

Innate Lymphoid Cells (ILCs)

Recent studies have identified populations of lymphocytes that lack TCRs but produce cytokines similar to those that are made by T cells. NK cells are considered the first defined ILC. Different subsets of ILCs produce IFN- γ , IL-5, IL-17, and IL-22. The functions that have been attributed to ILCs include:

- Early defense against infections
- Recognition and elimination of stressed cells (so-called stress surveillance)
- Shaping the later adaptive immune response, by providing cytokines that influence the differentiation of T lymphocytes.

Interest in these cells has been spurred by the hypothesis that they are early participants in inflammatory diseases, primarily as a source of cytokines. However, much remains to be learned about the functions and roles of these cells in normal and pathologic immune responses.

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.

Generative Lymphoid Organs

The principal generative lymphoid organs are the thymus, where T cells develop, and the bone marrow, the site of production of all blood cells and where B lymphocytes mature. These organs are described in Chapter 13.

Peripheral Lymphoid Organs

The peripheral lymphoid organs—lymph nodes, spleen, and the mucosal and cutaneous lymphoid tissues—are organized to concentrate antigens, antigen-presenting cells, and lymphocytes in a way that optimizes interactions among these cells and the development of adaptive immune responses.

- *Lymph nodes* are nodular aggregates of lymphoid tissues located along lymphatic channels throughout the body (Fig. 6-8). As lymph slowly suffuses through lymph nodes, antigen-presenting cells in the nodes are able to sample the antigens of microbes that may enter through epithelia into tissues and are carried in the lymph. In addition, dendritic cells pick up and transport antigens of microbes from epithelia and tissues via lymphatic vessels to the lymph nodes. Thus, the antigens of microbes that enter through epithelia or colonize tissues become concentrated in draining lymph nodes.
- The *spleen* is an abdominal organ that serves the same role in immune responses to bloodborne antigen as the lymph nodes do in responses to lymph-borne antigens. Blood entering the spleen flows through a network of sinusoids. Bloodborne antigens are trapped by dendritic cells and macrophages in the spleen.
- The cutaneous and mucosal lymphoid systems are located under the epithelia of the skin and the gastrointestinal and respiratory tracts, respectively. They

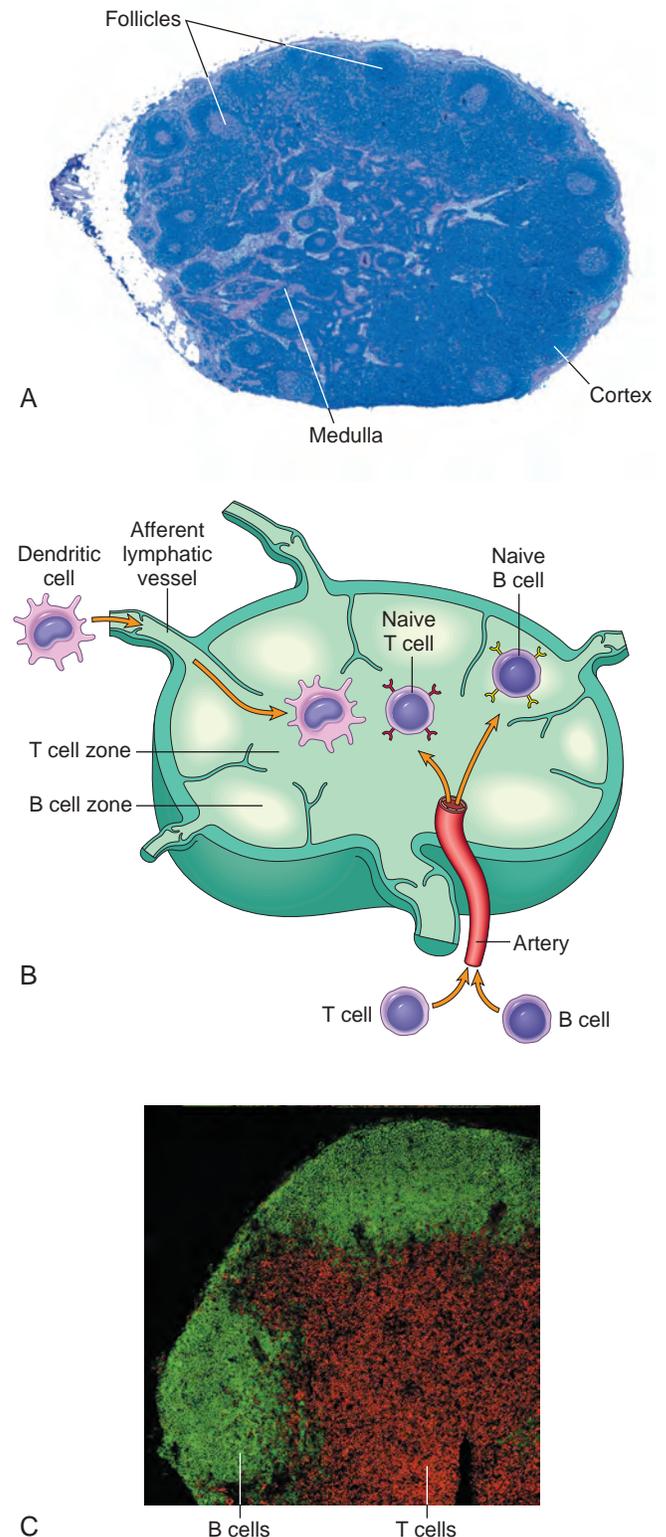


Figure 6-8 Morphology of a lymph node. **A**, The histology of a lymph node, with an outer cortex containing follicles and an inner medulla. **B**, The segregation of B cells and T cells in different regions of the lymph node, illustrated schematically. **C**, The location of B cells (stained green, using the immunofluorescence technique) and T cells (stained red) in a lymph node. (Courtesy Drs. Kathryn Pape and Jennifer Walter, University of Minnesota School of Medicine, Minneapolis, Minn.)