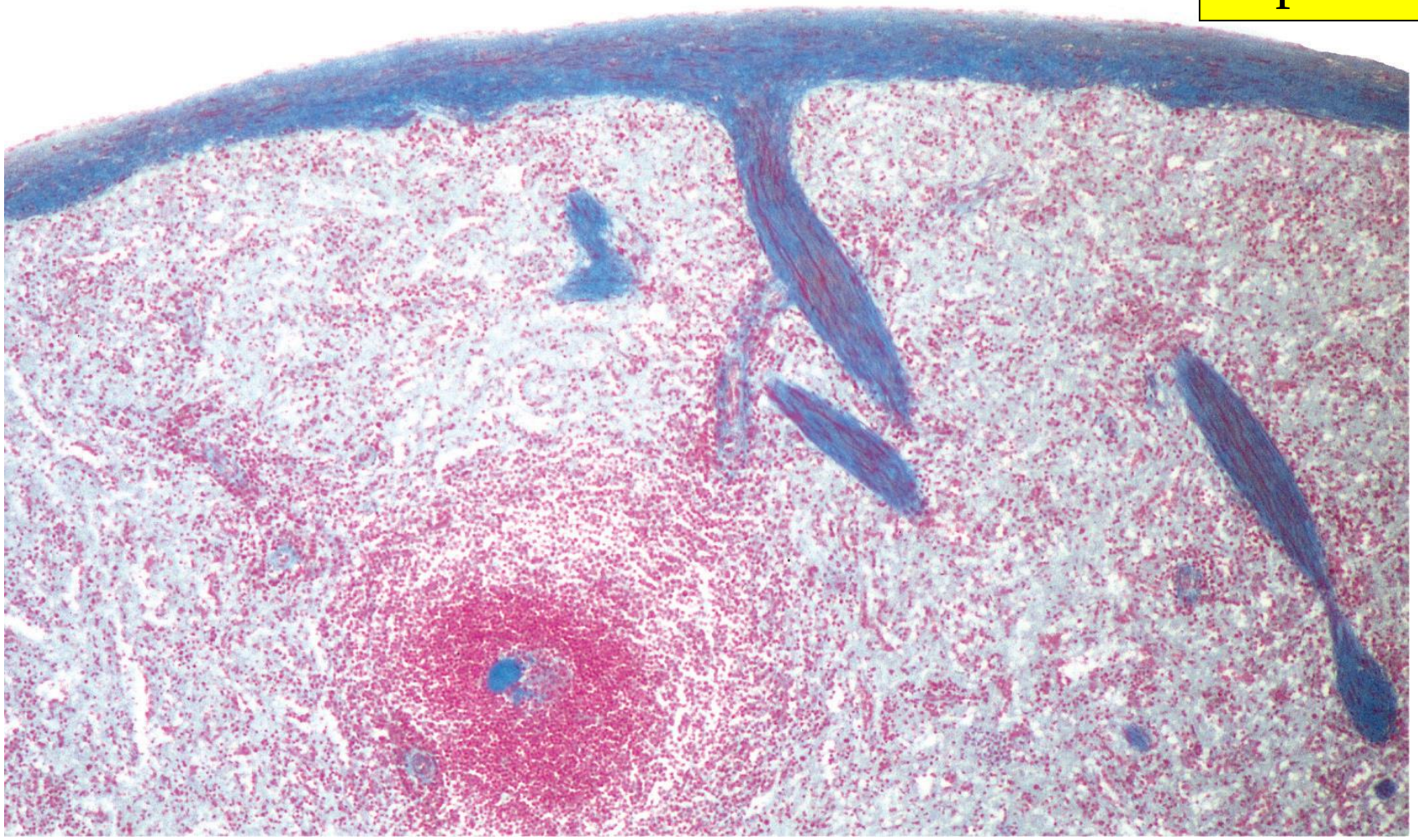


Palatine tonsils

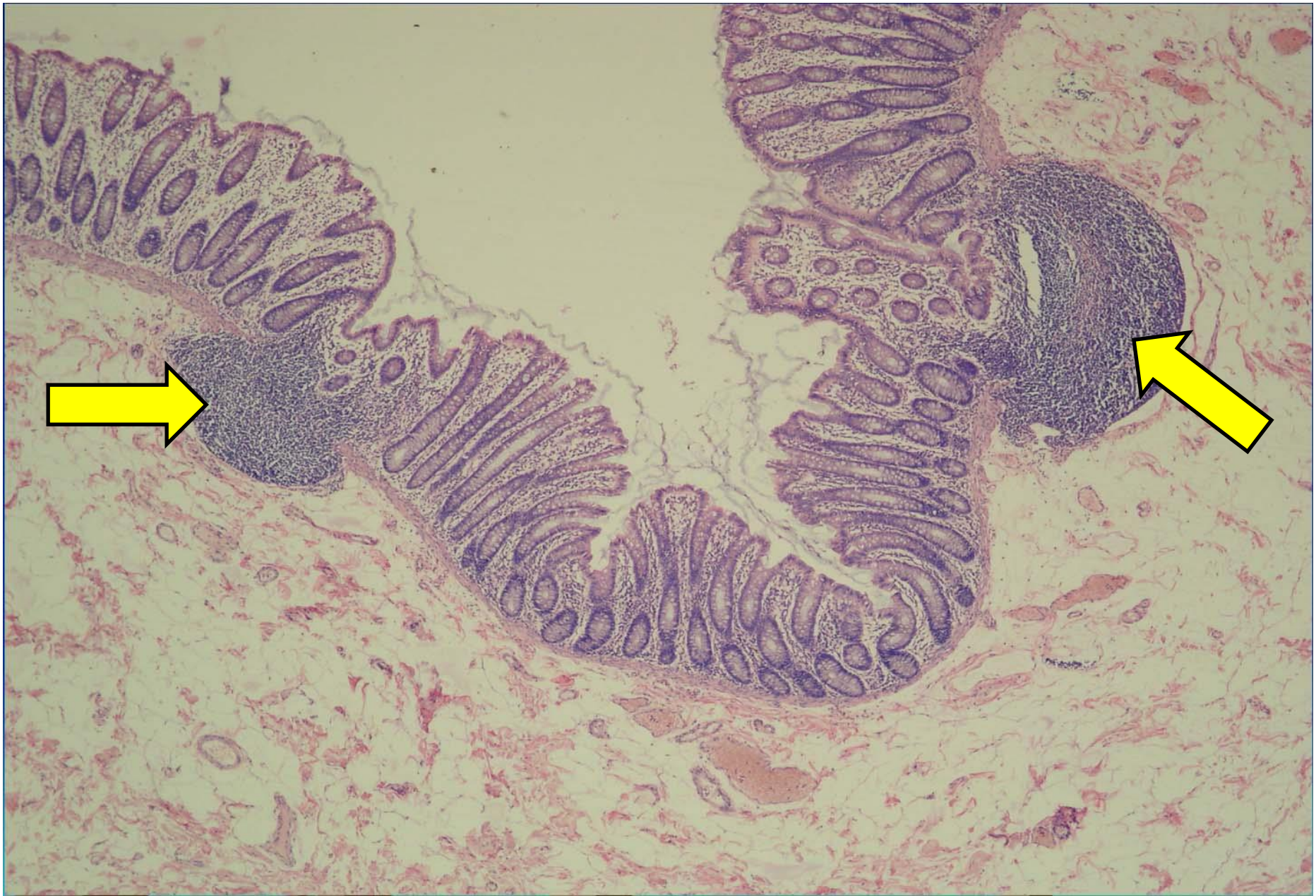
Thymus



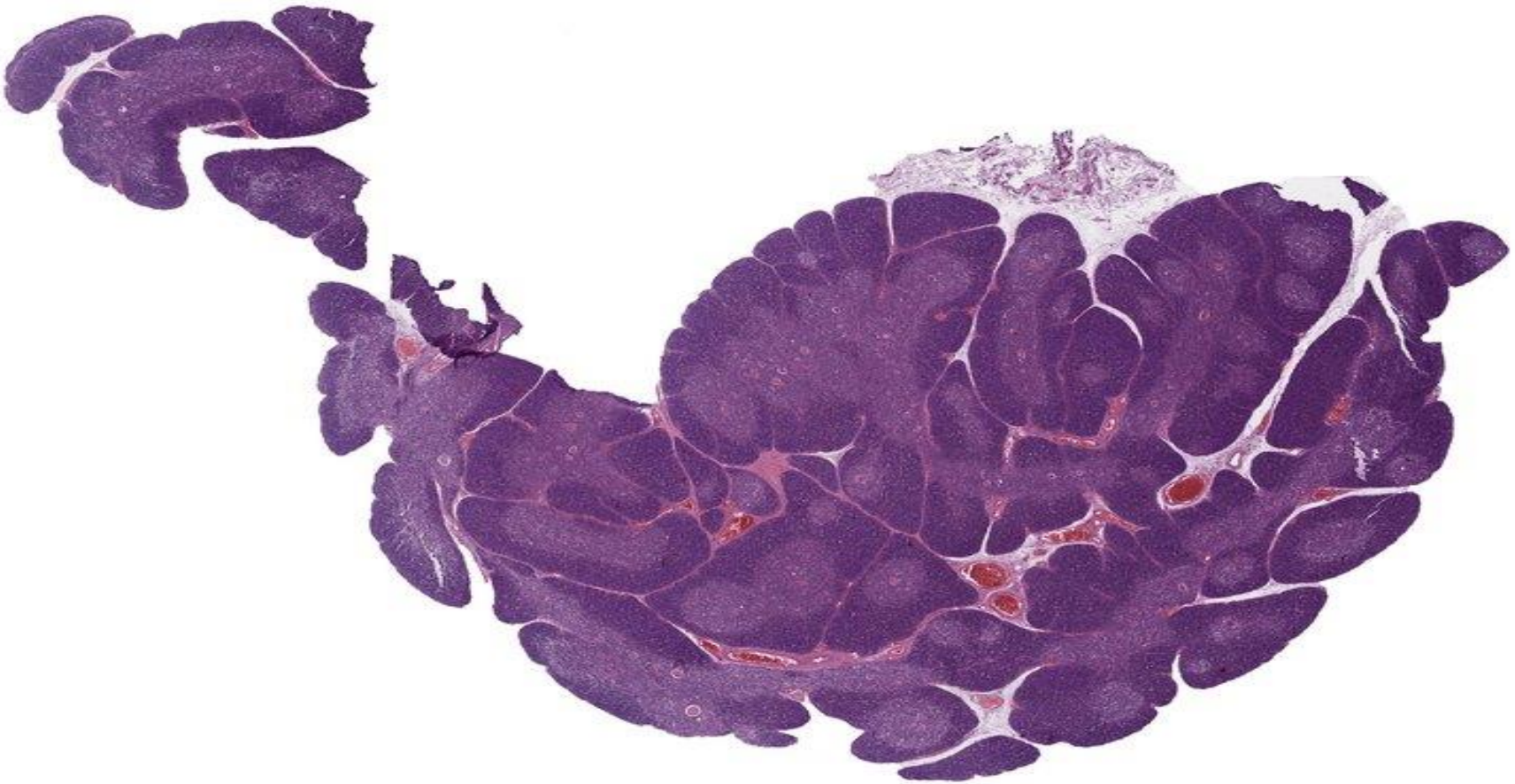
Spleen



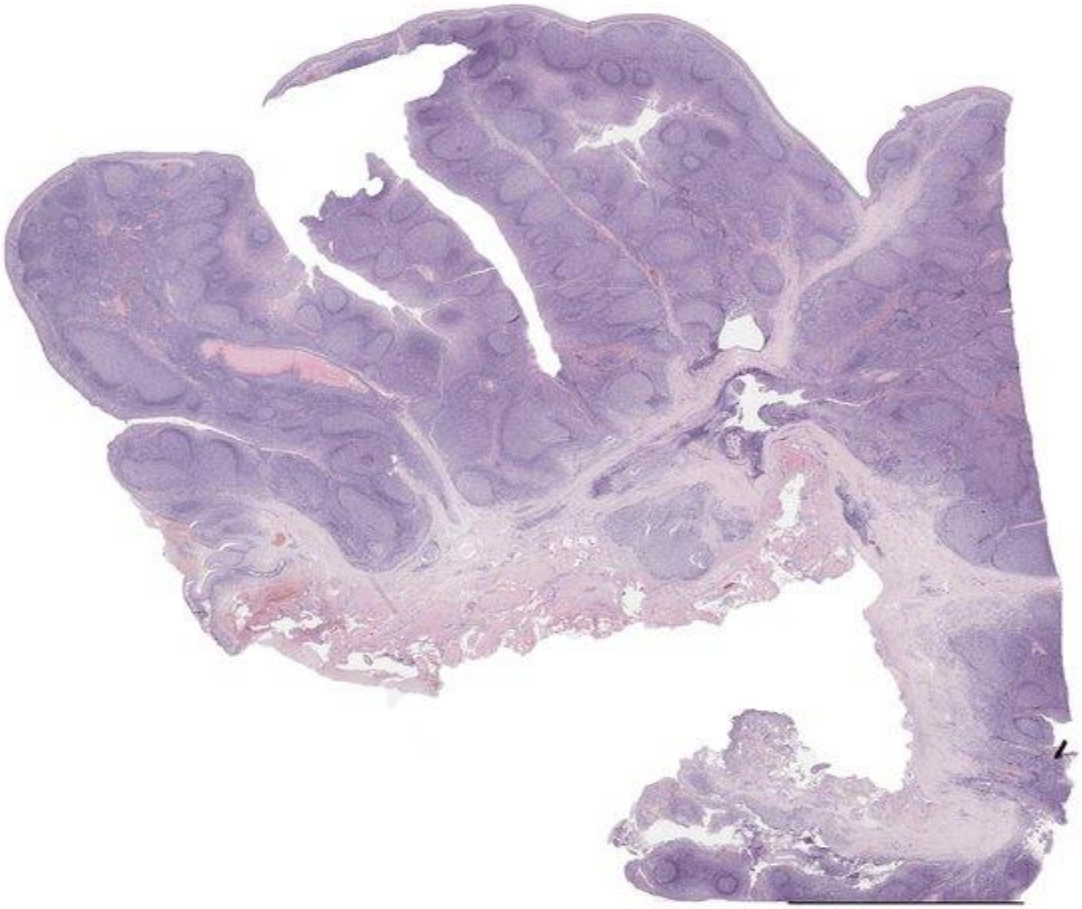
Solitary Lymphatic nodules (diffuse lymphatic tissue



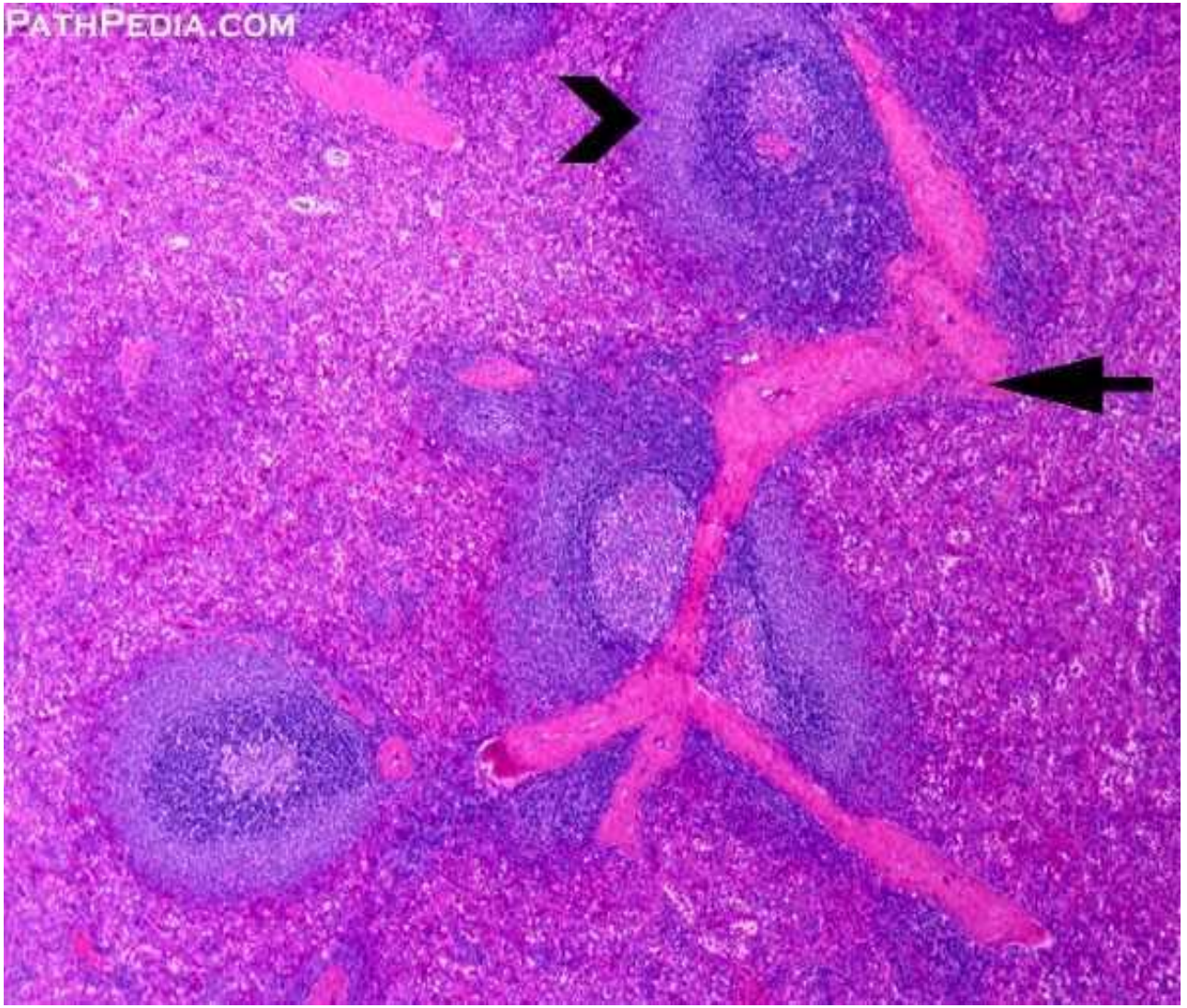
Thymus

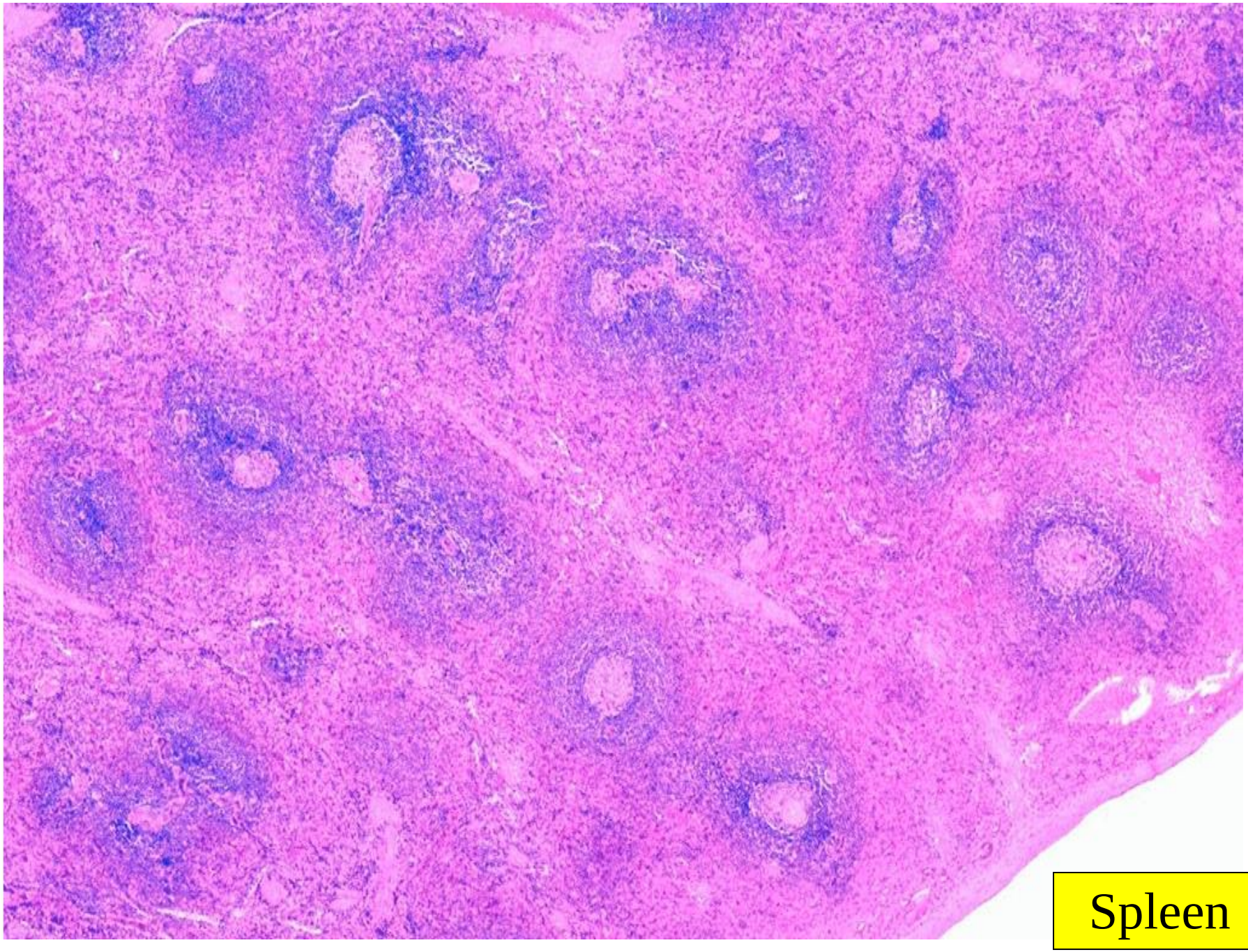


Palatine tonsils



Spleen





Spleen

	Lymph node	Spleen	Thymus
Cortex/ medulla	Present	Absent	Present
Lymphatic follicles (nodules)	Present (in cortex only)	Present (in white pulp only)	Absent
Lymphatic vessels	Afferents at capsule, emptying into subcapsular sinus; efferent at hilum	No afferents; efferents in trabeculae	No afferents; few efferents in septa
Unique features	Thin paracortical region between cortex and medulla, with high endothelial venules (HEV); medullary cords and sinuses	Minor white pulp component, with central arterioles; major red pulp component, with many sinusoids	Hassall (thymic) corpuscles in medulla; epithelial- reticular cells in cortex and medulla

Useful links (optional)

http://highered.mheducation.com/sites/dl/free/0072507470/291136/t_cell_dependent_antigens.swf

http://highered.mheducation.com/sites/dl/free/0072507470/291136/Cytoxic_T_cell_activity_against_target_cells.swf

http://highered.mheducation.com/sites/dl/free/0072507470/291136/immResponse.swf