

# Lymph Node



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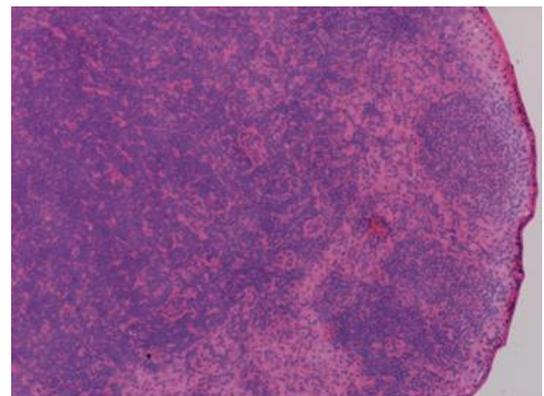
A number of specialised tissues are important for the proper functioning of the immune system. Among these are the **lymph nodes**, which **provide an ideal environment for communication between immune cells**. This environment is necessary for proper activation of the T and B cells (or lymphocytes) that are required for defence against many pathogens. A number of features of lymph nodes help them to perform their functions.

## Lymph node location

The lymph nodes are strategically located at anatomical locations where they are most able to receive immunological signals from around the body. The total number of nodes is not known, but there are likely to be hundreds. Each node is well-supplied by both lymphatic and blood vessels, which allow lymphocytes to enter and exit. They are contained within a tough capsule, and surrounded by specialised fatty deposits, which may give some physical protection.

## Lymph node structure

Each human lymph node is up to 20mm in diameter, and is divided into compartments, with important functions in enabling communication between lymphocytes. The outer layer (Cortex) contains the B-cell areas, or follicles. The middle layer (Paracortex) is mostly populated by T cells and dendritic cells (**Figure 1**). The paracortex also contains specialised blood vessels (high endothelial venules) through which many B and T cells enter the node. The lymph vessels enter the nodes at the outer edge, between the capsule and the cortex, and also penetrate deep within the nodes, via conduits. T and B cells leave the node via "efferent" lymphatic vessels, found in the central "medullary" region. All these structures are maintained by a network of non-lymphoid cells that also actively influence immune responses.



**Figure 1.** A slice through a lymph node, showing B and T cell areas where lymphocytes are tightly packed (purple).

## Co-ordinated movement of cells in lymph nodes

T cells enter the lymph nodes through high endothelial venules, and move around within the T-cell area, transiently interacting with large numbers of dendritic cells. They finally leave the node via the efferent lymphatic vessels. B cells enter by the same route, and migrate through the T-cell area to the follicles, before finally leaving the node and re-entering the circulation. These migratory patterns give dendritic cells, T cells, and B cells many opportunities to interact. The cells may travel on a network of microscopic fibres, further increasing their chances of interacting.

## Responding to new infections

Lymph nodes are extremely important in responses to pathogens, especially those that an individual has not previously encountered. Proteins from the pathogen will reach dendritic cells in the lymph node, or will be carried to the lymph node by migrating dendritic cells, and protein fragments will be "presented" to T cells. The continual interactions between dendritic cells and T cell ensure that a T cell will soon be found that recognises the pathogenic protein fragment. This T cell will then divide and coordinate the immune response against the pathogen. Crucially, some of the dividing T cells' daughters will travel to the B cell follicle and promote B-cell division and maturation, enabling the production of the antibodies that are essential for fighting many infections.