

Introductory Concepts in Immunity



NOVEMBER 2005

Objectives:

- Identify the components of the immune system
- Explain the function of the immune system
- Discuss the assessment of the immune system
- Describe the signs & symptoms of select disorders – HIV, neutropenia, leukemia, ITP, TTP, lupus
- Discuss the management and nursing care of clients with the above disorders

Immune System

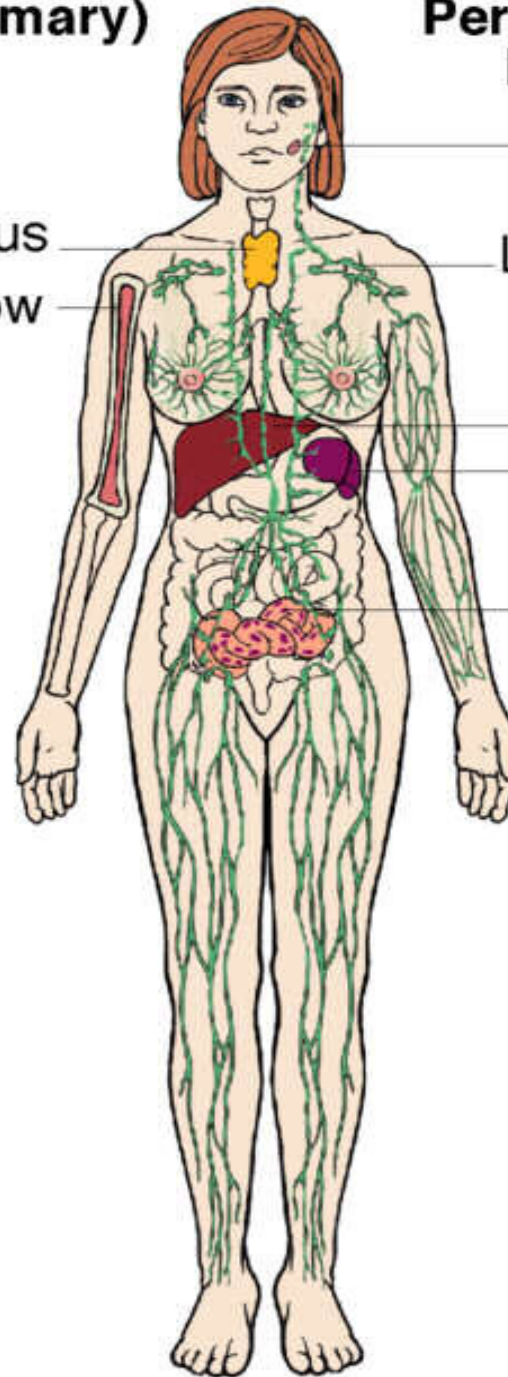
- “free from burden”
- Body’s defense network against infection
- *Immunity* – quality of being insusceptible to or unaffected by a particular disease or condition
- Study of the immune system - *immunology*

**Generative (central, primary)
lymphoid organs**

**Peripheral (secondary)
lymphoid organs**

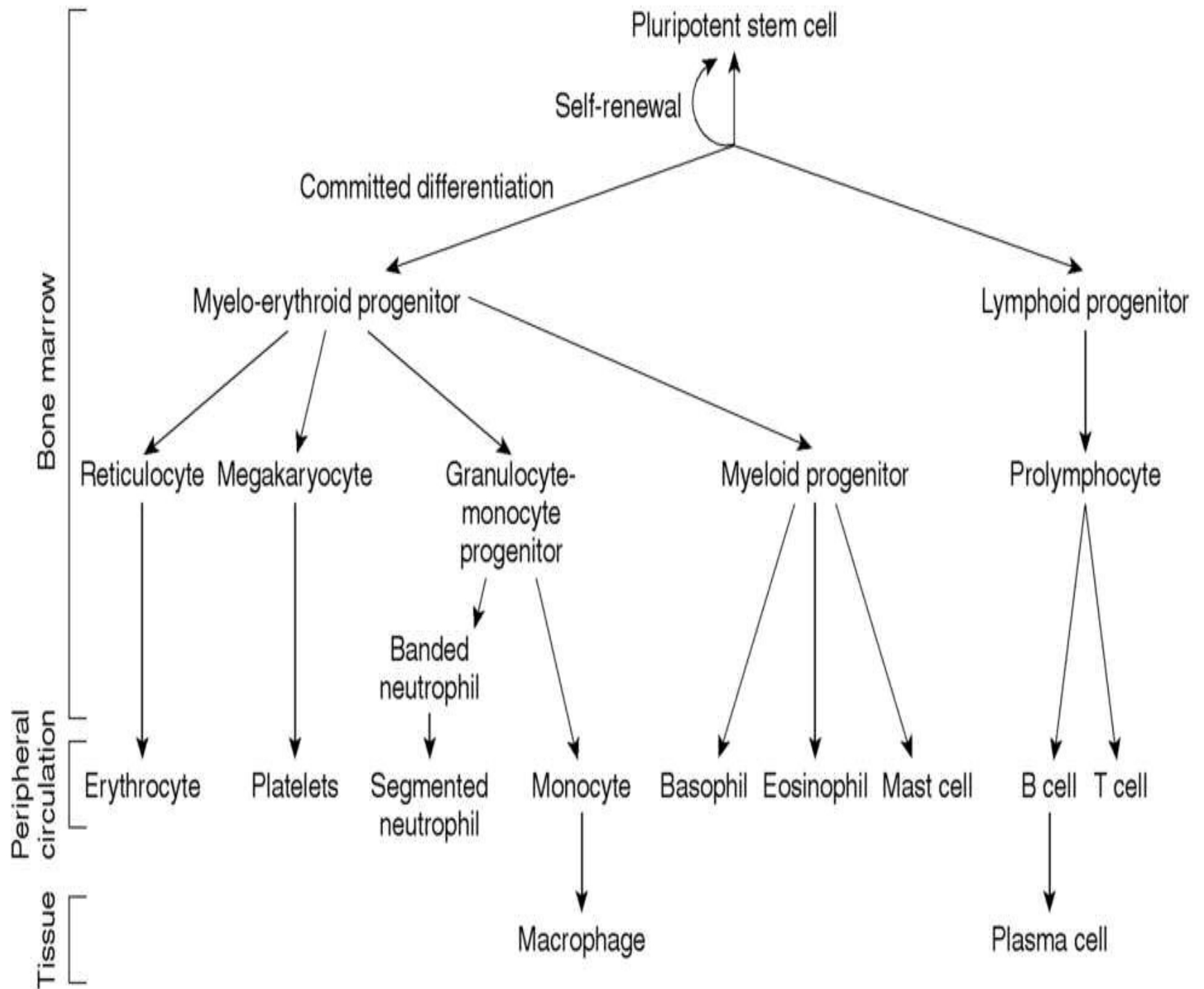
Thymus
Bone marrow

Tonsils
Lymph nodes
Liver
Spleen
Peyer's patches



Functions of Immune System

- Protect the body's internal environment against invading organisms
- Maintain homeostasis by removing damaged cells from circulation
- Serve as a surveillance network for recognizing and guarding against the development and growth of abnormal cells



Cells

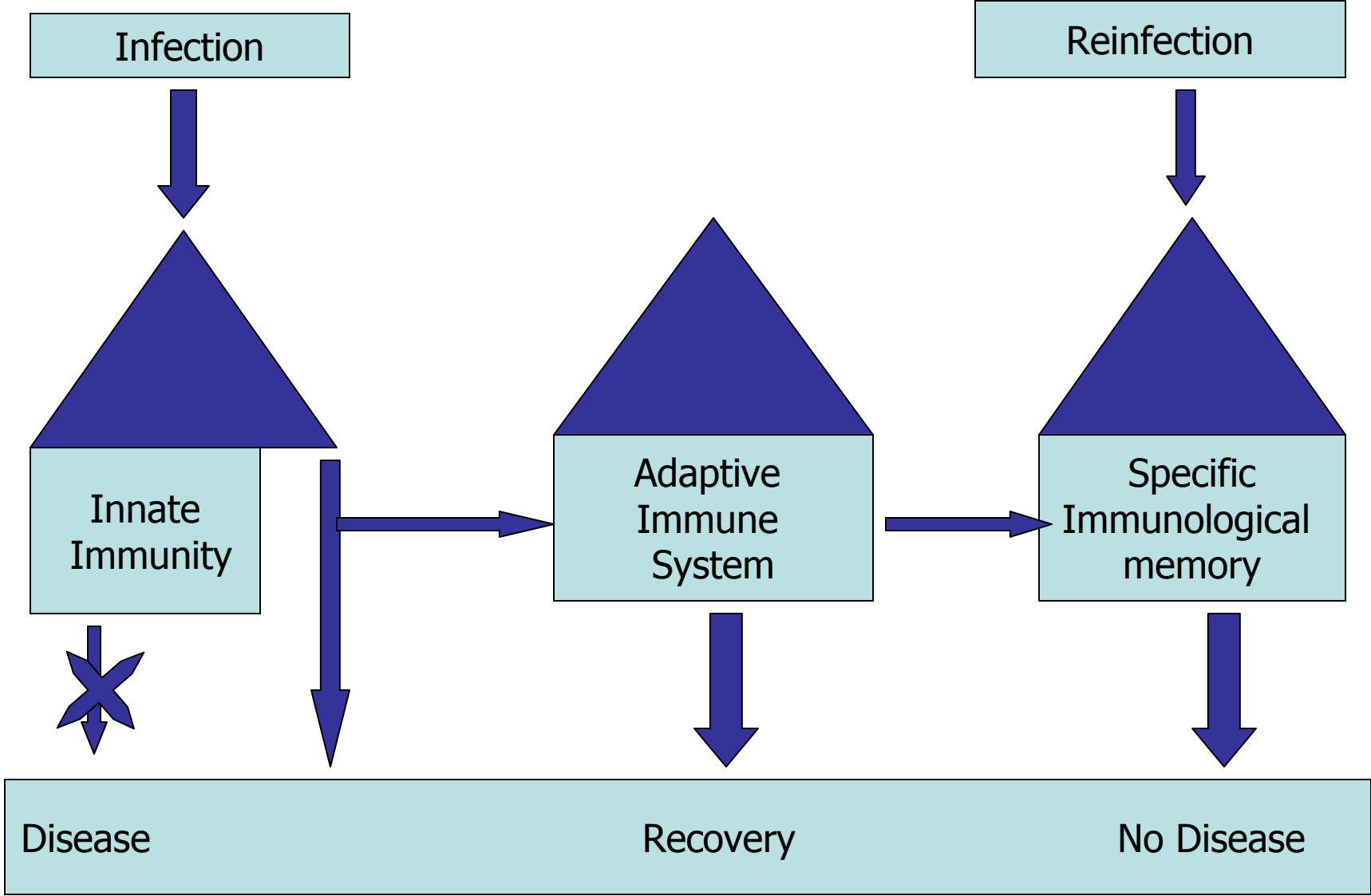
- Stem cells – progenitor cells
- White blood cells (WBC)(leukocytes)
 - Neutrophils
 - Lymphocytes
 - Eosinophils
 - Basophils
 - Monocytes

Types of Immunity

- Innate or natural
- Adaptive or acquired
- Humoral immunity

Innate Immunity

- Body's first line of defense
- Provides physical and chemical barriers to invading pathogens and protects against the external environment
- On guard 24-7
- Skin, mucous membranes, cilia, stomach acid, tears, saliva, sebaceous glands, intestinal secretions, vaginal secretions



Acquired Immunity

- Second line of defense
- Provides a specific reaction to each invading antigen
- Unique ability to remember the antigen that caused the attack
- Involves specific immunity – antibodies develop naturally after infection or after immunizations

Antibody-Mediated Immunity

- As organisms pass through the epithelial barriers, phagocytes are activated
- Phagocytes carry antigens to the lymphocytes
- Lymphocytes include T cells, B cells, and natural killer
- When activated T cells release lymphokine
- Lymphokine attracts macrophages to site and gets them ready for attack
- B cells produce antibodies

- Active acquired immunity

- Vaccinations
- Production of antibodies in response to infection
- permanent

- Passive acquired immunity

- Transfer of antibodies from one person to another
- Breast milk
- Gamma globulin injection
- Lasts 1-2 months

Cellular Mediated Immunity

- Whole T cells become sensitized (Tc)
- Released into bloodstream
- They remain indefinitely
- When they come in contact with the antigen they were sensitized to, they attach and destroy

Assessment of Immune System

- Health History
- Any signs of infection in any system
- Fatigue
- Tachypnea, tachycardia, hypotension

Diagnostic Tests

- Complete Blood Count (CBC)
 - Normal WBC 5,000-10,000 mm³
 - Differential
 - Neutrophils
 - Shift to left – increase greater than 60%
 - Shift to right – decrease less than 50%
 - Basophils, eosinophils, lymphocytes, monocytes, bands
- Antinuclear antibody assay (ANA)
- Cultures
- Bone Marrow Biopsy

Major Bone Marrow Transplant Complications

- Infection
- Thrombocytopenia
- Renal damage
- Liver failure
- Graft-versus-host rejection

Nursing Care of Neutropenic Client

- Private room
- Restricted visitors
- Monitor VS for infection
- Aseptic technique
- Pulmonary Hygiene
- Wear masks when outside room
- Diet restriction – no raw veggies, fruit, milk

Leukemia

- Cancer of white blood cells
- Excess production of immature white blood cells
- Classified as acute or chronic; and as myelogenous or lymphocytic

Myelogenous Leukemia

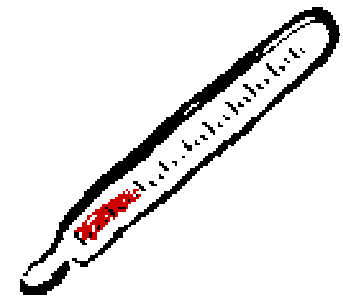
- Acute myelogenous
 - Sudden onset
 - WBC counts rise quickly
 - Chemotherapy needs to be initiated immediately
 - 20% alive in 5 years
- Chronic myelogenous
 - WBC count rises slowly
 - Responds well to chemotherapy
 - Gleevac
 - Life expectancy -3 to 8 years after diagnosis

Lymphocytic Leukemia

- Acute lymphocytic
 - Most often in children ages 2-6 years
 - Chemotherapy started ASAP
 - 80% are alive 5 years after diagnosis
- Chronic lymphocytic
 - WBC rise slowly
 - Responds to chemo
 - Life expectancy of 2 to 10 years, depending on how soon diagnosed

Signs & Symptoms of Leukemia

- Fever
- Night sweats
- Fatigue
- Pallor
- Tachycardia
- Tachypnea
- Petechiae
- Epistaxis
- Melena
- Bone pain
- Weight loss



Management of Leukemia

- High Dose Chemotherapy
- Close vital signs
- Risk for bleeding – monitor platelets
- ANC less than 1,000 –compromised host precautions
- Blood transfusion
- Activity planning
- Psychological support

Idiopathic Thrombocytopenic Purpura

- Affects all ages but more common in children and women
- Acute form – children 1 to 6 weeks after viral illness; usually self limiting
- Platelets are destroyed
- Autoimmune disorder
- Can be induced by certain medications

Signs & Symptoms of ITP

- Many asymptomatic
- Low platelet count
- Easy ecchymosis
- Heavy menstrual cycles
- GI bleeding

Management of ITP

- Stop medication if it is what induced it
- Immunosuppressant (prednisone)
- Intravenous immune globulin
- Splenectomy



Thrombotic Thrombocytopenic Purpura (TTP)

- Exaggerated response to vessel injury
- Clot formation exaggerated
- Critically ill
- Plasmapheresis
- Steroids

Human Immunodeficiency Virus Infection

- Retrovirus
- Transmitted via infected blood, semen, vaginal secretions, breast milk
- CD4 cells (T_H) are destroyed
- After initial infection, virus is abundant in blood. Can last 8 weeks
- Latent stage – virus is virtually undetected, can last 12 years

Initial Stage

- Experience very mild flu-like symptoms
- Rapid CD4 cell destruction and a responsive rapid production
- Viral load is high
- *Seroconversion* can take place anywhere from 5 days to 3 months
- Enzyme Immunoassay (ELISA)
- Western Blot

Latent Stage

- Virus lies dormant in resting CD4 cells
- Asymptomatic
- Tc cells and B lymphocytes try to destroy virus but are ineffective without the CD4 cells
- Can still transmit virus

Early Symptomatic Stage

- Previously called AIDS-related complex
- CD4 cell count drops below 500 cells/mm³
- This stage can last 2 to 3 years



Signs & Symptoms of Early Symptomatic Stage

- Persistent unexplained fever
- Recurrent drenching night sweats
- Chronic diarrhea
- Headaches
- Fatigue
- Interference in ADLs
- Recurrent infections
- Lesions that do not heal
- Weight loss

AIDS

- Once CD4 level falls to 200, classified as AIDS
- Opportunistic infections overwhelm client
- Death commonly occurs within one year once this point is reached

Opportunistic Infections

- Wasting
- Secondary cancers -Kaposi's Sarcoma
- Pneumocystis carinii pneumonia
- Histoplasmosis
- Mycobacterium tuberculosis
- Varicella zoster – shingles
- Cytomegalovirus retinitis
- HIV encephalopathy (HIV associated cognitive motor complex)

Management of HIV Infection

- No cure
- Aimed at treating symptoms and preventing complications
- Treat in nonjudgmental, empathetic caring manner
- Prevent infection
- Promote good nutrition
- Promote self-care
- Provide emotional support
- Medication administration
- Education
- Safety

Medications

- Nucleoside Reverse Transcriptase Inhibitors
 - Zidovudine (AZT, Retrovir)- initial drug of choice, anemia, headache, nausea, bone marrow suppression
 - Lamivudine (Epivir) – neutropenia, headache, fatigue, develop resistance rapidly, often used with AZT
 - Combivir – AZT and Lamivudine
- Nonnucleoside Reverse Transcriptase Inhibitors
 - Viramune use in combination with others, rash, thrombocytopenia
- Protease Inhibitors
 - Fortovase (Saquinavir) – nausea, vomiting, neutropenia

Nursing Diagnoses

- Imbalanced Nutrition: less than body requirements r/t diarrhea, GI infection
- Impaired skin integrity r/t presence of lesions
- Impaired mucous membranes r/t oral infection
- Anxiety r/t HIV diagnosis
- Risk for injury r/t immunocompromised state
- Alteration in comfort r/t opportunistic infection, medication side effects
- Potential for Ineffective coping r/t therapeutic regime

Systemic Lupus Erythematosus (SLE)

- Autoimmune disease characterized by inflammation of any body part
- Effects more women than men, usually child bearing age, more African Americans
- Damage to connective tissues
- Exacerbations and remissions

Clinical Manifestations of SLE

- Oral ulcers
- Arthritis or arthralgias
- Vasculitis
- Butterfly rash
- Nephritis
- Pericarditis
- Anemia
- Leukopenia
- Thrombocytopenia
- Dermatitis

Diagnosis of SLE

- Antinuclear antibody assay (ANA)
- Based on clinical presentation, presence of four signs & symptoms
- Other general labs that indicate acute inflammatory disorder but not confirm SLE:
 - Sedimentation rate
 - C-reactive protein
 - Rapid plasma reagin (RPR)

Management of SLE

- Nonsteroidal antiinflammatory agents (NSAIDS)
- Corticosteroids (prednisone)
- Antimalarial drugs (Plaquenil)
- Cytotoxic agents (Imuran, Cytoxan)
- Dialysis if renal failure occurs

Nursing Interventions for SLE

- Pace activities
- Comfort measures
- Proper skin care-avoid sun, use sunscreen
- Education on signs of exacerbation (fever, cough, increase pain)
- Recognize signs of infection early
- Stress management
- Optimal nutrition

