Immunology

Lec. 5

Memory cells

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Tissues of the Immune System:-

- The tissues of the immune system consist of the generative (also called primary, or central) lymphoid organs, in which T and B lymphocytes mature and become competent to respond to antigens, and the peripheral (or secondary) lymphoid organs, in which adaptive immune responses to microbes are initiated

  (see Fig. 1-10).

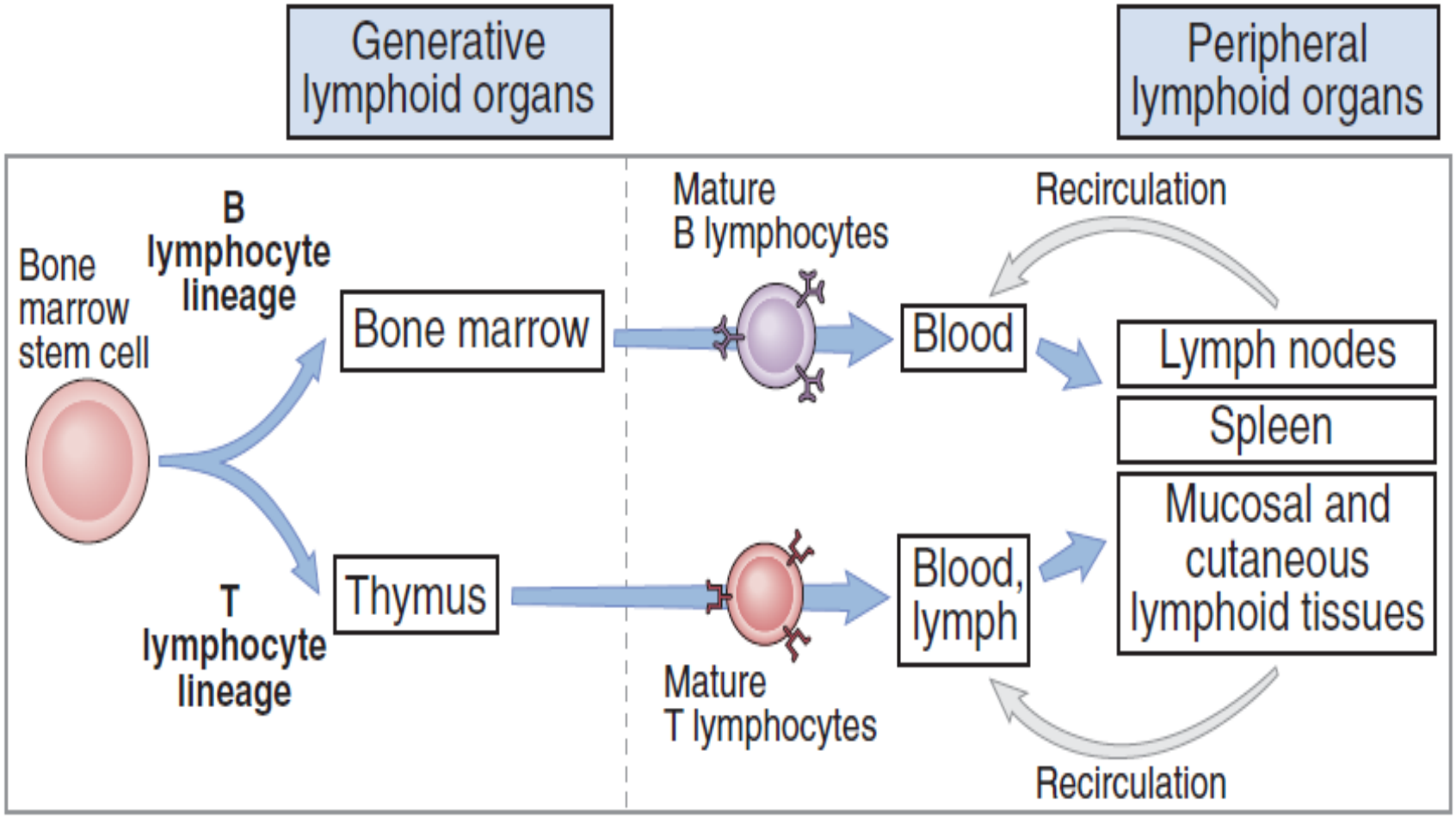


FIGURE 1-10 **Maturation of lymphocytes.** Lymphocytes develop from precursors in the generative lymphoid organs (the bone marrow and thymus). Mature lymphocytes enter the peripheral lymphoid organs, where they respond to foreign antigens and from where they recirculate in the blood and lymph.

- **Primary** lymphatic organs :-
- where **lymphocytes** are **formed and mature**. They provide an environment for stem cells to divide and mature into B- and T- cells:
- There are two primary lymphatic organs: the **red bone marrow** and the **thymus gland**. The development of white blood cells (haemopoesis) .
- Both T-cell and B-cells are 'born' in the bone marrow.
- However, whereas B cells also mature in the bone marrow, T-cells have to migrate to the thymus, which is where they mature in the thymus.

- Secondary (peripheral) lymphoid organs :-

- The peripheral lymphoid organs, which consist of the lymph nodes, the spleen, and the mucosal and cutaneous immune systems, are organized to optimize interactions of antigens, antigen presenting cells (APCs), and lymphocytes in a way that promotes the development of adaptive immune responses.

- **Lymph nodes:-** are nodular aggregates of lymphoid tissues located along lymphatic channels throughout the body (Fig. 1-12). Fluid from all epithelia and connective tissues and most parenchymal organs is drained by lymphatics, which transport this fluid, called lymph, from the tissues to the lymph nodes. Therefore, the lymph contains a mixture of substances that are absorbed from epithelia and tissues. As the lymph passes through lymph nodes, Antigen Presenting Cells (APCs) in the nodes are able to sample the antigens of microbes that may enter through epithelia into tissues. In addition, dendritic cells pick up antigens of microbes from epithelia and transport these antigens to the lymph nodes.

- The **spleen:-** is an abdominal organ that serves the same role in immune responses to blood borne antigens as that of lymph nodes in responses to lymph-borne antigens. Blood entering the spleen flows through a network of channels (sinusoids). Blood borne antigens are trapped and concentrated by dendritic cells and macrophages in the spleen. The spleen contains abundant phagocytes, which ingest and destroy microbes in the blood.

- **The cutaneous and mucosal lymphoid**:- systems are located under the epithelia of the skin and the gastrointestinal and respiratory tracts, respectively. Pharyngeal tonsils and Peyer’s patches of the intestine are two anatomically defined mucosal lymphoid tissues

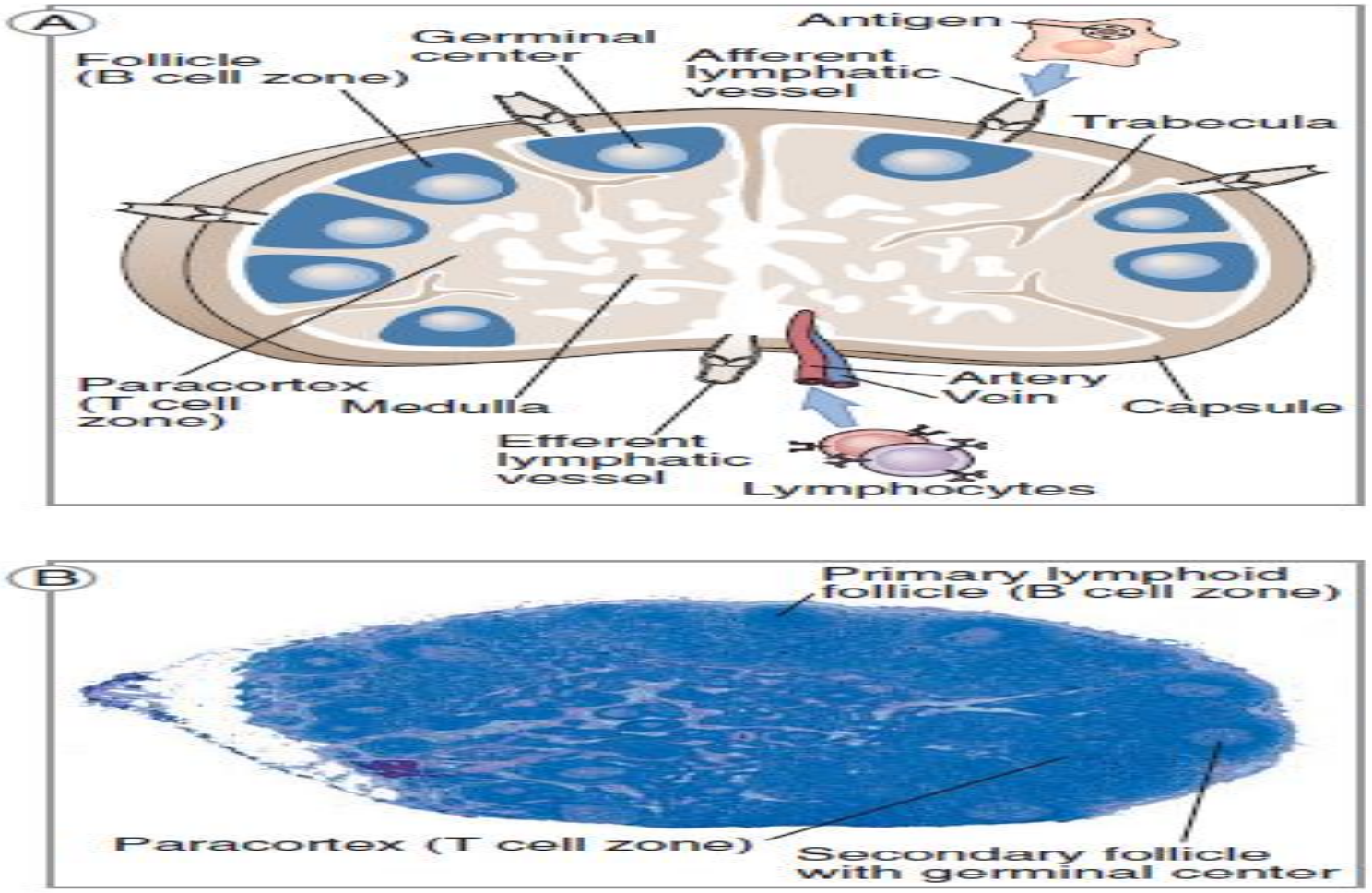


FIGURE 1-12 **The morphology of lymph nodes. A,** This schematic diagram shows the structural organization and blood flow in a lymph node. **B,** This light micrograph shows a cross section of a lymph node with numerous follicles in the cortex, some of which contain lightly stained central areas (germinal centers), and the central medulla.

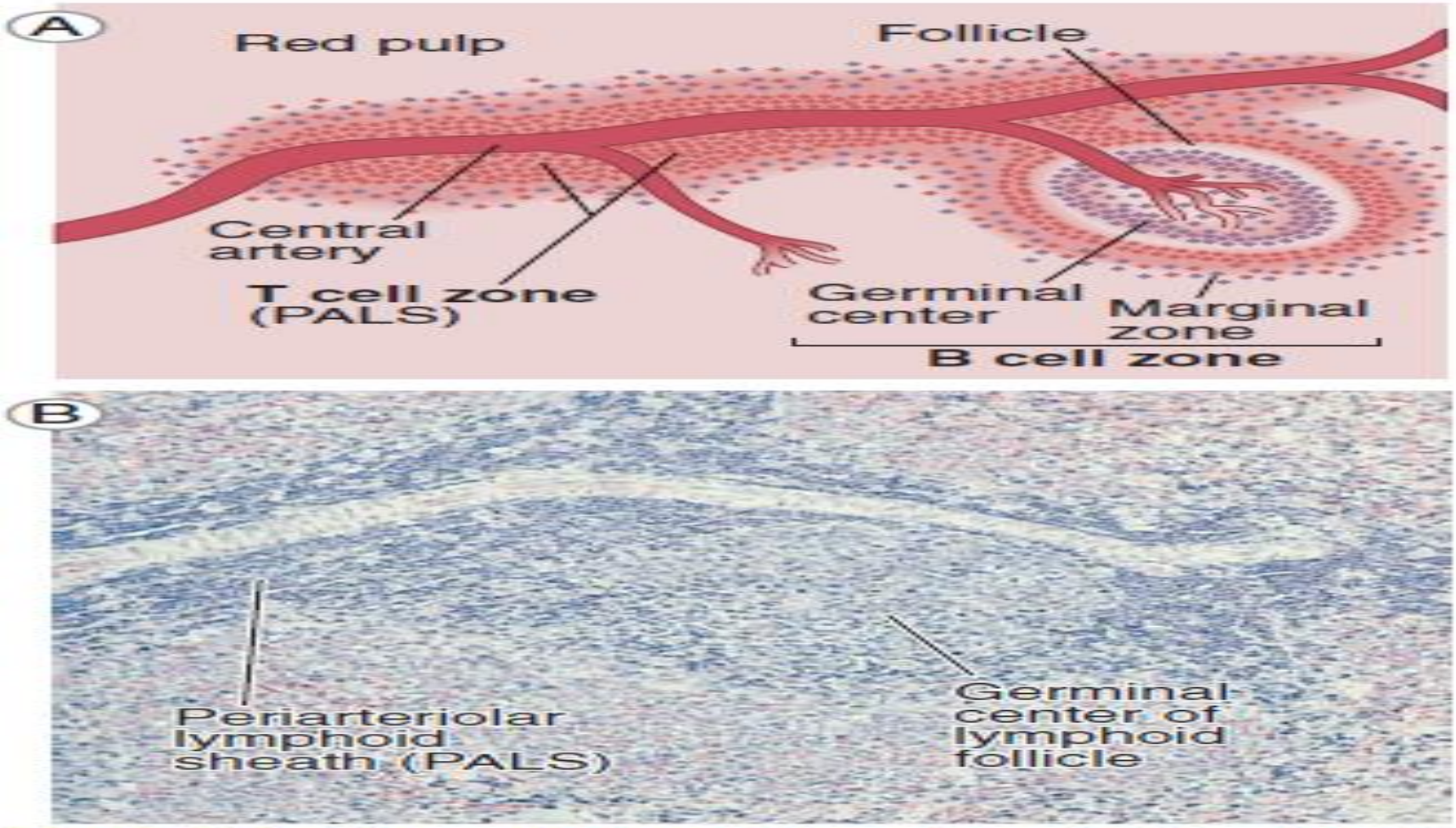


FIGURE 1-13 The morphology of the spleen. A, This schematic diagram shows a splenic arteriole surrounded by the periarteriolar lymphoid sheath (PALS) and attached follicle containing a prominent germinal center. The PALS and lymphoid follicles together constitute the white pulp. **B,** This light micrograph of a section of a spleen shows an arteriole with the PALS and a secondary follicle. These are surrounded by the red pulp, which is rich in vascular sinusoids.

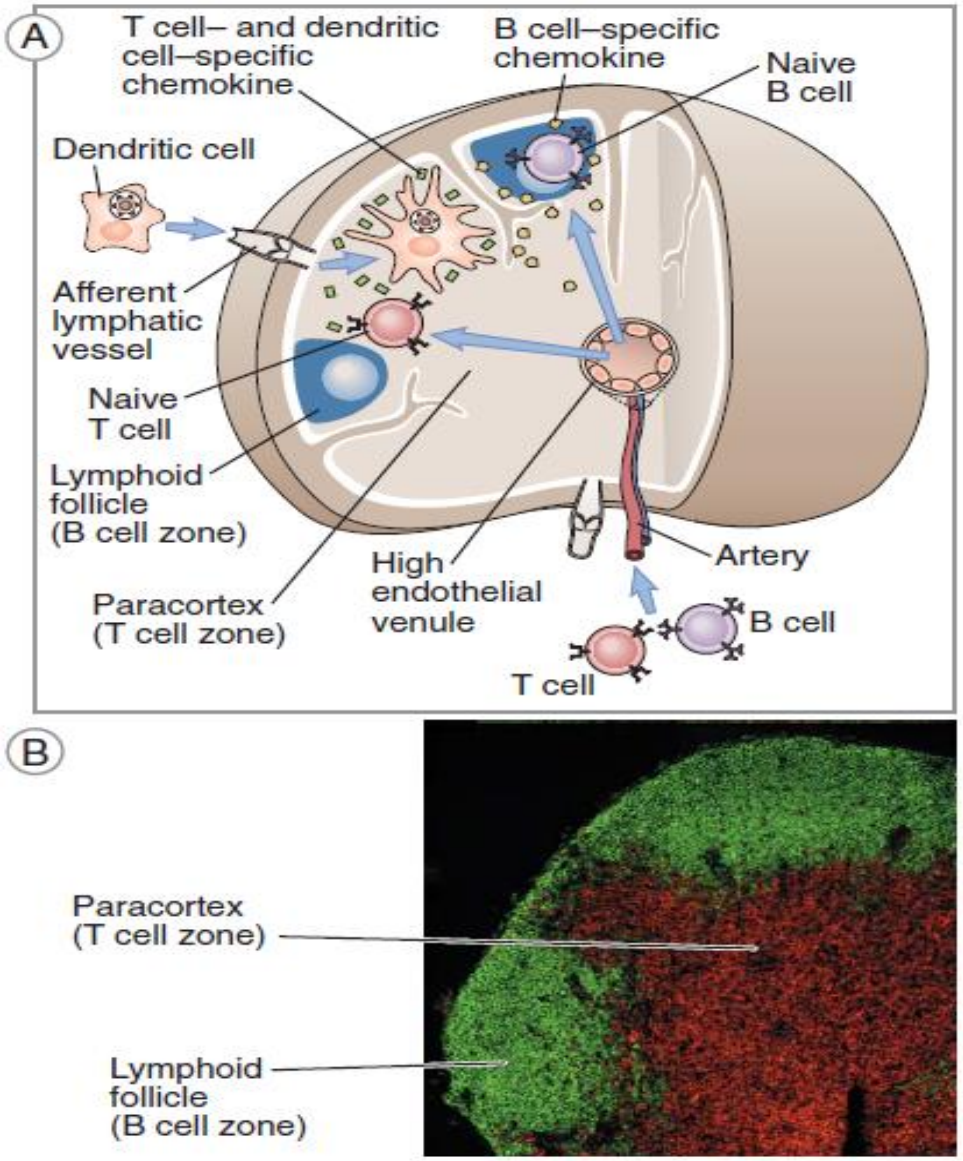
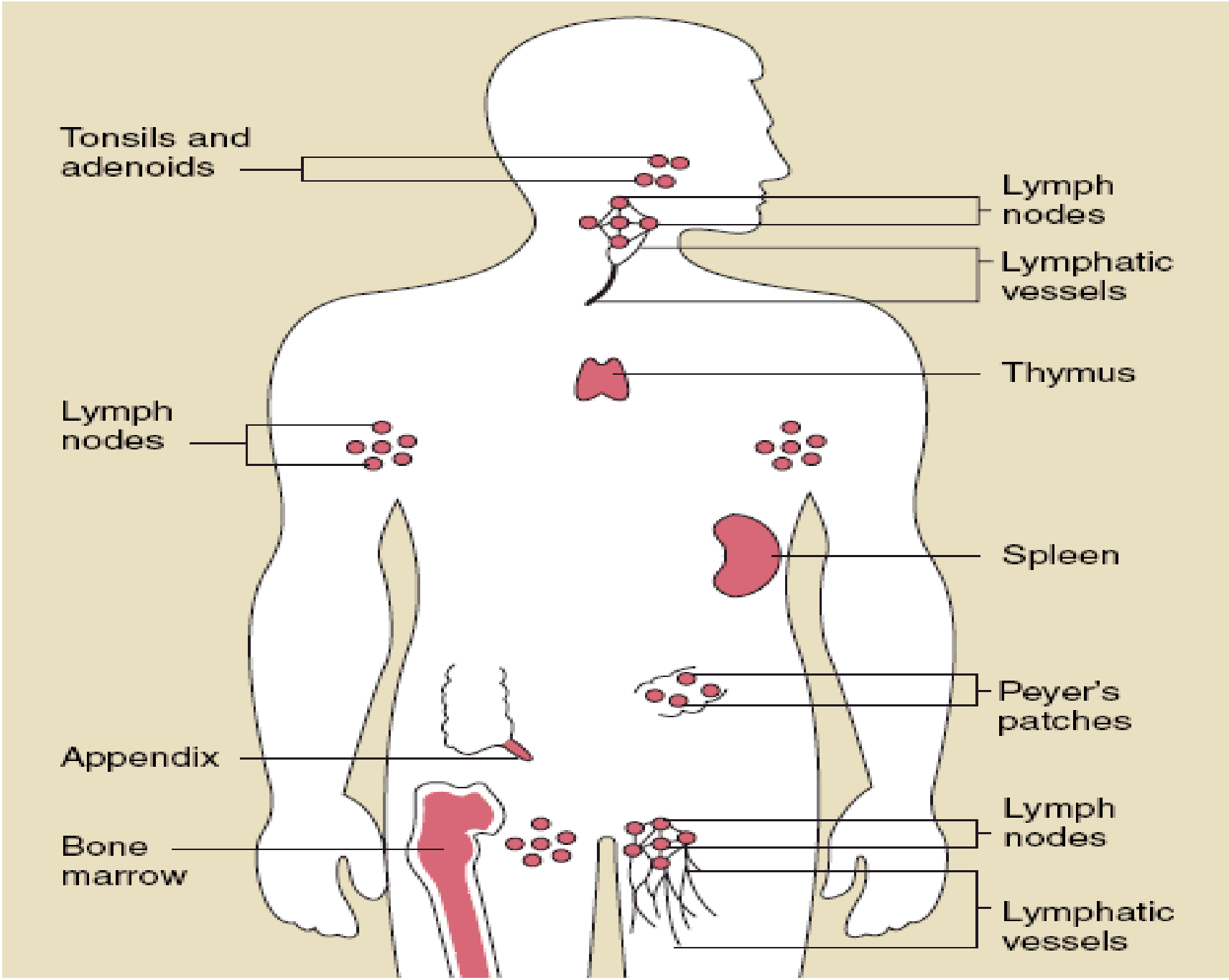


FIGURE 1-14 Segregation of T and B lymphocytes in different regions of peripheral lymphoid organs. **A,** This schematic diagram illustrates the path by which naive T and B lymphocytes migrate to different areas of a lymph node. The lymphocytes enter through a high endothelial venule (HEV), shown in cross section, and are drawn to different areas of the node by chemokines that are produced in these areas and bind selectively to either cell type. Also shown is the migration of dendritic cells, which pick up antigens from epithelia, enter through afferent lymphatic vessels, and migrate to the T cell–rich areas of the node. **B,** In this section of a lymph node, the B lymphocytes, located in the follicles, are stained green, and the T cells, in the parafollicular cortex, are red. The method used to stain these cells is called immunofluorescence. In this technique, a section of the tissue is stained with antibodies specific for T or B cells that are coupled to fluorochromes that emit different colors when excited at the appropriate wavelengths. The anatomic segregation of T and B cells also occurs in the spleen (not shown). (Courtesy of Drs. Kathryn Pape and Jennifer Walter, University of Minnesota Medical School, Minneapolis.)


Tonsils and adenoids
Lymph nodes
Lymphatic vessels
Thymus
Lymph nodes
Spleen
Peyer's patches
Appendix
Lymph nodes
Bone marrow
Lymphatic vessels