



## Medical Laboratory Techniques Department Lymphatic System



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### The Lymphatic System

- network of tissues, organs and vessels that help to maintain the body's fluid balance & protect it from pathogens
- lymphatic vessels, lymph nodes, spleen, thymus, tonsils, etc
- without it neither the circulatory system nor the immune system would function
- can be thought of as an accessory to the circulatory system
- it helps the circulatory system to do its job
- the two systems are directly connected together
- it consists of fluid derived from plasma =lymph and white blood cells (esp. lymphocytes and macrophages (monocytes))
- the lymph travels in only one direction - it doesn't Circulate

#### General Functions of Lymphatic System:

**1. Returns Fluid from Tissues to Blood.** ~85% of fluids that leak out of blood returns to blood via blood capillaries ~15% returns via lymph capillaries- in 24 hrs lymphatics return fluid equivalent to entire blood volume - if lymphatic system becomes blocked edema

**2. Returns Large Molecules to Blood .**~25-50% of blood proteins leak out of capillaries each day

\* they cannot get back into capillaries



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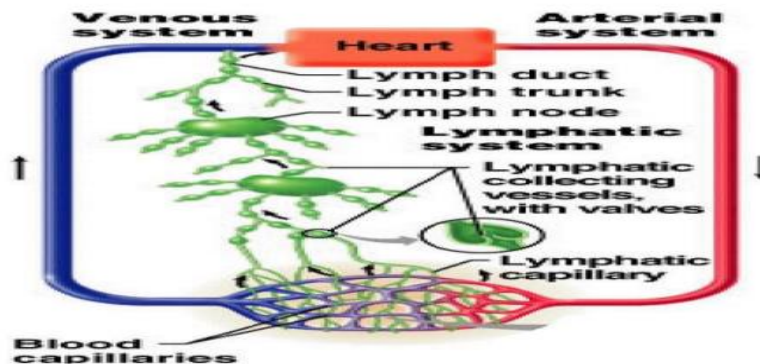
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- \* instead lymphatic capillaries pick them up and return them to the blood
  - \* if lymphatics are blocked blood protein decreases leading to fluid
  - \* imbalances in body

3. **Absorb and Transport Fats** - Special lymphatic capillaries (=lacteals) in villi of small intestine absorb all lipids and fat soluble vitamins from digested food bypasses liver much goes straight to adipose tissues

4. **Hemopoiesis** - some WBC's (lymphocytes, monocytes) are made in lymphatic tissues (not bone marrow) main supply of lymphocytes

5. **Body Defense/Immunity** - lymphoid tissue is an important component of the Immune System (forms a diffuse surveillance defense system in all body tissues and organs

- \* the major role of WBC's is in body defense
- \* lymphatic system screens body fluids and removes pathogens and damaged cells





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### Lymph

- Lymph is a clear watery fluid that resembles blood plasma but: has fewer proteins its composition varies depending on organs that it drains
- the lymphatic system handles 125 ml/hr (2500-2800 ml of lymph/day) ~1/2 of this from the liver and small intestine alone.

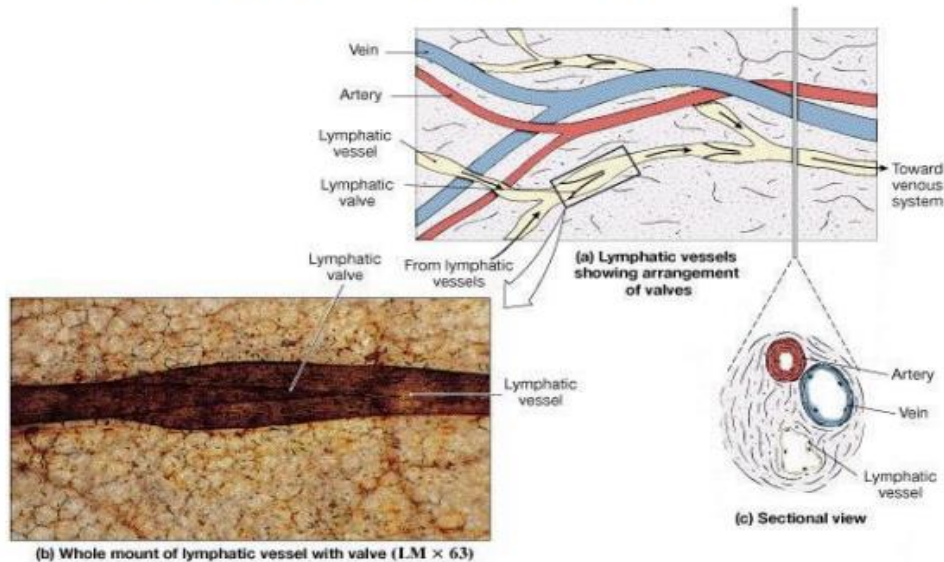
### Lymphatic Vessels (lymphatics):

#### Lymphatic Capillaries

- originate in tissues as tiny blind ended sacs
- lie side by side with blood capillaries
- single layer of endothelial cells like blood capillaries
- but much more permeable to solvents, and large solutes and whole cells

**Lymphatic Vessels** - these small lymphatic capillaries merge with others to form larger lymphatic vessels - they resemble veins in structure:

- three layers – but much thinner
- one way valves – but many more .
- also has lymph nodes at intervals along its course
- as they converge they become larger and larger



### Lymph Circulation

- Lymph vessels are thin walled, valved structures that carry lymph
- Lymph is not under pressure and is propelled in a passive fashion
- Fluid that leaks from the vascular system is returned to general circulation via lymphatic vessels.
- Lymph vessels act as a reservoir for plasma and other substances including cells that leaked from the vascular system
- The lymphatic system provides a one-way route for movement of interstitial fluid to the cardiovascular system.
- Lymph returns the excess fluid filtered from the blood vessel capillaries, as well as the protein that leaks out of the blood vessel capillaries.



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- Lymph flow is driven mainly by contraction of smooth muscle in the lymphatic vessels but also by the skeletal-muscle pump and the respiratory pump.

### LYMPH CIRCULATION

Interstitial fluid → Lymph → Lymph capillary → Afferent lymph vessel → Lymph node → Efferent lymph vessel → Lymph trunk → Lymph duct {Right lymphatic duct and Thoracic duct (left side)} → Subclavian vein (right and left) → Blood → Interstitial fluid

### Major Accessory Lymphatic Organs

- Spleen – largest
- Thymus
- Tonsils
- Peyer's patches
- Appendix

