

LYMPHATIC SYSTEM

The lymphatic system consist of lymph, lymphatic vessels, and lymphatic structures

I. Function - To transport some of the interstitial fluid back to blood-stream and to help the body fight infection. Plasma pushes out of blood capillaries and into the tissues. Fluid within tissues = Interstitial fluid. Blood capillaries pick up most, but not all of this fluid.

BODY FLUIDS:

- in the blood: plasma
- in the tissues: interstitial fluid = extracellular fluid
- in the lymphatic system: lymph

Some of the interstitial fluid id picked up by the lymphatic capillaries = lymph

II. Lymph

A. Lymph - composed of;

1. interstitial fluid
2. Fats from intestine
3. Foreign material

*If lymph isn't removed, the tissue swells = edema.

III. Lymph Vessels

A. Lymphatic capillaries

1. Wall = simple squamous epithelium. (highly permeable)
2. Form vast networks between cells
3. In small intestine = lacteals (for fat absorption)

B. Lymphatic Vessels - Formed by merging lymph capillaries

1. Have 3 tunics (like a vein; thinner walled)
2. May contain valves
3. "Skeletal muscle pump" is required to move lymph along
4. All lymphatic vessels empty into lymphatic trunks.

C. Lymphatic Trunks

1. Large vessels (like veins)
2. Named for the region from which they collect lymph: There are the paired lumbar, bronchomediastinal, subclavian, and jugular trunks, and the single intestinal trunk to name a few.

3. The trunks flow into ducts.

D. Lymphatic Ducts

1. **Rt. Lymphatic Duct** – drains r. arm, r. chest, r. side of head & neck into R. Subclavian Vein

2. **Thoracic Duct** – drains rest of body into L. Subclavian vein

Lymph Flow:

Lymphatic capillaries → Lymphatic vessels → Lymphatic trunks → Lymphatic ducts → Subclavian Veins (blood stream)

IV. Lymphatic Cells

A. Macrophages – these are monocytes that have migrated from the bloodstream into the lymphatic system. They are phagocytes and they are responsible for presenting antigens (foreign substances) to other lymphatic cells.

B. Dendritic Cells – these are found in lymphatic nodules. They internalize antigens from the lymph and like the macrophages, present them to other lymphatic cells.

C. Lymphocytes – most abundant cell type; 3 types

1. T- Lymphocytes – 2 types

a. Helper T- Lymphocytes – initiate the immune response

b. Cytotoxic T-Lymphocytes – they destroy infected or foreign cells.

2. B-Lymphocytes – they are responsible for producing antibodies

3. NK (natural killer) cells – they can kill a wide variety of infected cells and some cancerous cells.

V. Lymphatic Structures

A. Lymphatic Nodules – aggregations of phagocytes & lymphocytes (not surrounded by a connective tissue capsule)

1. MALT (**M**ucosa-**A**ssociated **L**ymphatic **T**issue) – an example are the Peyer's Patches found in the wall of the small intestine.

2. Tonsils – pharyngeal, palatine, & lingual

B. Lymphatic Organs – consists of lymphatic cells completely surrounded by a connective tissue capsule.

1. Thymus: a “bag” of WBC's

a. Located in the anterior thorax, behind sternum

b. Function: stores newly formed T-cells (lymphocytes) until they reach maturity

c. When mature, the T-cells are released & they migrate to other lymphatic structures

2. Lymph Node

a. An encapsulated “bag” of WBC's

b. Occur in regional clusters: popliteal, inguinal, lumbar, cubital, axillary, thoracic, and cervical to name a few.

c. Contents:

i. Phagocytic cells (eat cellular debris & foreign material)

ii. Specialized lymphocytes (T & B cells): provide immunological defense

d. Function: **FILTERS LYMPH & PROVIDES AN IMMUNOLOGICAL RESPONSE**

3. Spleen

a. Located posterior & lateral to stomach

b. An encapsulated “bag” of WBC's (phagocytes & lymphocytes)

c. Functions:

i. Destroys old RBC's

ii. **FILTERS BLOOD & PROVIDES AN IMMUNOLOGICAL RESPONSE**