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# **The Lymphatic System**

222 CLS

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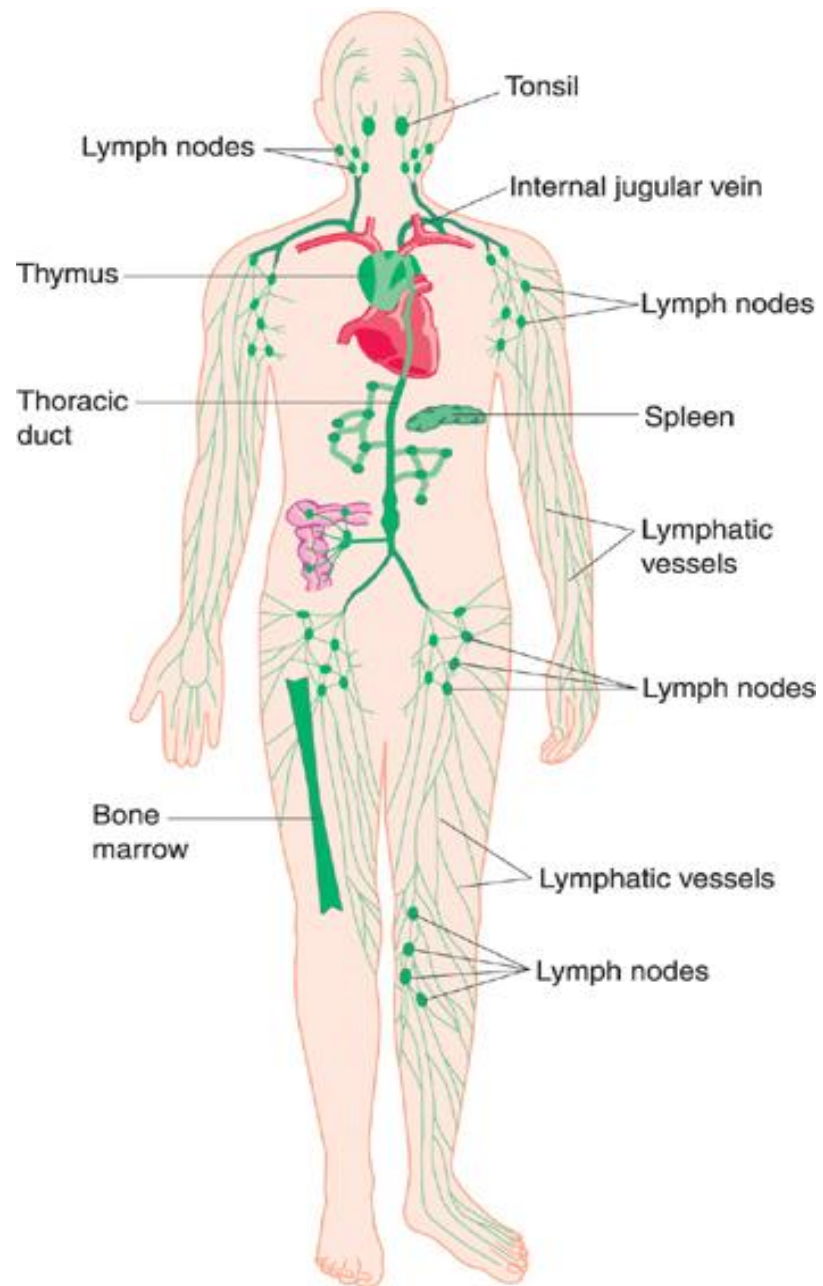
# Lymphatic System Function

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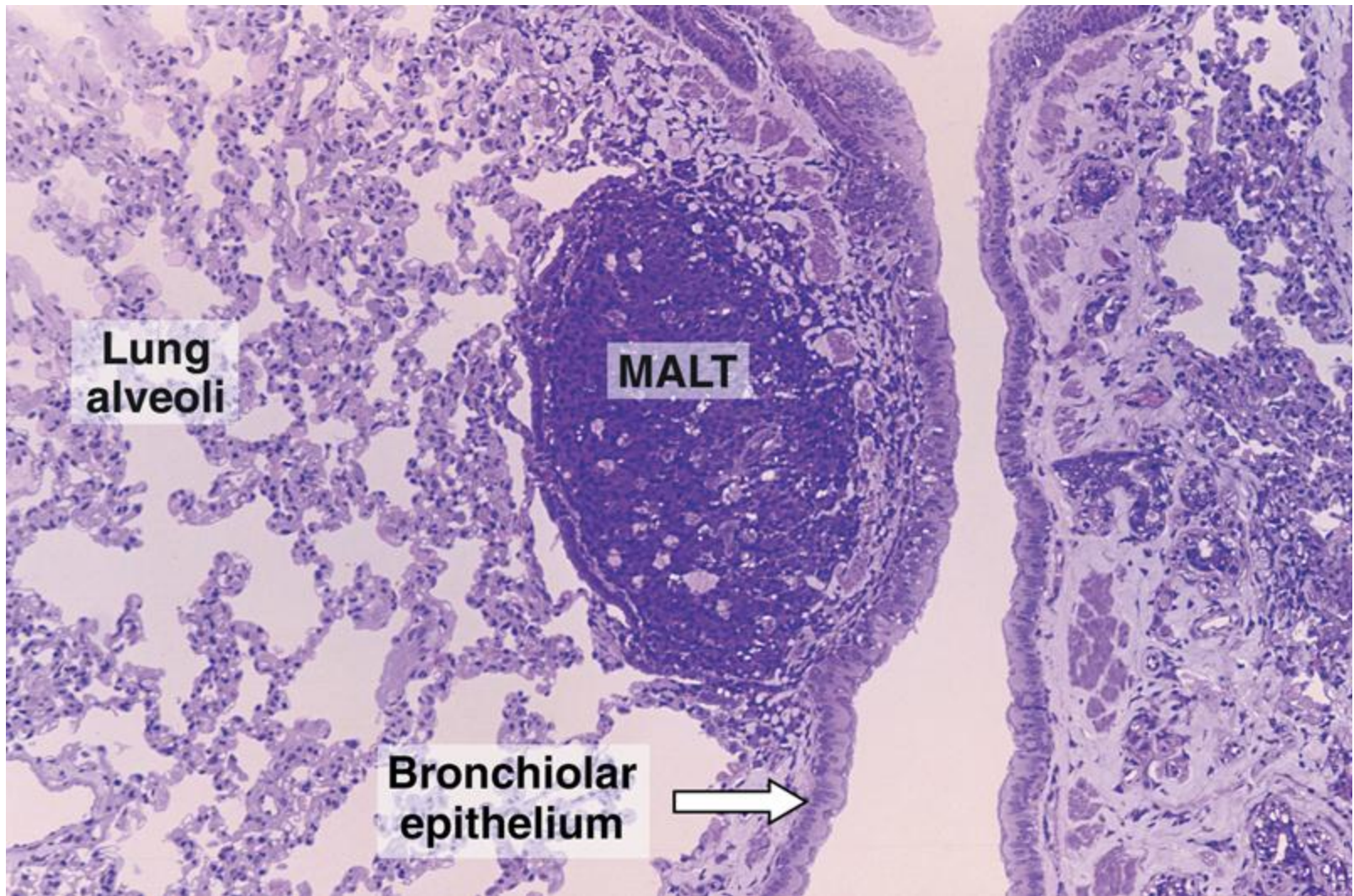
Lymphatic System which consists of vessels and organs plays **two vital roles** in our lives:

- 1) **The vessels** essentially maintain interstitial fluid levels by **carrying excess fluids as well as any plasma proteins, back into the CVS.**
- 2) **The organs**, where critical immune cells such as lymphocytes which carryout our **body defense against infection and disease as well as offer ACQUIRED IMMUNITY.**





**video**



**Section of lung showing a collection of lymphocytes in the connective tissue of the bronchiolar mucosa, an example of mucosa-associated lymphoid tissue (MALT). Pararosaniline-toluidine blue (PT) stain. Low magnification.**

# Lymphatic Characteristics

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## ▶ **Properties of lymphatic vessels**

- ▶ One way system toward the heart
- ▶ No pump
- ▶ Lymph moves toward the heart
  - ▶ Milking action of skeletal muscle
  - ▶ Rhythmic contraction of smooth muscle in vessel walls



# Composition of Lymph

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- ▶ Lymph is usually a clear, colorless fluid, similar to blood plasma but low in protein
  - ▶ Its composition varies from place to place; after a meal, for example, lymph draining from the small intestine, takes on a milky appearance, due to lipid content.
  - ▶ Lymph may contain macrophages, viruses, bacteria, cellular debris and even traveling cancer cells.
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# Lymphatic System Vessels

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- ▶ The vessels are called lymphatics.
- ▶ They are thin-walled and are analogous to veins.
- ▶ Small lymphatics are similar to capillaries only more porous; Larger vessels are called collecting vessels: both have valves.
- ▶ 2 large Ducts: Right **Lymphatic duct** and **Thoracic duct** (**both empty into the RT and LT subclavian veins**)
- ▶ Lymph flows only to The Heart (One Way).
- ▶ This is a **low-pressure, pumpless system**. Lymph moves via skeletal muscles and pressure changes in thorax during breathing only.



# Lymph Nodes

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- ▶ Then Lymph Nodes take the germ-filled lymph and
- ▶ Filter lymph before it is returned to the blood
- ▶ **Defense cells** within lymph nodes
  - ▶ Macrophages – engulf and destroy foreign substances
  - ▶ Lymphocytes – provide immune response to antigens





# Lymphatic Organs

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- ▶ **Lymph Node-** Important lymphocytes of the immune response are matured here.
- ▶ **Spleen-** DESTROYS RBCs and Reservoir of Blood; IT IS THE LARGEST Lymph organ and it filter blood of bacteria and antigen-filled cells.
- ▶ **Thymus Gland-** produces hormone, *thymosin*, functions in **programing** lymphocytes T and B cells; T-cells matured here ( become immunocompetent)



## **Lymphatic organs con.**

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- ▶ **Tonsils**-Traps bacteria and other microbes in throat.
- ▶ **Peyer's Patch**- capture and destroy bacteria in intestine, thereby preventing them from penetrating the intestinal wall.



# Lymph Node Structure

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- ▶ Most are kidney-shaped, less than 1 (one) inch long

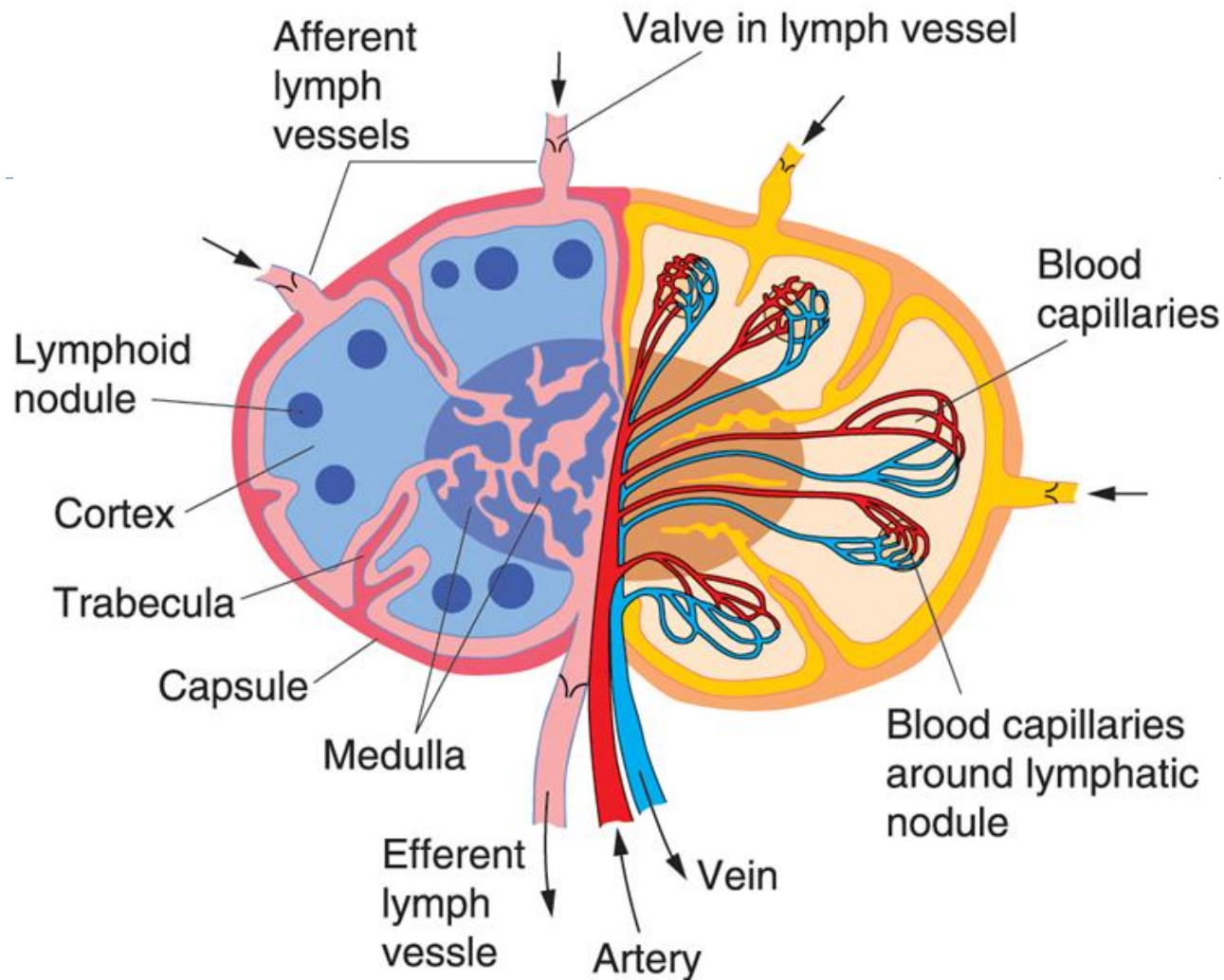
## 1. Cortex

- ▶ Outer part
- ▶ Contains follicles – collections of lymphocytes

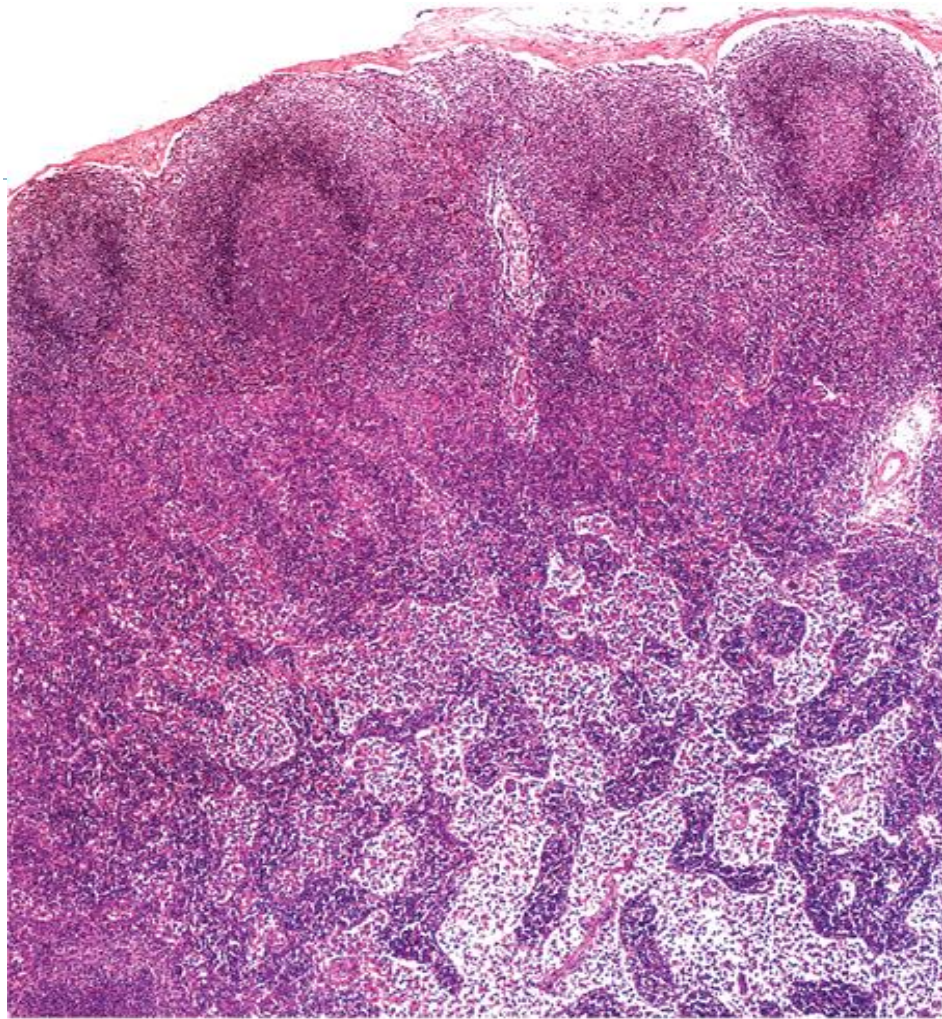
## 2. Medulla

- ▶ Inner part
- ▶ Contains phagocytic macrophages

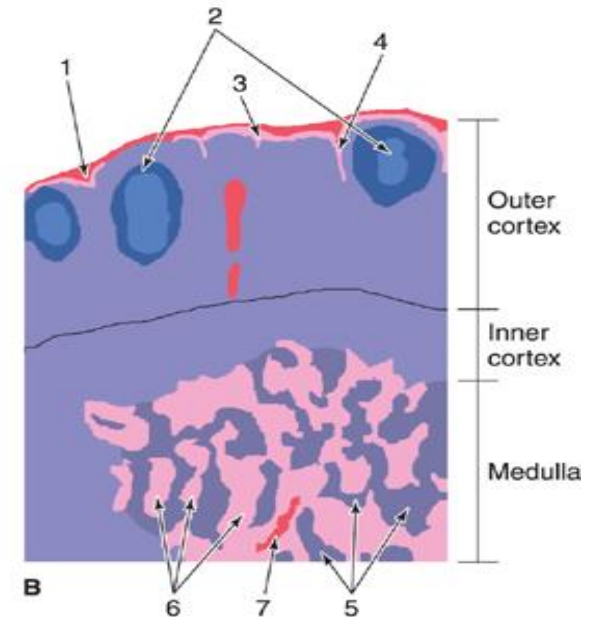




The left half of the figure shows the primary components of the organ and the circulation of lymph within a lymph node, entering through the convex side of the node and leaving through the hilum. The right half depicts part of the blood circulation.



A



B

**A:** Section of a lymph node showing the cortex and the medulla and their primary components. **B:** (1) Capsule; (2) lymphoid nodule with germinal center; (3) subcapsular sinus; (4) intermediate sinus; (5) medullary cords; (6) medullary sinus; (7) trabecula. H&E stain. Low magnification. (Courtesy of PA Abrahamsohn.)

# Thymus Gland

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Histologically, each lobe of the thymus is subdivided by collagenous septa into lobules. Each lobule consists of a

- ▶ **Peripheral cortex** composed of lymphocytes
- ▶ **Medulla lacking lymphocytes** but containing glandular tissue.

Various thymic hormones produced by the medulla regulate the differentiation of T lymphocytes, for example, thymosin and thymopoietin.





# Spleen

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- ▶ **Filters blood** of bacteria, viruses and other debris
  - ▶ Destroys worn out blood cells. It then returns (or recycles) some of the breakdown products of RBCs to the liver ..for example Fe, so that more RBCs can be made. The unusable portion of worn-out blood is excreted in bile.
- ▶ Another function: **Stores platelets** and acts as a blood reservoir.
- ▶ Lymphocytes are produced; RBCs also made in **fetus only**.



# References

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- ▶ <http://www.youtube.com/watch?v=38hwl88Gb44>
- ▶ <http://www.youtube.com/watch?v=8ngnKlyBA20&feature=relmfu>
- ▶ <http://www.youtube.com/watch?v=KI5L0IBCYYC8>
- ▶ <http://www.youtube.com/watch?v=FKAfjzjX9Mg>

