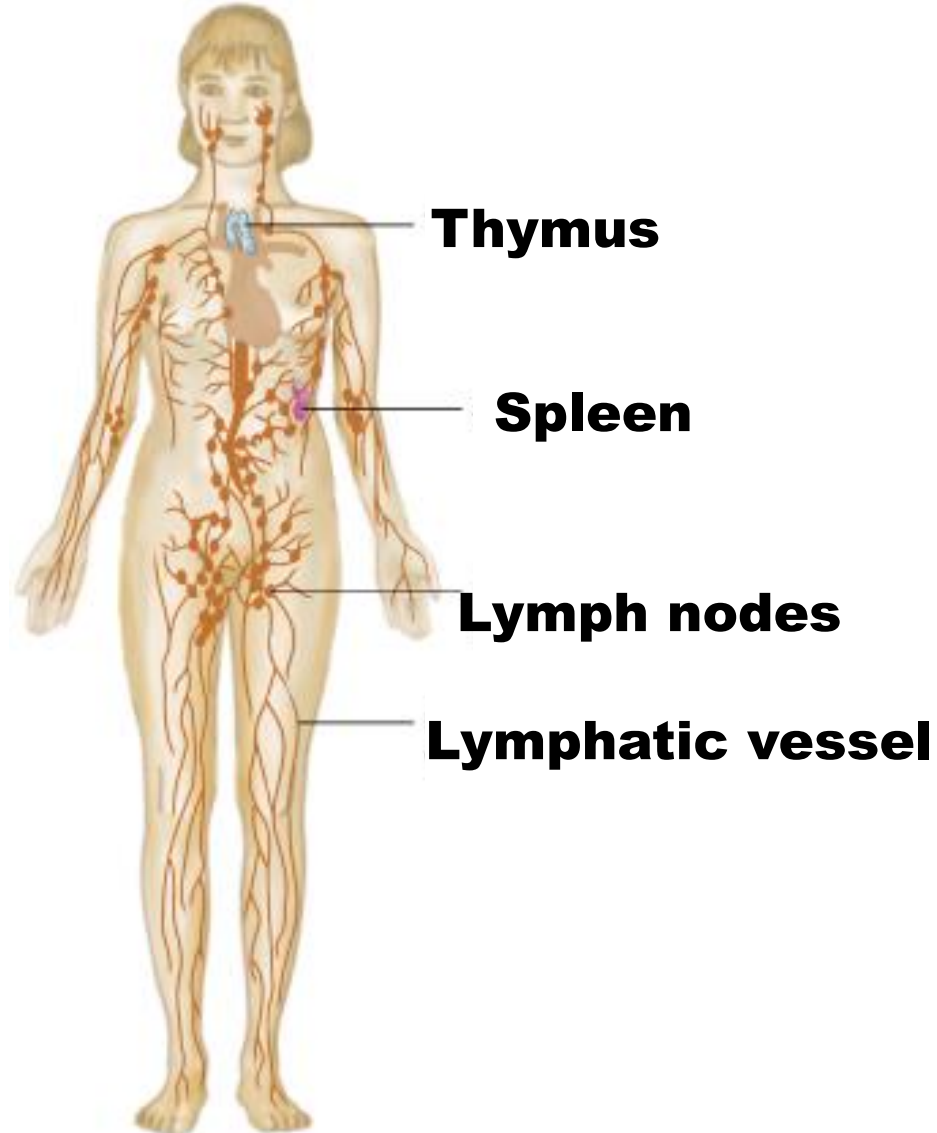


The Lymphatic and Immune Systems



Objectives

After studying this chapter, you will be able to:

- **Name the parts of the lymphatic and immune systems and discuss the function of each part**
- **Define combining forms used in building words that relate to the lymphatic and immune system**
- **Identify the meaning of related abbreviations**
- **Name the common diagnoses, clinical procedures, and laboratory tests used in treating the lymphatic and immune systems**

Objectives cont'd

- **List and define the major pathological conditions of the lymphatic and immune systems**
- **List common pharmacological agents used in treating disorders of the lymphatic and immune systems.**

Structure and Function

The Lymphatic and Immune System

Lymphatic Organs and Structures

Lymph

- **A fluid containing:**
 - water
 - salts
 - sugars
 - waste
 - white blood cells
 - protein

Lymph Vessels

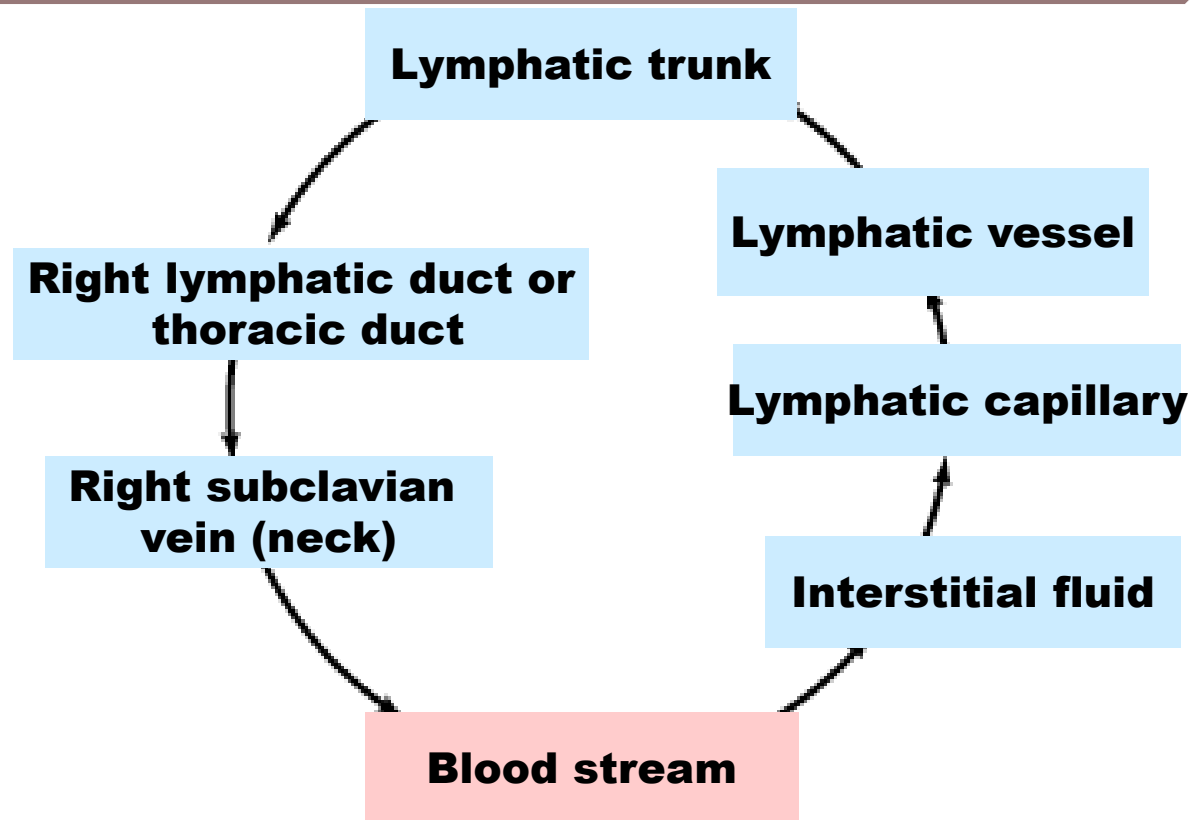
- **Carry lymph within the lymphatic system**
- **Lymph capillaries are the smallest of the lymph vessels**

Structure and Function

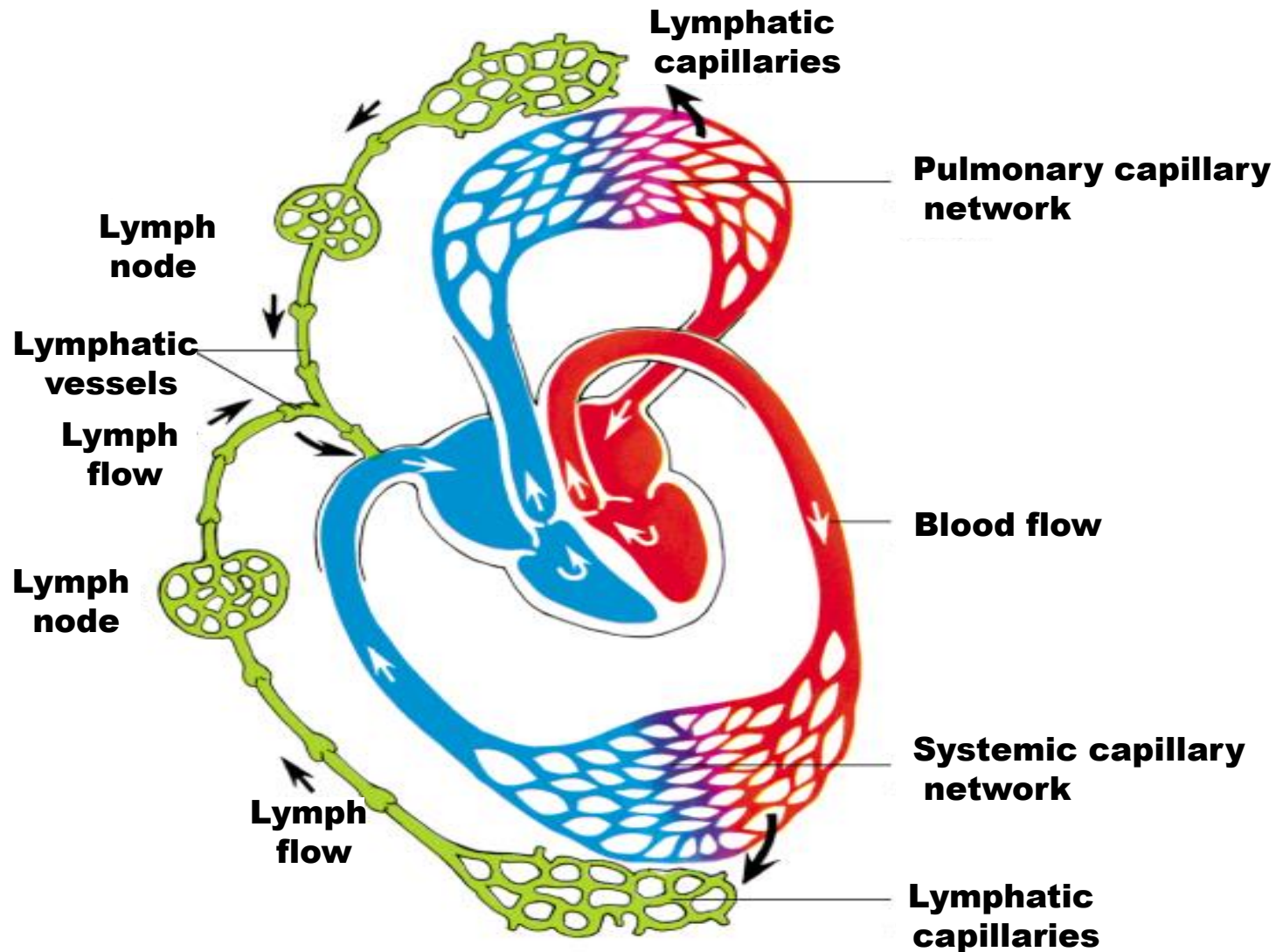
Capillaries have thin walls which allow fluid in body tissues to flow between the capillaries and tissues.

Fluid in the spaces between tissues is called *interstitial fluid*

Once the interstitial fluid flows into the lymph capillaries it is called *lymph*



Structure and Function



Structure and Function

Lymph Nodes

- **Specialized organs that produce lymphocytes**
- **Filter harmful substances from the tissues**
- **Contain *macrophages* that devour foreign substances**

- **Lymphocytes produce specialized proteins called *antibodies* that fight disease**
- ***Antigens* also fight disease by stimulating an immune response in other cells**

Structure and Function

Lymph

- **Travels in only one direction**
- **Empties into the right thoracic duct and the lymphatic duct**
- **Lipids are transported from the small intestines to the blood stream by the lymph vessels**

Location of major groups of lymph nodes:

- tonsils
- adenoids
- neck
- armpit
- groin
- mediastinum

Structure and Function

Organs of the Lymphatic System

Spleen

- largest lymphatic organ
- located in upper left portion of the abdominal cavity
- filters foreign material from the blood
- destroys old red blood cells
- activates *lymphocytes*

Thymus Gland

- soft gland with two lobes
- larger during infancy and childhood
- contains important cells called *thymocytes* (ex. T cells)
- T cells (T lymphocytes provide immunity)
- thymosin* aids with T cell movement

Structure and Function

Immune System

Consists of a series of defenses against intruders, such as microorganisms

Mechanical Defenses

- skin
- nasal cilia
- mucous membranes

Chemical Defenses

- stomach gastric juices

Other Barriers

Phagocytosis

The ingesting of foreign substances by specialized cells like macrophages

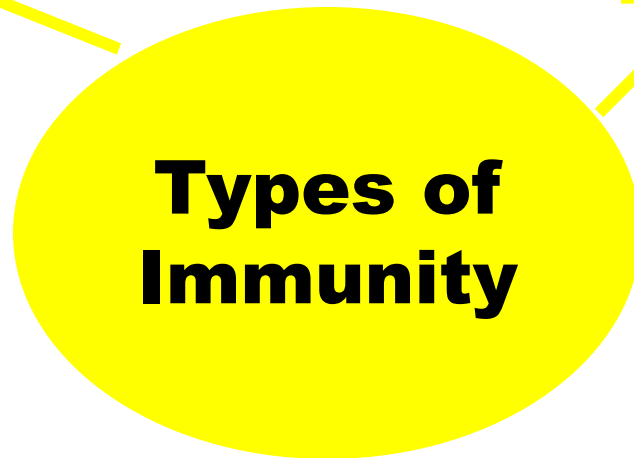
Structure and Function

Natural Immunity

A natural resistance to certain diseases in which the extent varies from person to person

Acquired Passive Immunity

Immunity provided in the form of **antibodies** or **antitoxins** that have been developed in another person or species



Types of Immunity

Acquired Active Immunity

Immunity that develops after having the disease or after being **vaccinated** against the disease

Structure and Function

Major Immunoglobulins

Immunoglobulin G (IgG)

-effective against bacteria, viruses and toxins

Immunoglobulin A (IgA)

-common in exocrine gland secretions such as breast milk and tears

Immunoglobulin M (IgM)

-first antigen to be produced after an infection

Immunoglobulin D (IgD)

-important in B-cell activation

Immunoglobulin E (IgE)

-appears in glandular secretions and is associated with allergic reactions

NOTE: This type of immunity is provided by plasma cells and is called **humoral immunity.**

Structure and Function

Cell-mediated Immunity

This type of immunity is provided by the action of the T-cells which multiply rapidly and produce certain proteins in response to antigens.

Three Types of Specialized T-Cells

- **Helper cells** or **CD4 cells** that stimulate the immune response
- **Cytotoxic cells** or **CD8 cells** that help in the destruction of infected cells
- **Suppressor cells** or **T cells** that suppress **B-cells** and other immune cells

Combining Forms and Abbreviations

Combining Form

Meaning

aden (o)



gland

immun (o)



immunity

lymph (o)



lymph

lymphaden (o)



lymph nodes

lymphangi (o)



lymphatic vessels

splen (o)



spleen

thym (o)



thymus

tox (o)



poison

Combining Forms and Abbreviations

Abbreviation

Meaning

AIDS → **acquired immunodeficiency syndrome**

ALL → **acute lymphocytic leukemia**

AML → **acute myelogenous leukemia**

AZT → **azidothymidine**

CLL → **chronic lymphocytic leukemia**

Combining Forms and Abbreviations

Abbreviation

Meaning

CML	→	chronic myelogenous leukemia
CMV	→	cytomegalovirus
EBV	→	Epstein-Barr virus
ELISA	→	enzyme-linked immunosorbent assay
HIV	→	human immunodeficiency virus
HSV	→	herpes simplex virus
IgA	→	immunoglobulin A

Combining Forms and Abbreviations

Abbreviation

Meaning

IgD → immunoglobulin D

IgE → immunoglobulin E

IgG → immunoglobulin G

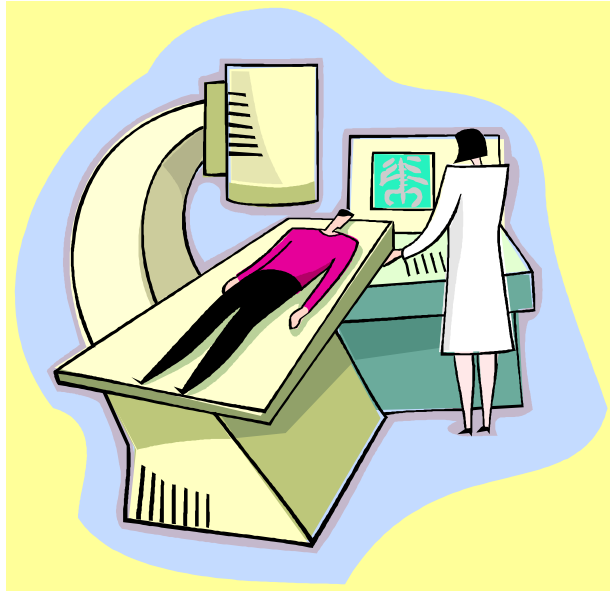
IgM → immunoglobulin M

PCP → pneumocystis carinii pneumonia

SLE → systemic lupus erythematosus

ZDV → zidovudine

Diagnostic, Procedural, and Laboratory Terms



CAT Scans are used frequently to diagnose abnormalities of the lymph organs

Blood tests that indicate the number and condition of the white blood cells are used in diagnosing lymph and immune system diseases



Pathological Terms

Diseases of the lymph and immune system that flourish are those diseases which suppress the immune response.

Acquired immunodeficiency syndrome (AIDS) is the most widespread immunosuppressive disease.

Opportunistic Malignancies and Infections Associated with AIDS

- **candidiasis**
- **cytomegalovirus**
- **Kaposi's sarcoma**
- **Mycobacterium avium-intracellulare (MAI)**
- **Pneumocystis carinii pneumonia**

Pathological Terms

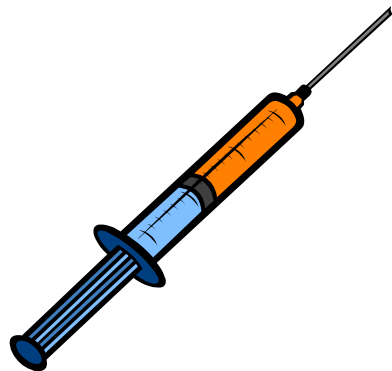


During birth if the mother is infected



Receiving infected blood or other tissue

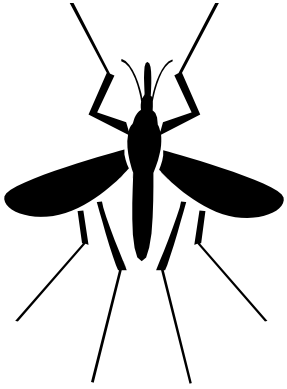
How is HIV Transmitted?



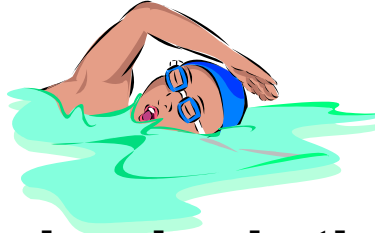
Contaminated needles

Sexual contact

Pathological Terms



mosquitoes



Swimming in the same water as infected persons



Objects like toilet seats, doorknobs etc.



Casual contact like hugging and kissing

How is HIV NOT Transmitted?



Sharing food

Pathological Terms

Hodgkin's Lymphoma

- **A type of lymph cancer that appears in early adulthood and the cause or origin is uncertain**
- **Involves the lymph nodes and spleen**

Non-Hodgkin's Lymphoma

- **A type of cancer of the lymph nodes in which some of the cells resemble healthy cells**
- **Usually appears during mid-life**
- **Malignant cells resemble large lymphocytes**

NOTE:

Depending on how far the disease has spread, both types can be arrested with chemotherapy and radiation.

Pathological Terms

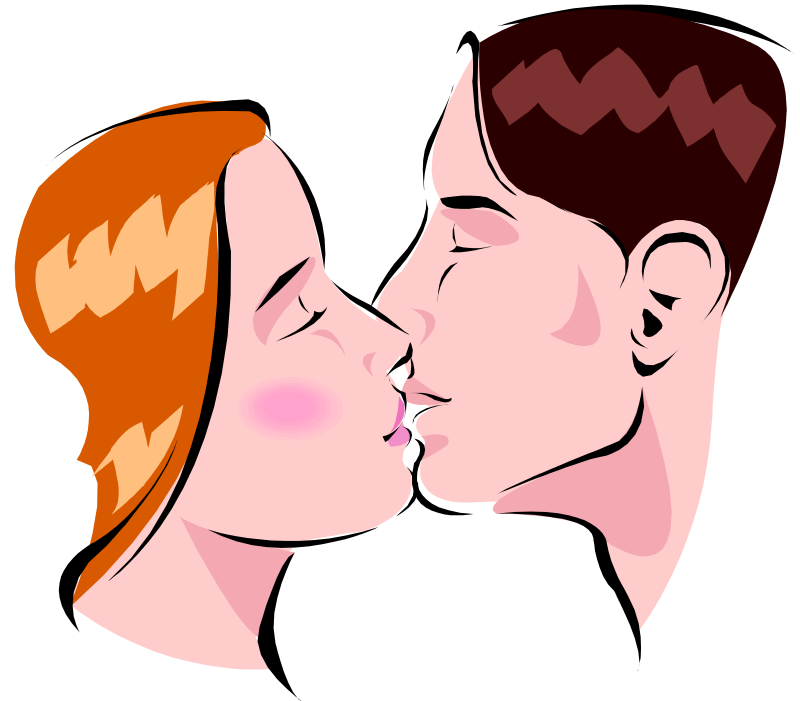
Non-malignant Diseases

Sarcoidosis

- **Inflammatory condition that can affect lung functioning**

Infectious Mononucleosis

- **Also called the kissing disease**
- **An acute infectious disease caused by the Epstein-Barr virus**
- **Swollen lymph nodes are a common symptom**



Pathological Terms



Allergies are a problem of the immune system that affect millions of people

Allergy Facts

- **Allergies are due to the production of the **IgE** antibodies against an **allergen****
- **Hypersensitivity increases as exposure increases**
- **Anaphylaxis may occur which is life-threatening if the allergy is severe**

Pathological Terms

Autoimmune Diseases

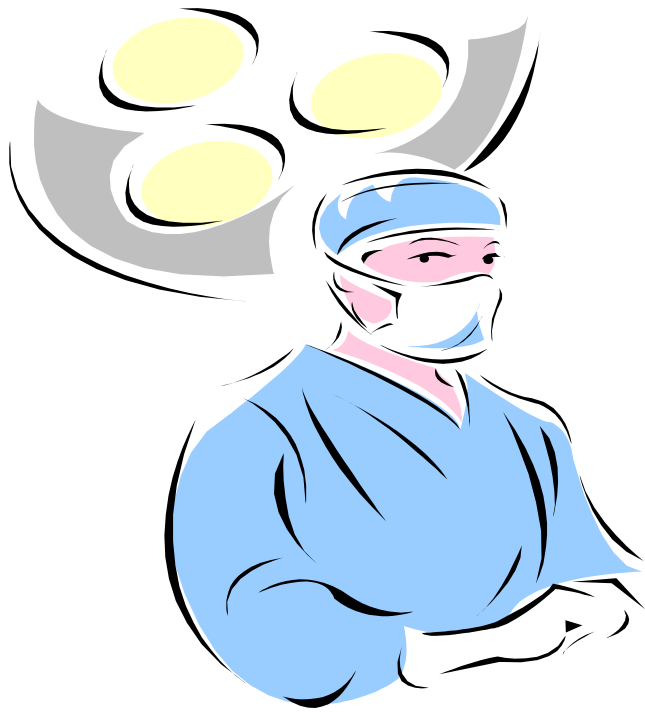
- **Conditions in which the body's immune system turns against its own healthy tissue**
- **An autoimmune response is the result of the T cells attacking their own healthy cells**

Examples

lupus

scleroderma

**rheumatoid
arthritis**



Surgical Terms

Cancer of the lymph system may require a **lymph-node dissection.**

Other Procedures

• **lymphadenectomy**
-removal of a lymph node

• **lymphadenotomy**
-incision into a lymph node

• **splenectomy**
-removal of the spleen

• **thymectomy**
-removal of the thymus gland

Pharmacological Terms

Diseases of the lymph and immune systems often require high doses of chemotherapy and/or radiation for treatment.



Other Medications



antivirals



used to treat AIDS by blocking viral growth

antimicroorganism agent



used to prevent PCP in AIDS patients

antihistamines



used to prevent or lessen allergic reactions

Apply Your Knowledge

Which of the following statements explains a major difference between lymph and blood?

- A. Lymph contains white blood cells and platelets.**
- B. Lymph contains only white blood cells.**
- C. Lymph contains only red blood cells and white blood cells.**

Answer: B. Lymph contains only white blood cells.

Apply Your Knowledge

Sharon, age 5 is taken to the doctors for her complaint of a sore throat. Her pediatrician might find which of the following signs during his assessment of the lymphatic system?

- A. elevated temperature**
- B. increased blood pressure**
- C. swollen lymph nodes**

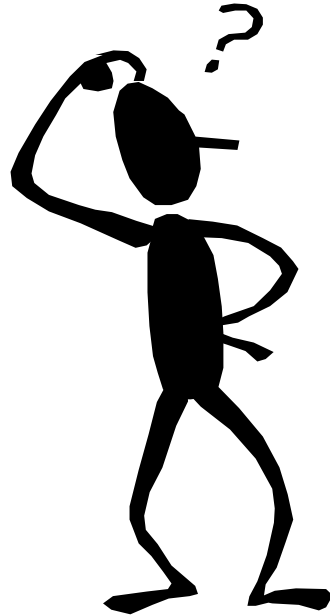
Answer: C. swollen lymph nodes

Apply Your Knowledge

Andy has recently been diagnosed with HIV. He is concerned that some of his friends might catch the virus from him. Place the following examples in the correct box based on their ability to transmit HIV.

**needle stick
sexual contact**

Will Transmit HIV



**mosquitoes
kissing
toilet seats**

**Will NOT Transmit
HIV**

Examples: kissing, accidental needle stick, mosquitoes, toilet seats, sexual contact