

Histology of the Immune System

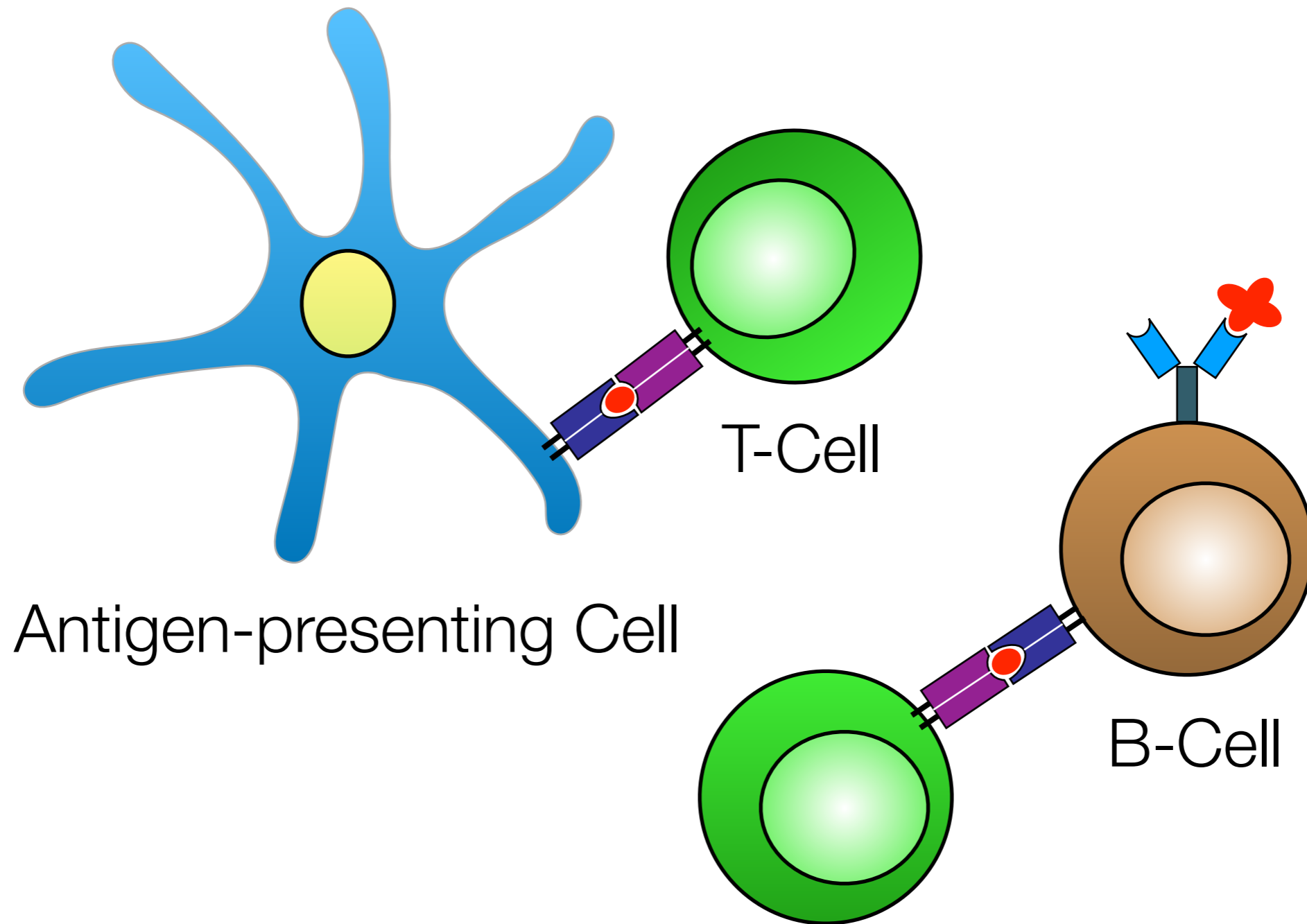
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What we'll talk about...

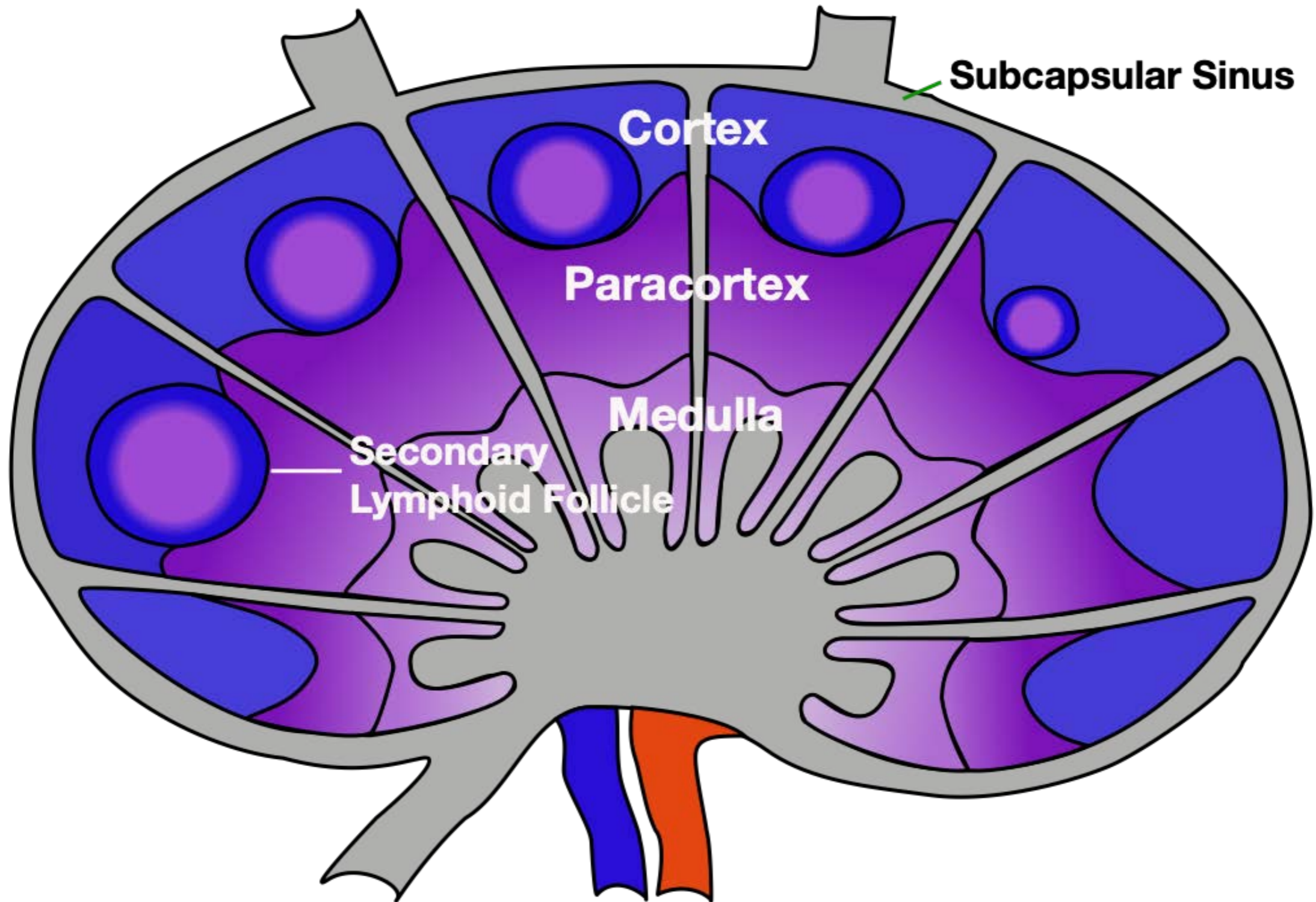
- Lymph nodes and the development of humoral immune responses
- Red pulp and white pulp in the spleen
- Thymus and T-cell development

An adaptive immune response requires direct interaction between specific immune cells.

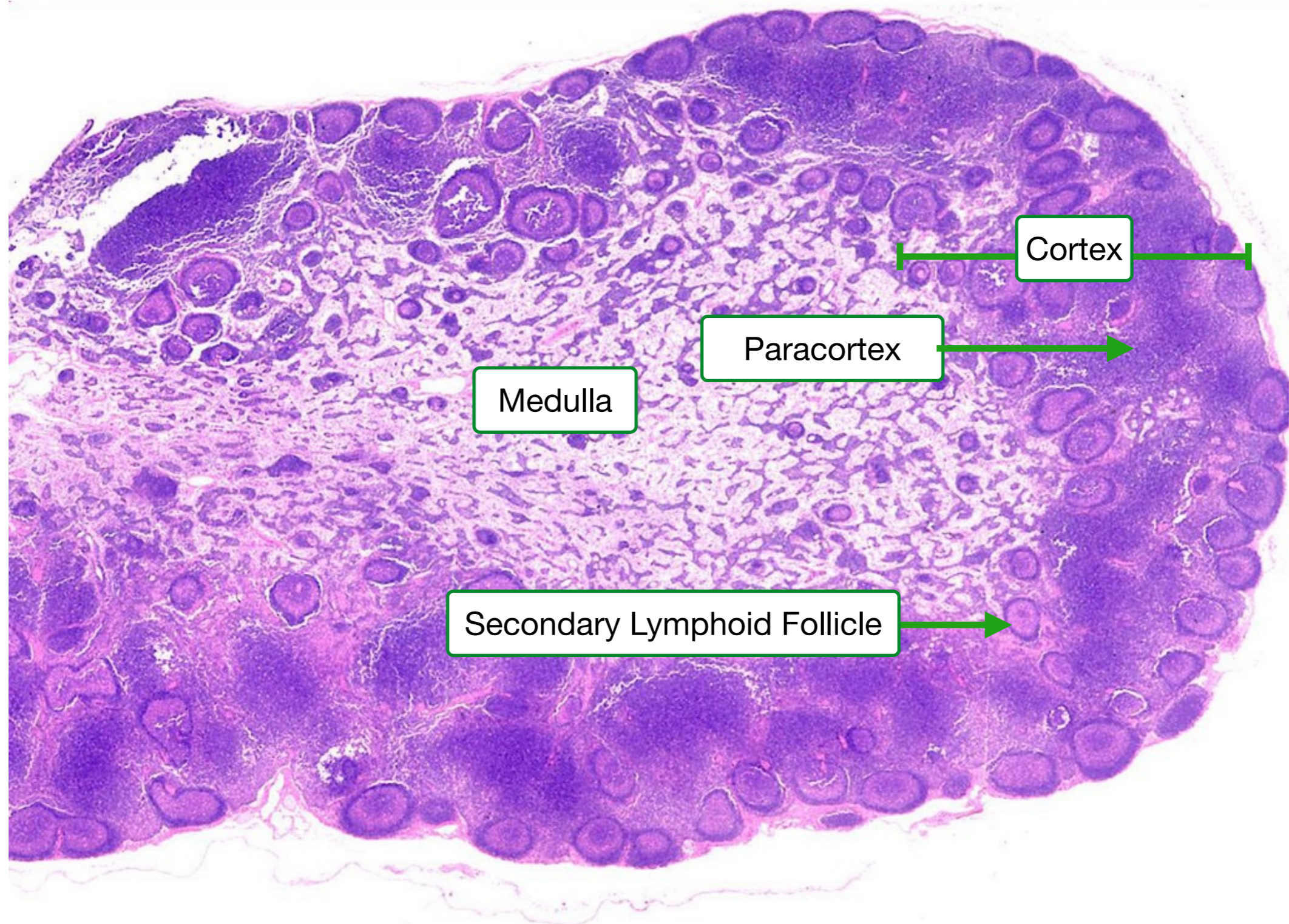


Lymph Node

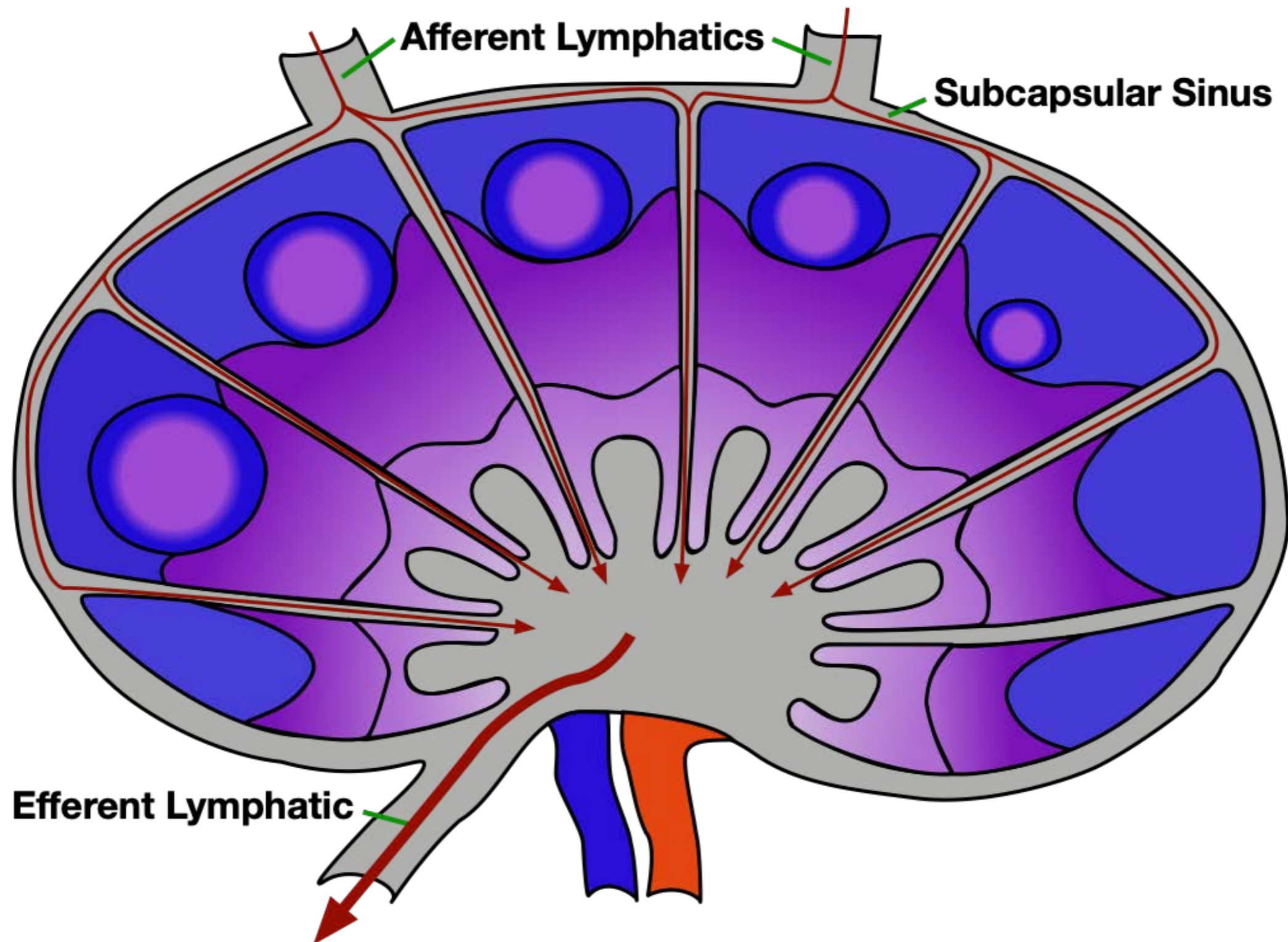
Lymph nodes facilitate interactions between antigen, antigen-presenting cells and lymphocytes.



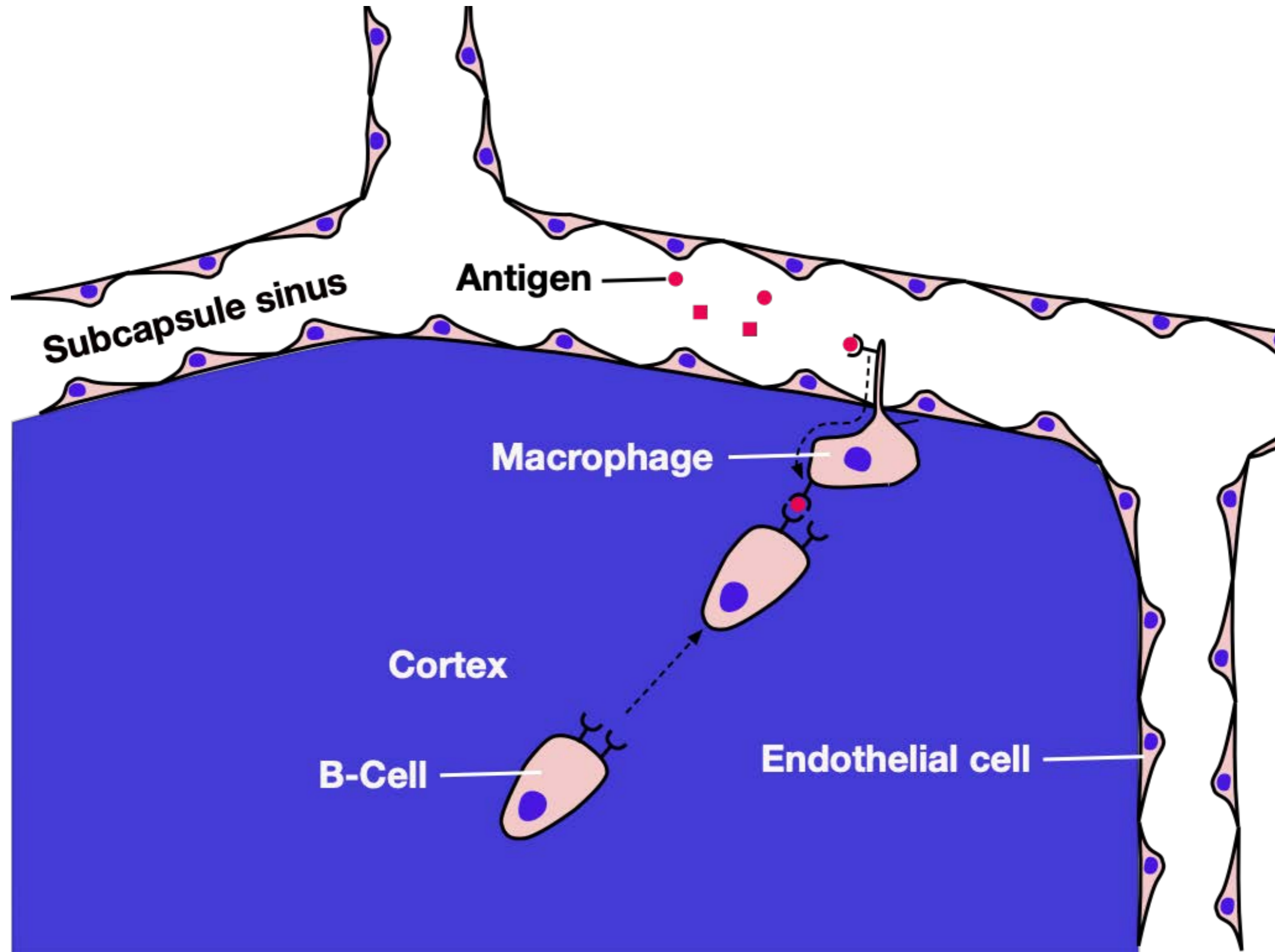
The lymph node is structurally and functionally divided into a cortex, paracortex and medulla.



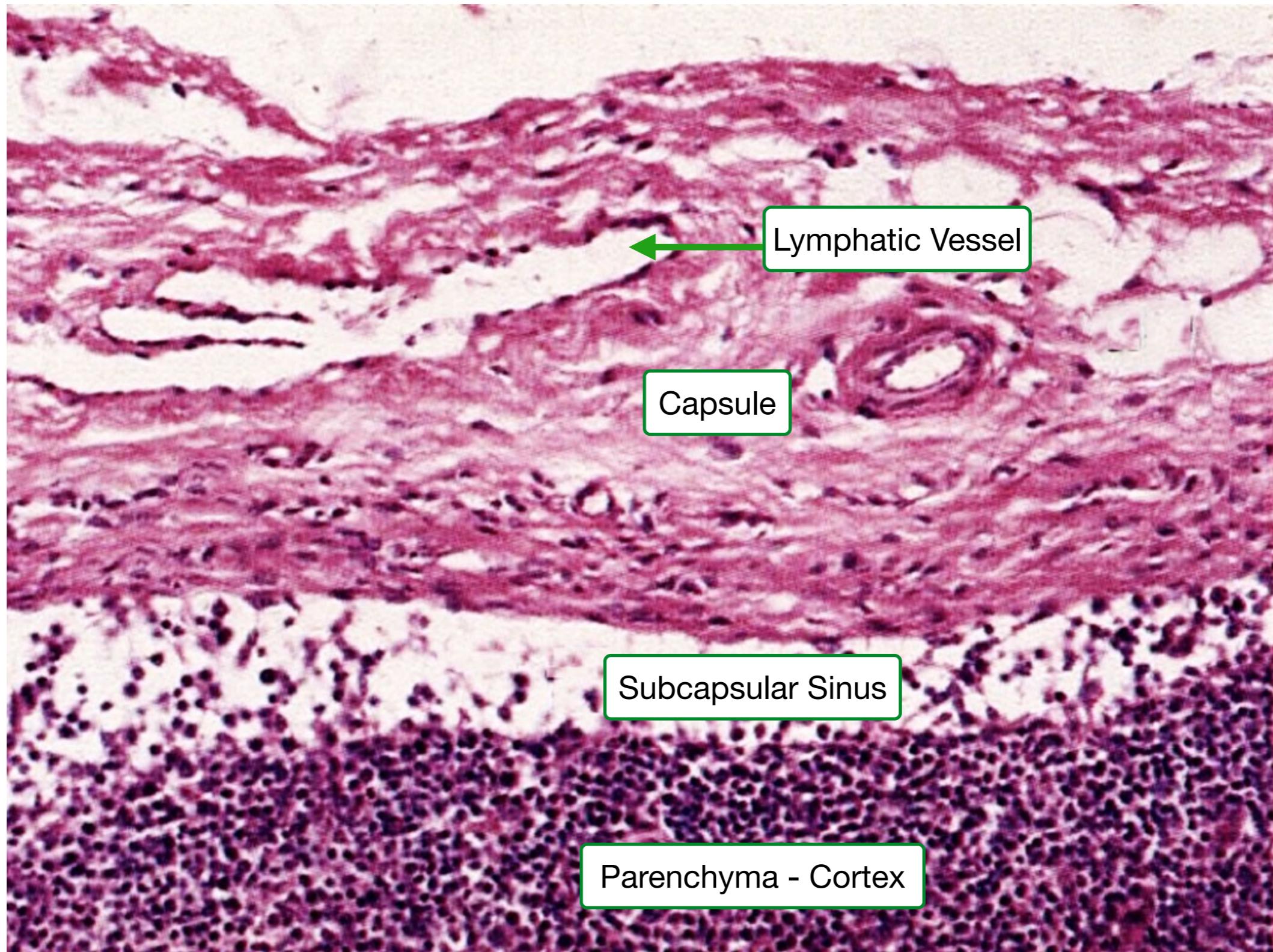
Lymph enters through the capsule and then flows through sinuses in the cortex and medulla.



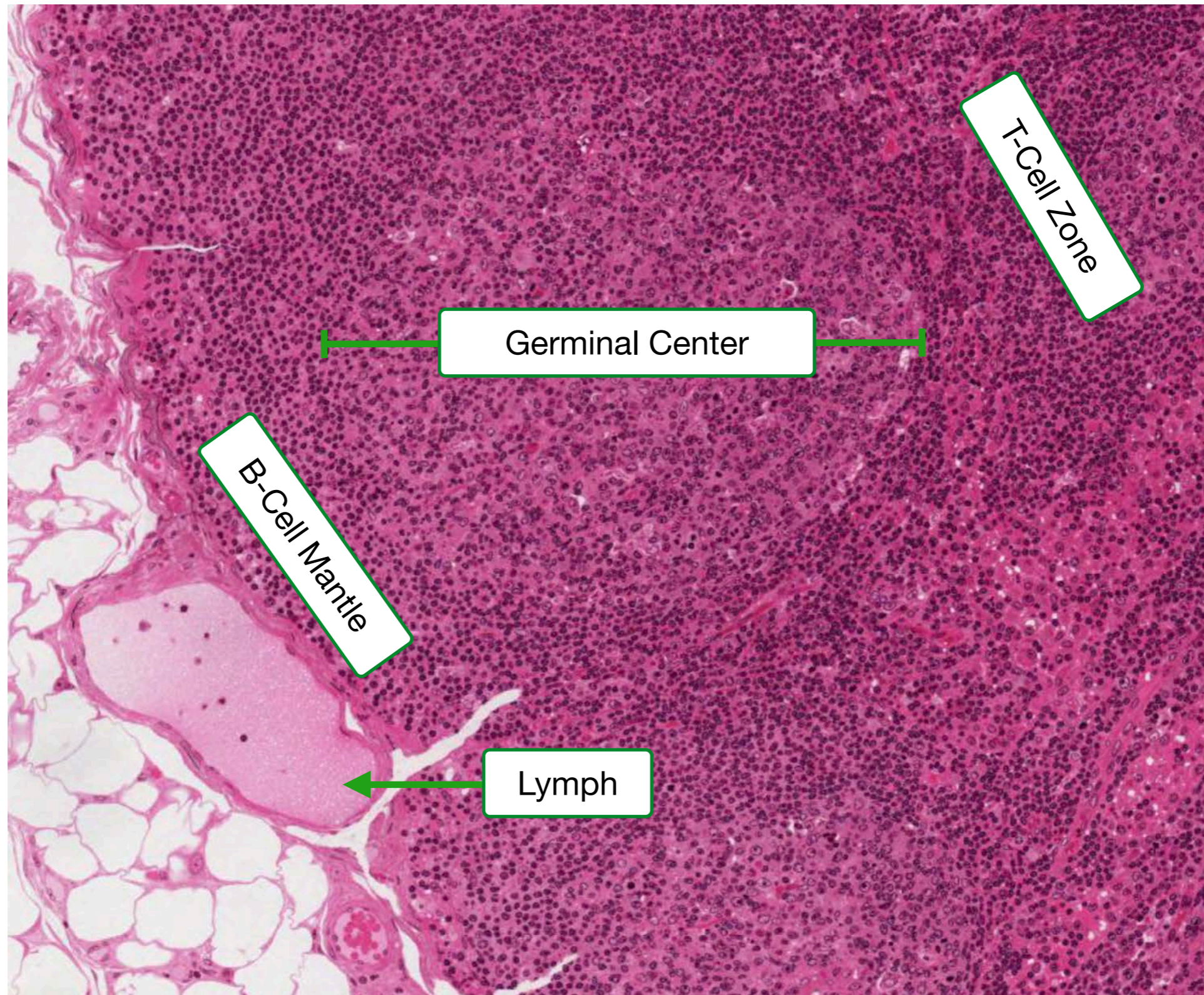
Macrophages beneath the subcapsule sinus capture antigen from lymph.



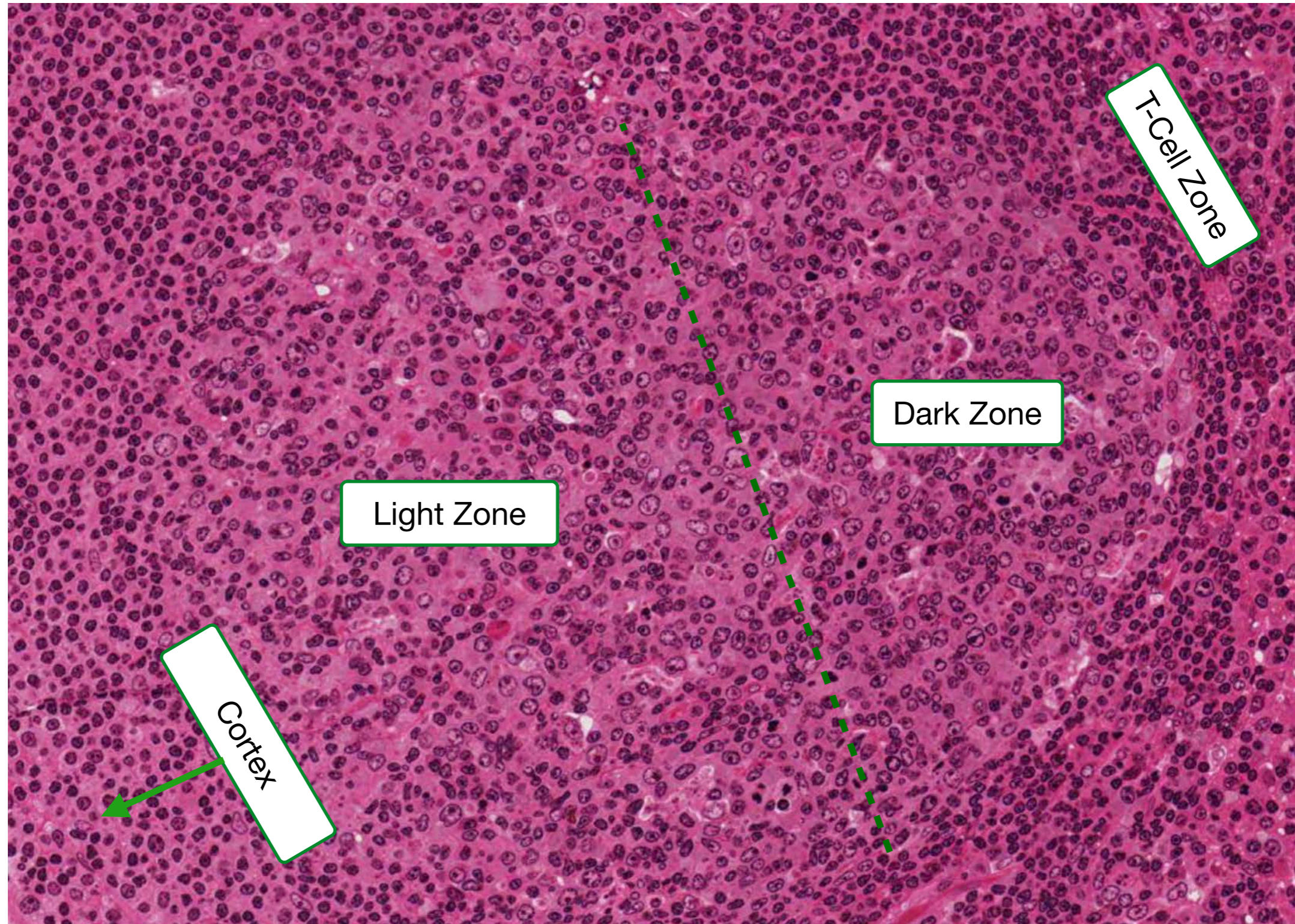
The capsule contains afferent lymphatic vessels that delivers lymph from peripheral tissues.



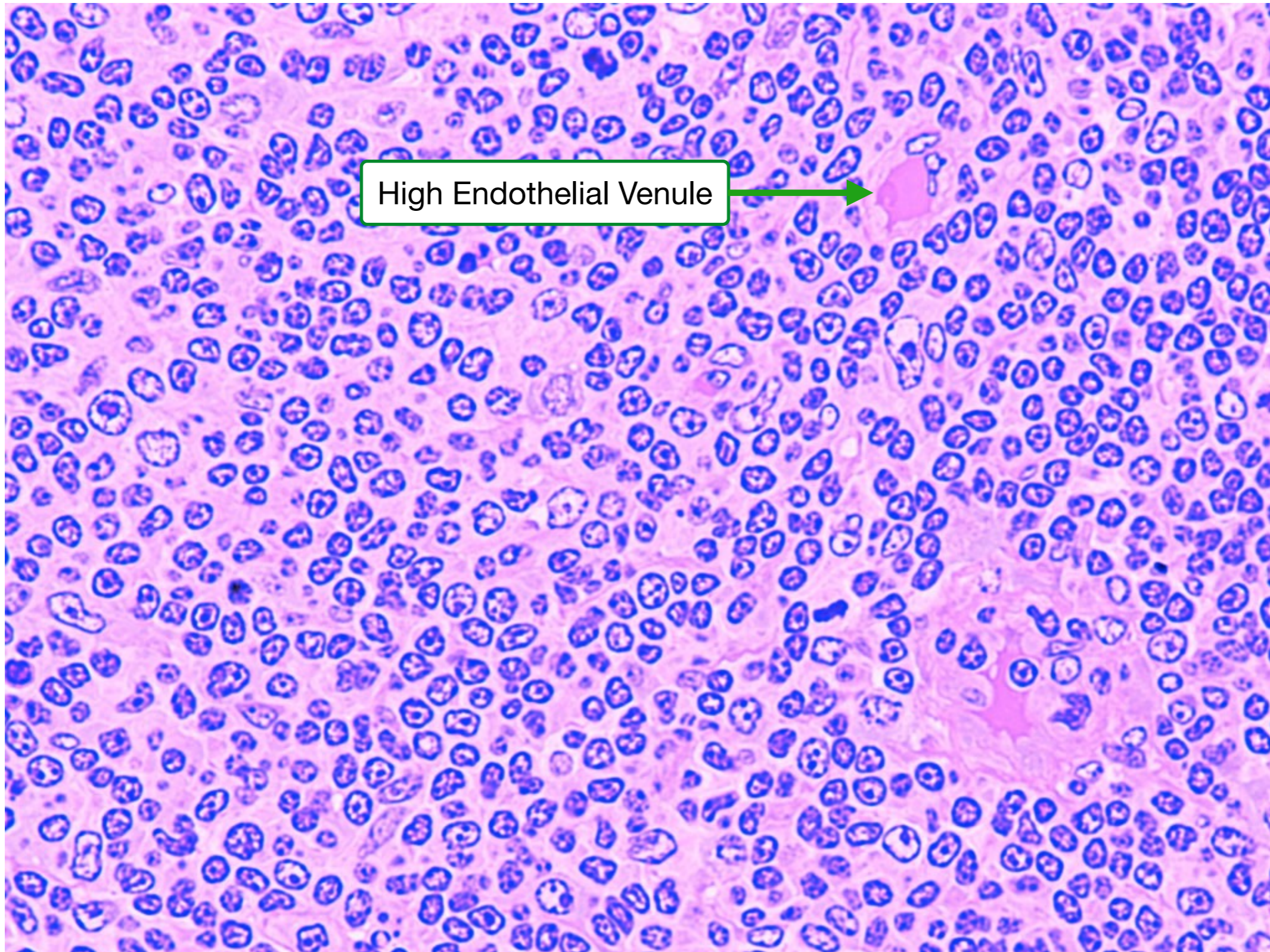
Secondary lymphoid follicles contain a germinal center with maturing and dividing B-cells.



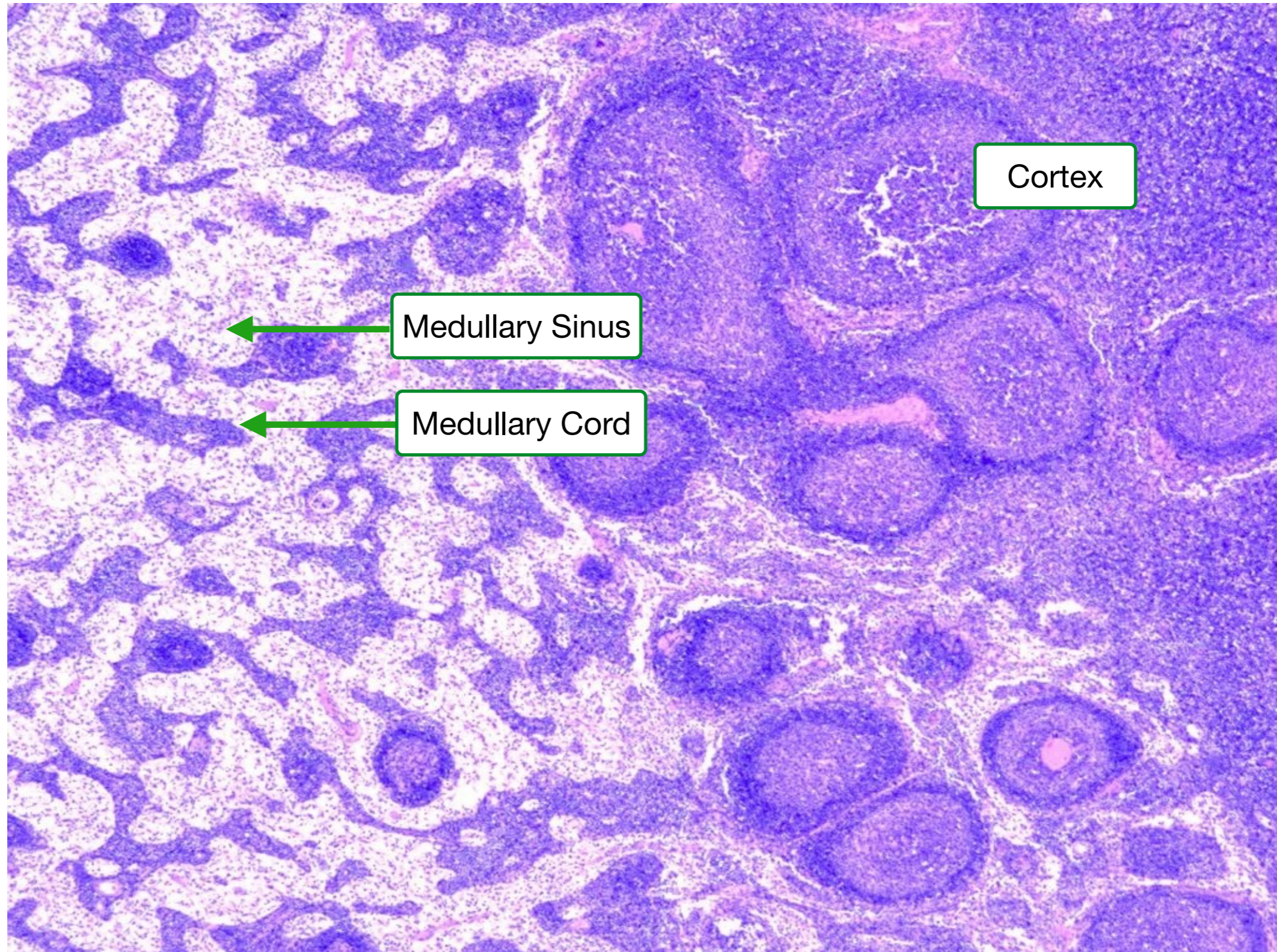
B-cells find antigen in the light zone of germinal centers and divide in the dark zone.



The paracortical region contains T-cells and venules where lymphocytes enter lymph nodes.

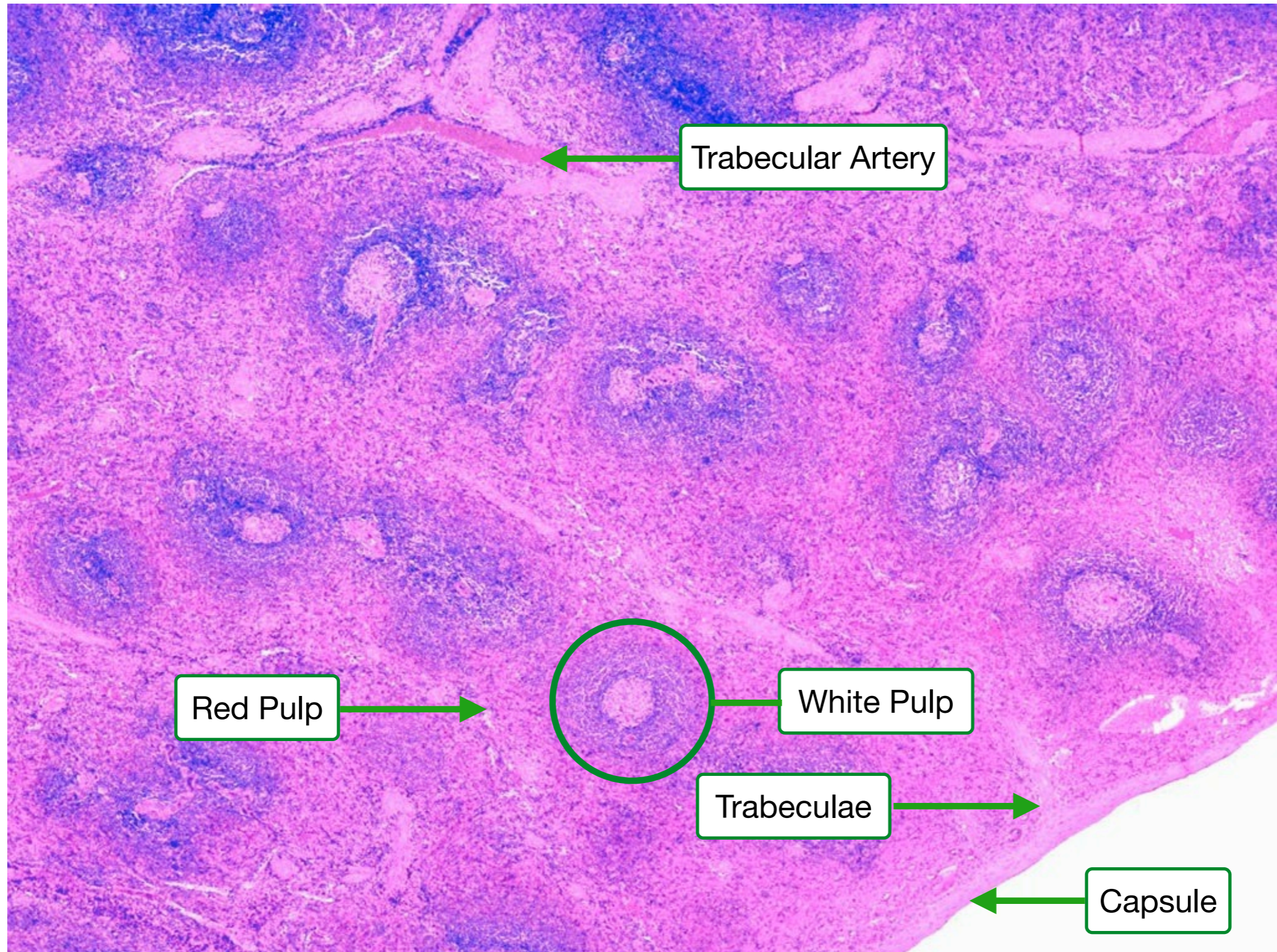


The medulla contain macrophages and B-cells arranged in cords and sinuses that contain lymph.

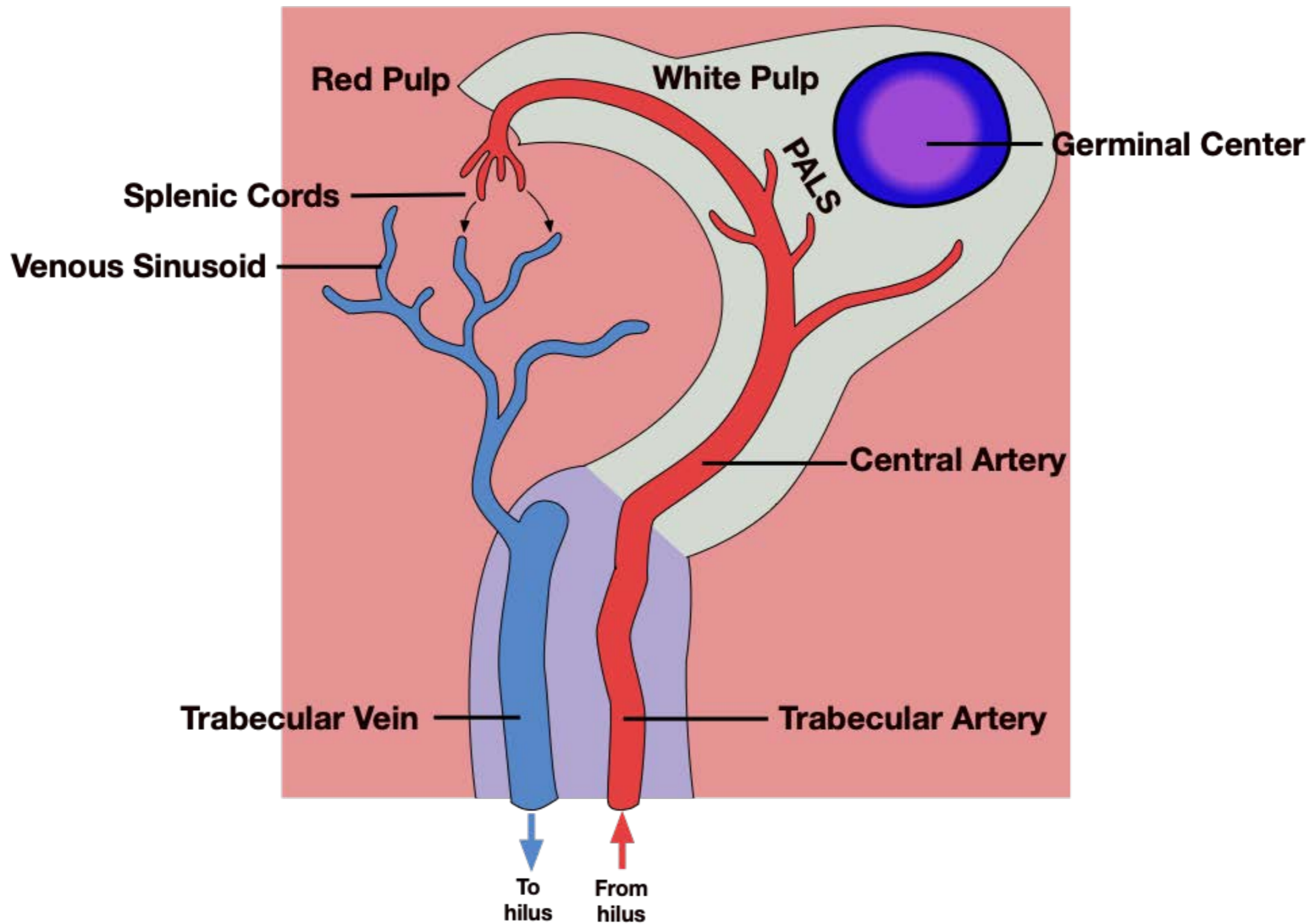


Spleen

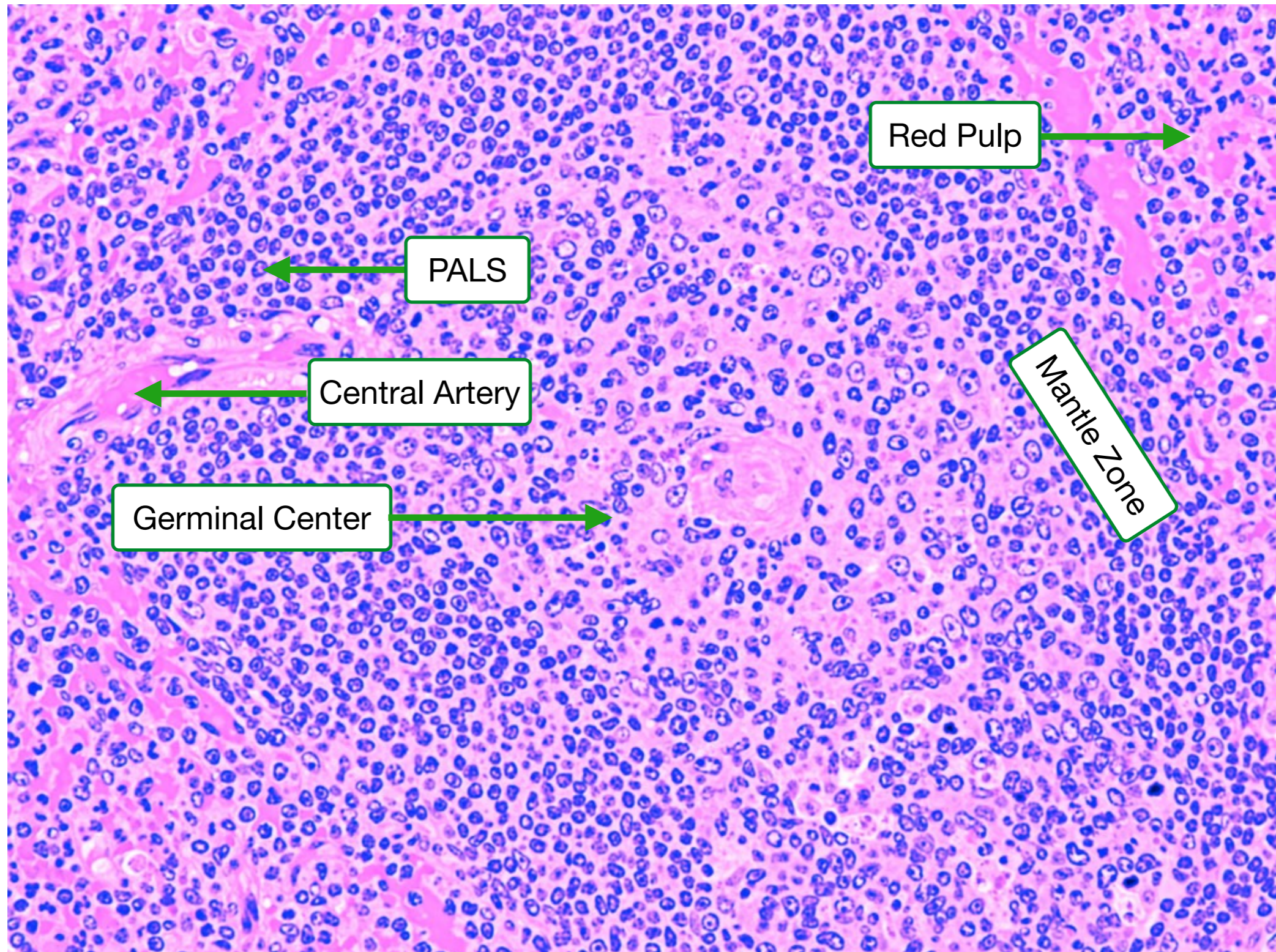
The spleen forms immune responses in white pulp and filters red blood cells in red pulp.



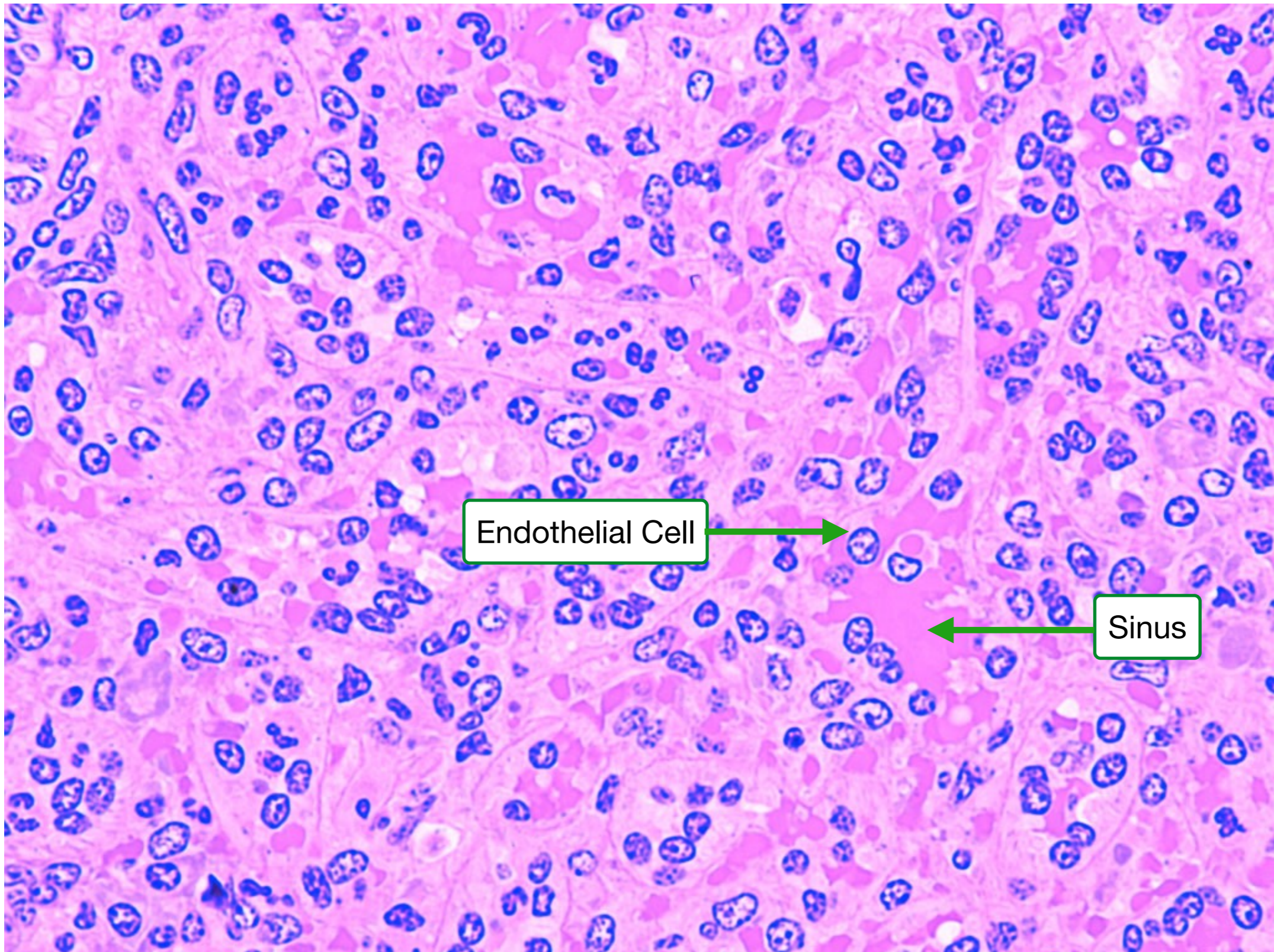
Blood flows through white pulp and then some is released into red pulp.



White pulp contains germinal centers with B-cells surrounded by T-cells and resting B-cells.

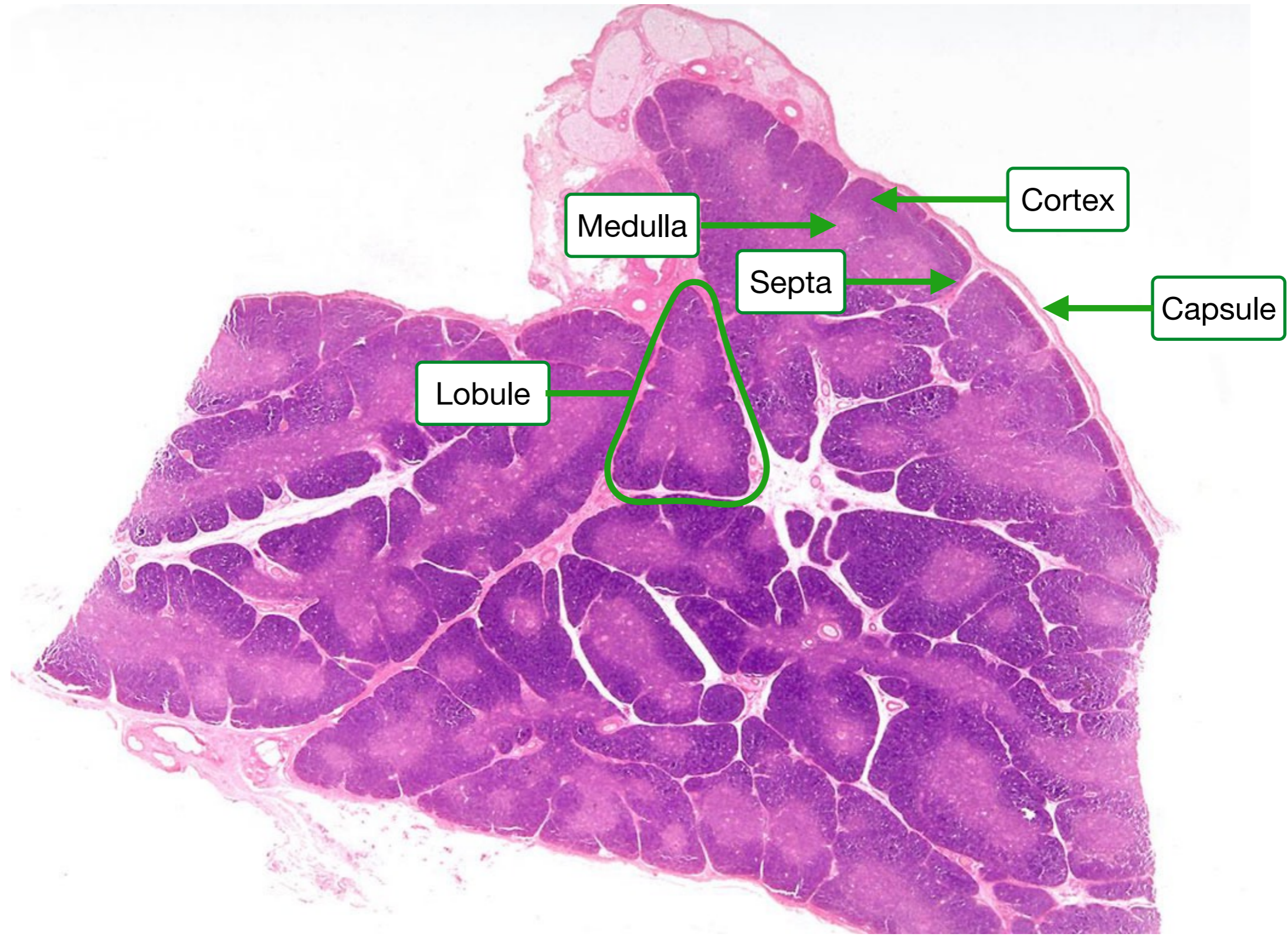


Red pulp contains venous sinuses that filter old and malformed red blood cells.

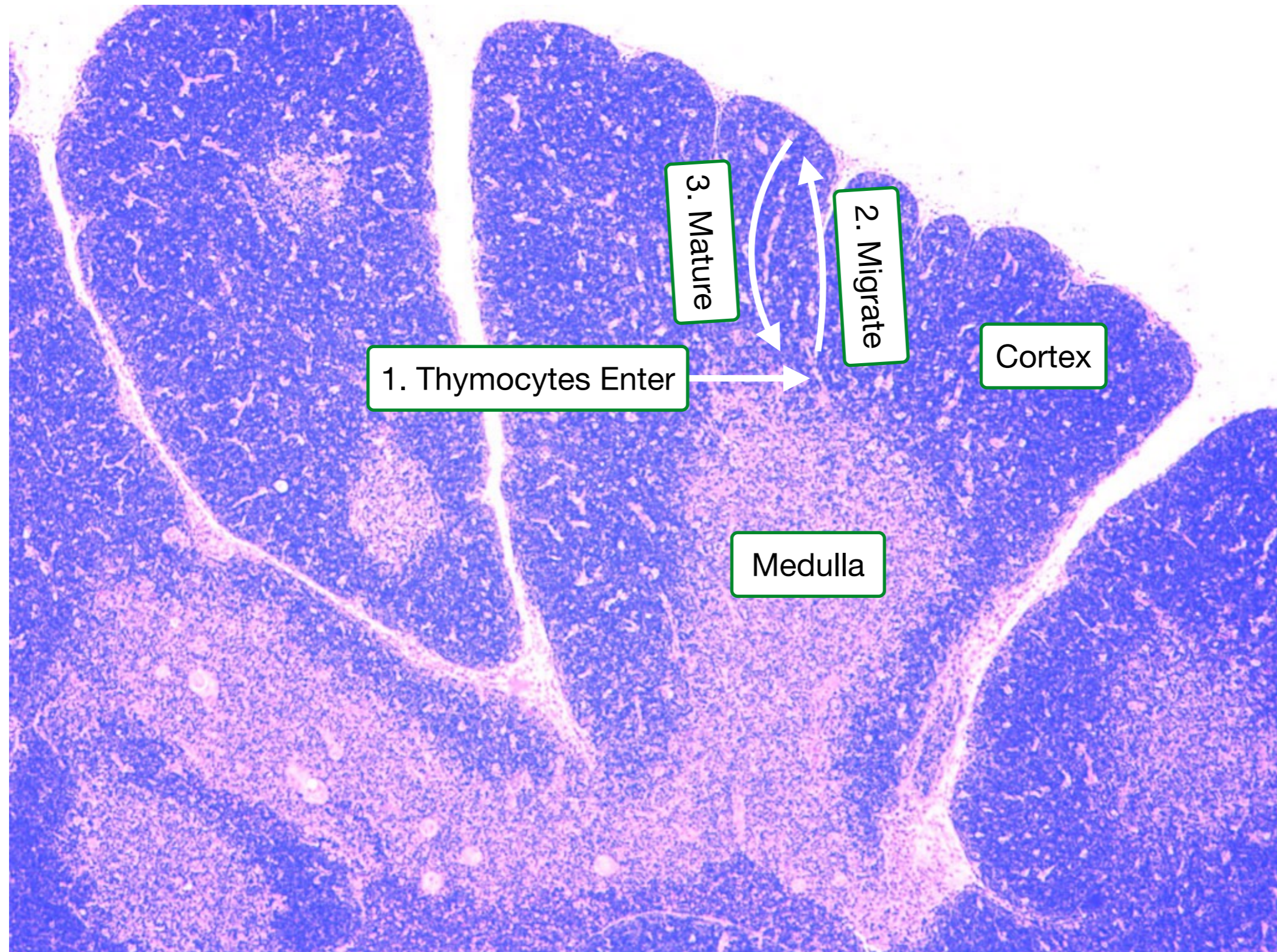


Thymus

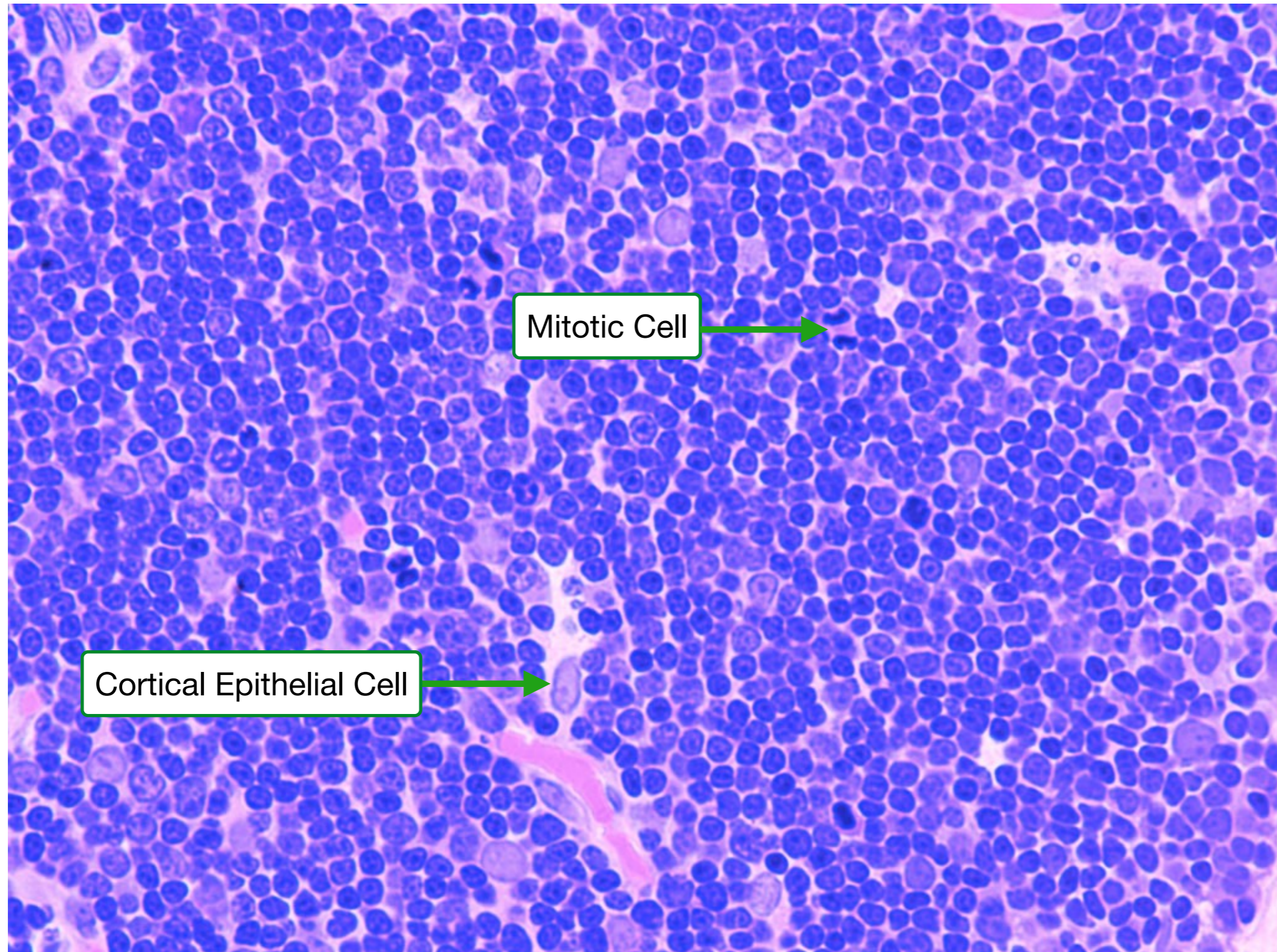
The thymus is arranged into lobules each with an outer cortex and inner medulla.



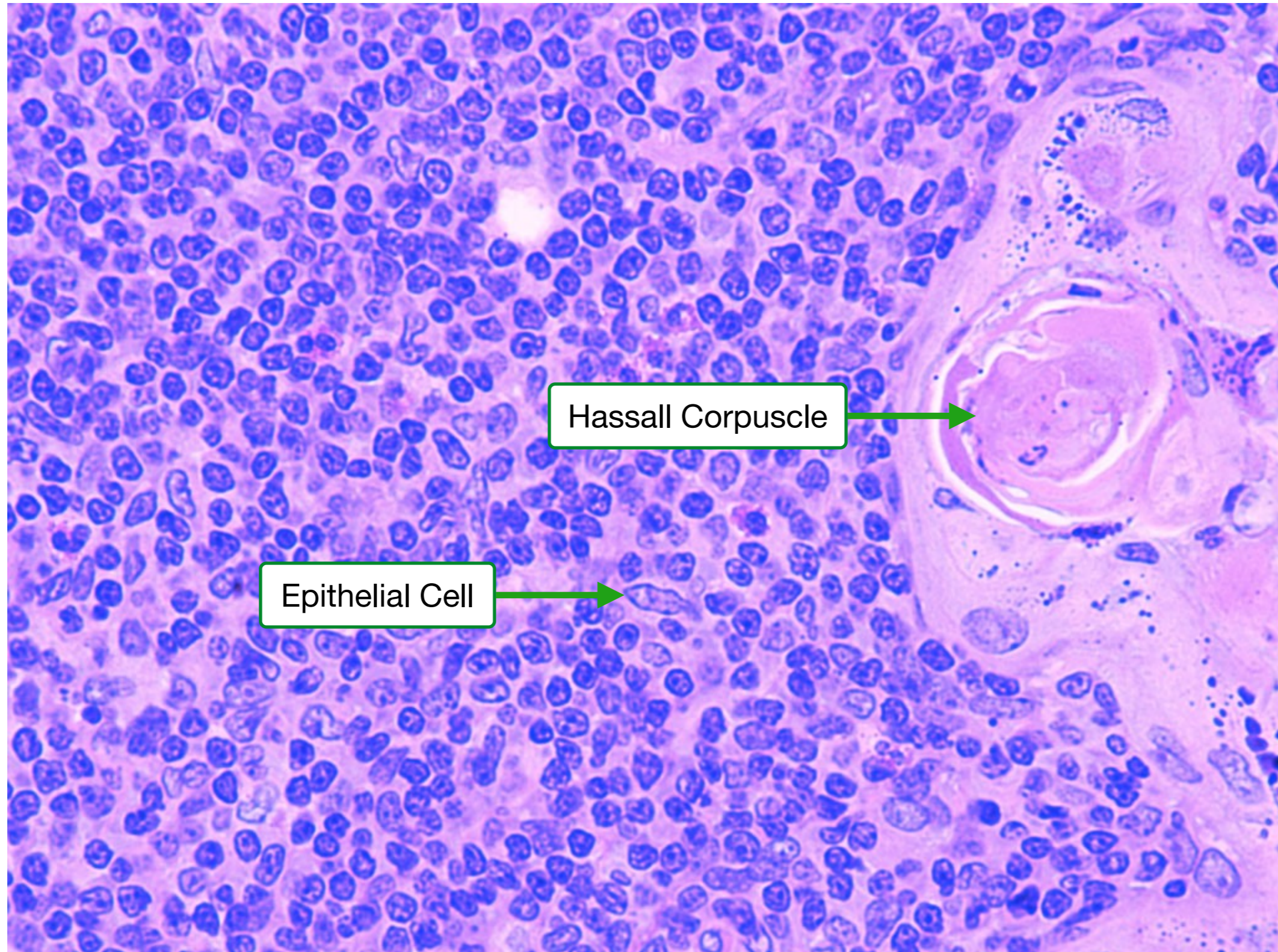
Thymocytes enter at cortical-medulla border, migrate to the outer cortex and undergo maturation.



The cortex is the site of positive selection and contains immature and maturing thymocytes.



The medulla is the site of negative selection of thymocytes.



Take home messages...

- Lymph nodes facilitate interactions between B-cells, T-cells and antigen to generate a humoral immune response
- The spleen filters old and damaged red blood cells and generates immune responses against blood-borne antigen.
- The thymus facilitates development of T-cells through positive and negative selection.