

## Lymphatic System Intro

EQ: What are the five main organs of the lymphatic system and their functions?

- I. Functions
  - a. Collect tissue fluid & return to blood stream
  - b. Transport large molecules (hormones and lipids) into blood stream
  - c. Immune surveillance (detect, destroy and remember pathogens & rogue cancer cells)
- II. Lymph Fluid
  - a. Blood moves under pressure through arteries into smaller capillaries where some fluid leaks out into body tissues
  - b. Lymphatic vessels collect leaked interstitial fluid to return to blood stream & filter it for pathogens
  - c. Once fluid enters lymph vessels it is called Lymph
  - d. Movement of Lymph
    - i. Overlapping lymphatic capillary cells allow lymph fluid to enter but internal pressure shuts cells & prevents leakage back out
    - ii. Unlike blood stream of cardiovascular system there is no heart pump to move lymph
    - iii. It is moved by nearby movements of skeletal muscles and pulsing arteries
    - iv. Lymph vessels have one-way valves to prevent lymph from moving backwards
- III. Lymphatic System Organs
  - a. Bone marrow
    - i. Location of hematopoiesis (blood cell formation)
    - ii. Lymphocytes
      1. B-cells stay and mature in bone
      2. T-cells leave and go to thymus to mature
      3. Phagocytes leave and move through body; looking for pathogens
    - iii. Red Blood Cells (RBCs) carry oxygen
  - b. Thymus
    - i. Above heart and active only until puberty –then shrinks
    - ii. After being formed in bone marrow, T-cells mature in Thymus
    - iii. T-cells learn self-proteins from non-self
  - c. Spleen
    - i. Organ below the lungs on left side of stomach
    - ii. Filters Blood (not lymph) for pathogens
    - iii. Recycles old blood cells
    - iv. Is a storage of extra blood for emergencies
  - d. Lymphatic vessels & ducts
    - i. Lymph moves into increasingly larger tubes
      1. Capillaries → Vessels → Trunks → Ducts
    - ii. Ducts return lymph into veins
  - e. Lymph nodes
    - i. Oval masses of lymphatic tissue that house white blood cells and filter for pathogens
    - ii. Concentrated in neck, armpits, groin and abdominal cavity
    - iii. Pathogen is engulfed by phagocyte (Dendritic cell or macrophage)
    - iv. Antigen from digested pathogen is presented to B-cell that then produces antibodies to attack pathogen in body
    - v. Tonsils

1. Are enlarged lymph nodes that surround the mouth
2. Trap any pathogens entering from food or air

#### IV. Diseases

- a. Infectious Diseases
  - i. transmitted from one person to another
  - ii. caused by a pathogen
    1. bacteria, virus, fungus, protozoa, worm etc
- b. Non-Infectious Diseases
  - i. cannot be transmitted w/ variety of
  - ii. causes both
    1. internal → vitamin deficiency, autoimmune, cancer...
    2. external → exposure to toxins, radiation, poison
- c. Bacteria
  - i. single prokaryote cell (simplest life form)
  - ii. Have DNA and make own proteins
  - iii. Pili – attachment to surfaces and facilitate infection
  - iv. Antibiotics
    1. work against bacteria b/c they live outside our cells
    2. antibiotics can break cell membrane or stop cell metabolism.
    3. Do NOT work for viruses
- d. Viruses
  - i. Virus Structure
    1. DNA or RNA genetic material
    2. Protein Coat-Protecting DNA
    3. Antigens- for attachment
  - ii. Are NOT defined as alive!
    1. NON-cellular
    2. NO metabolism
    3. NO growth
    4. NO response to stimuli
    5. Life like traits...
      - a. CAN reproduce and evolve
  - iii. Viral Reproduction-2 types
    1. Lytic Cycle -ends in host cell death + release of 100's + of new viruses
      - a. Attachment
      - b. Entry
      - c. Replication
      - d. Assembly
      - e. Lysis
    2. Lysogenic Cycle- ends with Viral DNA incorporated into host DNA
      - a. Attachment
      - b. Entry
      - c. Integration
      - d. Cell Reproduction
  - iv. Temperate Viruses -move from lysogenic back to lytic
    1. Varicella Virus - Chicken pox (lytic) and Shingles (lytic after lysogenic term)
    2. HPV Virus – can cause cancer by damaging host DNA
    3. Herpes - "outbreak" of cold sores is the lytic cycle