42.2D: Cytotoxic T Lymphocytes and Mucosal Surfaces

The lymphatic system houses large populations of immune cells which are released upon detection of a pathogen.

Learning Objectives

• Describe the features of the lymphatic system as they relate to the immune response

Key Points

• The lymphatic system contains lymph: a fluid that bathes tissues and organs and contains white blood cells (not red blood cells).
• Once B and T cells mature, the majority of them enter the lymphatic system, where they are stored in lymph nodes until needed.
• Lymph nodes also store dendritic cells and macrophages; as antigens are filtered through the lymphatic system, these cells collect them so as to present them to B and T cells.
• The spleen, which is to blood what lymph nodes are to lymph, filters foreign substances and antibody -complexed pathogens from the blood.

Key Terms

• lymph: a colorless, watery, bodily fluid carried by the lymphatic system, consisting mainly of white blood cells
Lymphatic system

Lymph, the watery fluid that bathes tissues and organs, contains protective white blood cells, but does not contain erythrocytes (red blood cells). Lymph moves about the body through the lymphatic system, which is made up of vessels, lymph ducts, lymph glands, and organs such as tonsils, adenoids, thymus, and spleen. Although the immune system is characterized by circulating cells throughout the body, the regulation, maturation, and intercommunication of immune factors occur at specific sites that are known as lymph nodes.

The blood circulates immune cells, proteins, and other factors through the body. Approximately 0.1 percent of all cells in the blood are leukocytes, which include monocytes (the precursor of macrophages) and lymphocytes. Most cells in the blood are red blood cells. Cells of the immune system can travel between the distinct lymphatic and blood circulatory systems, which are separated by interstitial space, by a process called extravasation (passing through to surrounding tissue).

Recall that cells of the immune system originate from stem cells in the bone marrow. B cell maturation occurs in the bone marrow, whereas progenitor cells migrate from the bone marrow and develop and mature into naïve T cells in the organ called the thymus. On maturation, T and B lymphocytes circulate to various destinations. Lymph nodes scattered throughout the body house large populations of T and B cells, dendritic cells, and macrophages. Lymph gathers antigens as it drains from tissues. These antigens are filtered through lymph nodes before the lymph is returned to circulation. Antigen-presenting cells (APCs) in the lymph nodes capture and process antigens, informing nearby lymphocytes about potential pathogens.

The spleen houses B and T cells, macrophages, dendritic cells, and NK cells. The spleen is also the site where APCs that have trapped foreign particles in the blood can communicate with lymphocytes. Antibodies are synthesized and secreted by activated plasma cells in the spleen, which filters foreign substances and antibody-complexed pathogens from the blood. Functionally, the spleen is to the blood as lymph nodes are to the lymph.
Figure \(\PageIndex{1}\): **Spleen in the lymphatic system**: The spleen functions to immunologically filter the blood and allow for communication between cells corresponding to the innate and adaptive immune responses.