Lymphatic System and Immunity

Defense against disease
Structure of the Lymphatic System

- **Lymph**
  - Straw-colored, similar to plasma
  - Interstitial fluid – in spaces between cells
  - Composed of water, lymphocytes. Oxygen, digested nutrients,
  - NO RBC’s or proteins
- Lymph vessels
  - Closely parallel veins
  - Located in almost all tissues and organs that have blood vessels
  - Thoracic duct or Left lymphatic duct – largest lymph vessel
  - R lymphatic duct - branches off thoracic duct
Lymph Nodes

- Tiny, oval shaped, size of pinhead to size of almond
- Located alone or grouped
Tonsils

- masses of lymphatic tissue that produce lymphocytes
- Get smaller as person gets older
- Located in throat
- Adenoids – tonsils on upper part of throat
- **Spleen**
- Sac – like mass of lymphatic tissue
- Upper left abdominal cavity, just below diaphragm
Thymus

- consists mostly of lymphatic tissue
- located in upper, anterior chest above the heart
Functions of the Lymphatic System

- Acts as an intermediary between the blood in the capillaries and the tissue (Lymph Fluid)
- **Transport** excess fluid tissue (Lymph vessel)
- **Produces** lymphocytes (lymph nodes)
- Works as a **recycling** plant (spleen)
- **Produces** T-Lymphocytes (Thymus Gland)
Function of the Lymphatic System

- Lymph – fluid that goes between capillary blood and tissues
- Carries digested food, oxygen and hormones to cells
- Carries wastes back to capillaries for excretion
- Since lymphatic system has no pump, skeletal muscle action squeezes lymph along
- Lymph in tissues is interstitial fluid
Lymph vessels

- transport excess tissue fluid back into circulatory system
- Valves prevent backward flow
- Lymph flows in only one direction - from body organs to heart
- Closely parallel veins
- Tissue lymph enters small lymph vessels which drain into larger lymph vessels (lymphatics) into two main lymphatics – the thoracic duct and right lymphatic duct
Lymph Nodes

- Produce lymphocytes
- Filter out harmful bacteria
- If substance can’t be destroyed, node becomes inflamed
Tonsils

- 3 pairs: Palatine, adenoids and lingual
- Lymph tissue that produces lymphocytes & filters bacteria
- **Spleen**
  - Produce lymphocytes and monocytes
  - Filter blood
  - Blood reservoir – stores large amounts of RBC’s, contracts during vigorous exercise or loss of blood to release RBC’s
  - Recycles old red cells – destroys and removes old or fragile RBC’s
Thymus gland

- Located in the upper anterior part of the thorax, above the heart.
- Often classified with lymphatic organs because it consists largely of lymphatic tissue
- Produces T-lymphocytes
- Also considered an endocrine gland
Immunity – body’s ability to resist disease

2 Types

1. Natural immunity – at birth, inherited and permanent
   - anatomical barriers/unbroken skin
   - cellular secretions/mucus and tears
   - blood phagocytes
   - local inflammation
2. Acquired Immunity – body’s reaction to invaders

a. passive acquired immunity – from injecting antibodies, only lasts a few weeks

b. Active acquired immunity – lasts longer
   
   i. Natural acquired immunity – result of recovering from disease, body manufactures own antibodies and person doesn’t get the disease again
   
   ii. Artificial acquired immunity – from being vaccinated
Immunity Cont.

3. Immunization
- antigen injected into a person to stimulate production of antibodies

4. Immunoglobulin
- protein that functions specifically as an antibody.
- IgG, IgM, IgA, IgD, IgE
Characteristics and treatment of common lymphatic disorders

Tonsillitis

- In childhood, tonsils become infected and enlarged
- Difficulty swallowing
- Tonsillectomy in extreme cases
Lymphadenitis (adenitis)

- Inflammation of the lymph node
- Swelling (enlargement) of lymph glands
- Occurs when infection present and body making WBC’s to fight infection
Hodgkin’s disease

- Cancer of lymph nodes
- Painless swelling of lymph node is an early symptom
- Treatment: chemotherapy and radiation
Infectious Mononucleosis Mono

- caused by Epstein-Barr virus
- occurs in young adults and children
- spread by oral contact ("kissing disease")

Symptoms: lymphadenitis, fever, fatigue, increased number of leukocytes

Treatment: bed rest
Hypersensitivity

- abnormal response to drug or allergen
- antibodies made in response to foreign material (allergen) irritate certain body cells
- Allergen – antigen that causes allergic response Ex: ragweed, PCN, bee stings, foods, etc.
Anaphylaxis (Anaphylactic shock)

- severe or fatal allergic reaction
- antigen-antibody response stimulates massive secretion of histamine
- symptoms: breathing difficulties, headache, facial swelling, falling blood pressure, stomach cramps, vomiting
- Treatment: Adrenaline or antihistamine
- Those prone should wear medic alert bracelet
- If proper care is not given immediately, death may occur in minutes.
AIDS
Acquired Immunodeficiency syndrome

- **Acquired**: the disease is not inherited
- **Immune**: refers to the body’s natural defense against cancers, disease, and infections
- **Deficiency**: lacks cellular immunity
- **Syndrome**: involves the set of diseases or conditions that are present to signal diagnosis
AIDS and HIV

- Acquired immunodeficiency syndrome

Cause: Human immunodeficiency virus (HIV)

Three responses to HIV infection:

a. AIDS – full disorder
b. ARC – AIDS – related complex
c. Asymptomatic infection

Screening test for HIV available

- ELISA-detects antibodies for AIDS but not the virus
AIDS cont.

- AIDS victim subject to opportunistic infections ex: (cancer, infections) that a healthy person would fight off but AIDS victim has compromised immune response

- Incubation period – 1 month to 12 years

- NO CURE; certain drugs may slow the virus: advances being made in HIV research

- AIDS-related complex (ARC) – HIV but not AIDS – less severe symptoms
AIDS cont.

- **Transmission**
  - sex with someone HIV positive
  - sharing needles with infected drug users
  - at birth from infected mother
  - transfusion of infected blood

- Cannot be spread by casual contact, coughing, sneezing, shaking hands and sharing eating utensils.

- **Prevention** – **AVOID** risky behaviors and observe standard precautions
Symptoms of AIDS

- Early stages: flu like symptoms, including fever, headache, malaise and enlarged lymph glands
- These symptoms usually disappear within a week to one month
- Could be asymptomatic for another 10 years, however the infected person could still transmit the disease.
AIDS Symptoms

- As the immune system begins to deteriorate, a variety of symptoms appear which include lymph glands which may be enlarged for greater than a month. Other symptoms before onset: lack of energy, weight loss, frequent fevers and sweats, persistent yeast infections (vaginal and oral), skin rashes, flaky skin, PID and short-term memory loss.
AIDS Symptoms

As the disease progresses—becomes susceptible to opportunistic infections producing symptoms such as cough, shortness of breath (SOB), seizures, mental symptoms, persistent diarrhea, fever, vision loss, extreme fatigue, nausea, vomiting, lack of coordination, coma, abdominal cramps or difficult swallowing.
Apply Standard Precautions

- Standard precautions:
  - used inpatient care setting when there is contact with blood or body fluids, mucous membrane or non-intact skin

- Hand washing – Single MOST EFFECTIVE way to prevent infection
  - wash after touching body fluids, even if wearing gloves
  - wash immediately after removing gloves and between patient contacts
  - use soap and friction
  - wash for a minimum of 10 seconds
Standard precautions Cont:

- Personal protective equipment:
  - gloves: when touching blood and body fluids
  - mask, goggles, face shield, gown – when patient care activities can generate splashing or spray of blood, body fluids
Standard precautions cont.

- patient care equipment and linens
  - handle with care
  - don’t let it touch your clothing, clean or discard appropriately
Occupational health and bloodborne pathogens

1. beware of needles

2. never recap used needles

3. dispose of all needles and sharp objects in sharps container

4. use mouthpieces, resuscitation bags, or other ventilation devices as alternative to mouth-to-mouth resuscitation

5. A patient who contaminates the environment should be in a private room or relatively isolated area
The AIDS patient

- sometimes treated as outcasts
- healthcare worker should be supportive
- use of gloves for normal patient contact is not necessary