CLIENTS WITH ALTERED IMMUNITY

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IMMUNE SYSTEM OVERVIEW

- Defends and protects the body from infection by bacteria, viruses, fungi, and parasites.
- Removes and destroys damaged or dead cells.
- Identifies and destroys malignant cells.
- Activated by minor or major injuries.
- Ability to distinguish self (host) from non-self.

SPECIFIC OR NONSPECIFIC RESPONSES

- NONSPECIFIC RESPONSE
  - Inflammation
- SPECIFIC RESPONSE
  - Called the “immune response”
  - Antigen-Antibody response

GENERAL IMMUNE RESPONSE

- FIRST LINE OF DEFENSE
  - INFLAMMATORY RESPONSE
  - PHAGOCYTOSIS
- SECOND PROTECTIVE RESPONSE
  - HUMORAL OR ANTIBODY RESPONSE
  - LYMPHOCYTES (B-cells)
- THIRD MECHANISM OF DEFENSE
  - CELLULAR IMMUNE RESPONSE
  - LYMPHOCYTES (T-cells)

NATURAL DEFENSE MECHANISMS

- PHYSICAL BARRIERS
  - Skin / mucus membranes / cilia
- CHEMICAL BARRIERS
  - Bactericidal substances in gastric fluid, prostatic fluid, tears, nasal secretions, and saliva
- LEUKOCYTES (White blood cells)

CELLS AND TISSUES OF THE IMMUNE SYSTEM

- LEUKOCYTES (WBCs)
  - GRANULOCYTES
    - NEUTROPHILS
    - EOSINOPHILS
    - BASOPHILS
  - MONOCYTES AND MACROPHAGES
    - Monocytes / Histocytes / Kupffer’s cells
**CELLS AND TISSUES OF THE IMMUNE SYSTEM**

- **LEUKOCYTES (continued)**
  - LYMPHOCYTES
    - **T cells (mature in thymus gland)** Cytotoxic
    - **B cells (mature in bone marrow)** Antibodies
    - **NK (natural killer) cells**
      - Surveillance / Cytotoxic
      - Found in spleen, bone marrow, and blood

- **LYMPHOID SYSTEMS / TISSUES**
  - PRIMARY (CENTRAL) STRUCTURES
    - Bone marrow / thymus gland
  - SECONDARY (PERIPHERAL) STRUCTURES
    - Lymph nodes / spleen / tonsils / intestinal lymph tissue / lymphoid tissue in other organs

**FUNCTIONS OF LYMPH NODES**
- Filter foreign products or antigens from the lymph
- House and support proliferation of lymphocytes and macrophages

- **IMMUNE RESPONSE**
  - IMMUNODEFI CIENCY DISEASE
    - Hypoactive immune system
  - HYPERSENSITIVITY DISORDERS
    - Hyperactive immune response
  - NATURAL IMMUNITY
    - Present at birth
  - ACQUIRED IMMUNITY
    - After birth, natural or response to antigen-antibody reaction

**NONSPECIFIC IMMUNE RESPONSE**
- PHYSICAL / CHEMICAL BARRIERS
- INFLAMMATORY RESPONSE
- PHAGOCYTOSIS
- COMPLEMENT SYSTEM
  - Enzymatic proteins in serum that destroy bacteria and other cells. "Complements" antibody activity
- CYTOKINES
  - Messengers between cells of inflammation to help provide adequate immune response
  - Interleukins

- **SPECIFIC IMMUNE RESPONSE**
  - HUMORAL IMMUNITY (Antibody-mediated)
    - Production of B lymphocytes
    - Production of antibodies to a specific antigen
    - Leads to antibody formation / memory
      - IgG, IgA, IgM, IgD, and IgE
**ANTIBODIES & IMMUNOGLOBULINS**

* IgG
  - 75%: Known as “gamma globulin”
  - Prior production of antibodies

* IgA
  - 10-15%: “Secretory” immunoglobulin
  - Found in tears, saliva, genital secretions

* IgM
  - 5-10%: Initial response to invader(s)

* IgD
  - < 1%: Function unknown

* IgE
  - < 0.1%: Hypersensitivity reactions

**SPECIFIC IMMUNE RESPONSE**

* CELLULAR IMMUNITY
  (Cell-mediated)
  - Production of T lymphocytes
  - Includes: delayed hypersensitivity, graft rejection, and defense against bacteria, fungi, and viruses

* “T” LYMPHOCYTES

  **EFFECTOR CELLS**
  - Killer (Cytotoxic) T cells
    • Kill foreign cells and can cause graft rejection
  
  **REGULATOR CELLS**
  - Helper T cells
    • Enhance production of antibody-forming cells from B lymphocytes
  - Suppressor T cells
    • Suppress production of B lymphocytes (keeps immune response in check)

**“T” LYMPHOCYTES**

* CLUSTER OF DIFFERENTIATION ANTIGEN (CD) ANTIGENS
  - Proteins on the surface of the T cell that help define its function and also provide a marker that can be used to identify cell class

* TWO PRIMARY CD PROTEINS
  - CD4 Antigen (CD4 Cells)
    • On helper T cells (T4 cells)
    • 70% of total circulating T lymphocytes
  - CD8
    • On killer and suppressor T cells

**FACTORS AFFECTING IMMUNE SYSTEM FUNCTION**

* EXTREME IN AGES
  - ↓ immunity & ability to respond to invading organisms

* NUTRITION

* MEDICATIONS
  - Steroids, cytotoxic agents, anesthetics, large doses of aspirin, NSAIDs, antibiotics, alcohol, heroin
FACTORS AFFECTING IMMUNE SYSTEM FUNCTION

- CHEMICAL EXPOSURE
- ULTRAVIOLET RADIATION
- ENVIRONMENTAL POLLUTION
- ENVIRONMENTAL TOXINS
- GENETICS
- RESPONSE TO PRIOR ILLNESSES
- DECREASED SYSTEM FUNCTION
  - GI, Neurological, Urinary, Skin, Endocrine

IMPAIRED IMMUNE RESPONSES

- IMMUNODEFICIENCY DISORDERS
  - EITHER CONGENITAL OR ACQUIRED
  - IMPAIRED FUNCTION OF T or B CELLS

  Whatever the cause...
  Immunodeficiency disorders lead to unusual susceptibility to infection

HIV INCIDENCE

- Estimated 10 million infected worldwide
- 1 million United States
- Highest occurrence in US, western Europe, central Africa, South America and Canada
- 8th leading cause of death in US (all ages)
- 7th leading cause of death in children (age 1-4)

HIV INCIDENCE

- Leading cause of death in males
  age 35-44
- 60% white males
- Estimated to be 2nd leading cause of death in women of childbearing age

CLIENT WITH HIV INFECTION

CAUSE: HIV is a RNA containing "retrovirus" transmitted by direct contact with infected blood and/or body fluids.

MODE OF TRANSMISSION:
- Sexual contact
- Infected blood via needle sharing, injection drug use, or blood transfusion
- Perinatally through HIV + mothers (92%)
- Small but real occupational health risk to HCPs
**PATHOPHYSIOLOGY**

Virus infects helper T lymphocyte with CD4 Antigen

\[ \downarrow \]

Once inside cell – converts RNA to DNA

\[ \downarrow \]

DNA of virus is integrated into host cell DNA and duplicates during normal cell division

\[ \downarrow \]

Virus may remain INACTIVE or become ACTIVE

**CLINICAL MANIFESTATIONS**

- **SEROCONVERSION**
  - Production of antibodies to virus
  - Occurs even if virus inactive
  - Antibodies usually detectable 6 weeks to 6 months after initial infection
  - Antibodies have little effect on virus

- **PROGRESSION OF DISEASE**
  - Range from no symptoms to severe immunodeficiency with multiple opportunistic infections and cancer

**INITIAL SYMPTOMS**

- An acute mononucleosis-type illness
  - Followed by asymptomatic period
  - Asymptomatic period varies

**OTHER POSSIBLE SYMPTOMS**

- Persistent generalized lymphadenopathy
- General malaise, fever, fatigue, night sweats, diarrhea, involuntary weight loss
- Persistent skin dryness and rash
- Oral lesions

**CNS CHANGES**

- **AIDS Dementia Complex**
  - 40-60% of clients will have neuro changes
  - Starts with apathy (losing interest in work, social, and recreational activities)
  - Fluctuating memory loss, confusion, difficulty concentrating, lethargy, and diminished motor speed
  - Progressive symptoms include severe dementia with motor disturbances such as ataxia, tremor, spasticity, incontinence and paraplegia
CNS CHANGES

* OTHER NEUROLOGIC EFFECTS
  - Toxoplasmosis and non-Hodgkin's lymphoma are space-occupying lesions.
  - Cryptococcal meningitis and CMV infection
  - Peripheral sensory neuropathies with numbness, tingling, and pain of lower extremities affect 30%
  - Guillain-Barré-type demyelinating polyneuropathy

OPPORTUNISTIC INFECTIONS

* Predictable when T4 or CD4 cell count < 200/mm³ (normal CD4 > 1000/mm³)
* Pneumocystis carinii Pneumonia
  - Most common
  - 75-85% develop PCP at some time
  - Tends to be recurrent
  - Cause of death in 20%
  - Common fungus-not pathogenic with intact immune system
  - S/S are nonspecific and may progress insidiously

* Cytomegalovirus (CMV)
  - Infection with herpes viruses that inhabit the salivary glands
  - Can affect retina, the GI system, nervous system or lungs
* Mycobacterium avium complex (MAC)
  - Occurs late in disease affecting up to 25%
  - CD4 counts usually <50-100
  - Women > Men
  - Organism commonly in food, water and soil
  - Major cause of "wasting syndrome"

* Candidiasis
  - Oral thrush, esophagitis, vaginitis
  - Usually first indication progression to AIDS
* Tuberculosis
  - 4% will develop TB
  - Common to have drug-resistant strains
  - Disseminated disease affects many organs and organ systems

* Herpes simplex or herpes zoster
  - Usually localized symptoms but can be disseminated
* Cryptococcus / Toxoplasmosis
  - Fungal / Protozoa infections that affects CNS
CANCERS

- KAPOSIS SARCOMA (KS)
  - Often the presenting symptoms of AIDS
  - Most common cancer
  - CAUSE: tumor of the endothelial cells lining small blood vessels
  - Late-stage HIV disease
  - Average survival 18 months after diagnosis

- NON-HODGKIN'S LYMPHOMA PRIMARY LYMPHOMA OF THE BRAIN
  - Aggressive tumors which grow and spread rapidly

- CERVICAL DYSPLASIA / CANCER
  - 40% of HIV infected women have cervical dysplasia
  - Cervical cancers tend to be aggressive
  - Usually die from cervical cancer not AIDS

OTHER CONDITIONS

- PELVIC INFLAMMATORY DISEASE
  - Severe presentation of usual organisms

- HUMAN PAPILLOMAVIRUS (HPV)
  - More rapid spread
  - Contributes to cervical dysplasia and cervical cancer

DIAGNOSTIC TESTS

- ELISA (Enzyme-linked immunosorbent assay)
  - Most widely used screening test
  - Test for HIV antibodies
  - 99.5% or higher sensitivity when performed at least 12 weeks after infection
  - False positives can occur
  - Initial positive result is always tested repeatedly and confirmed using a different method of detection, usually the Western Blot

- WESTERN BLOT ANTIBODY TESTING
  - More reliable but more time-consuming and expensive
  - Tests antibody response to HIV proteins, 99.9% specific when used in combination with ELISA
**IMMUNE AND HIV**
NURS 3720 - Dubois

**February 12th and 19th**

**POLYMERASE CHAIN REACTION (PCR)**
- New technique used to detect viral nucleic acids in people infected but fail to produce detectable antibodies
- Small population
  - 0.001 to 0.01% of those infected
- COMPLETE BLOOD COUNT (CBC)
- CD4 CELL COUNT
  - Usually measured every 3-6 months
- BLOOD CULTURE FOR HIV

**IMMUNE-COMPLEX/DISSOCIATED p24 ASSAY (ICD p24)**
- Tests HIV antigen in the blood
- TB SKIN TESTING
- MAGNETIC RESONANCE IMAGING (MRI)
  - Of the brain to identify lymphomas
- SPECIFIC CULTURES AND SEROLOGY
  - For PCP, Toxoplasmosis, and others
- PAP SMEARS
  - Every 6 months for early detection/treatment

**COMPLETE BLOOD COUNT (CBC)**
- Usually measured every 3-6 months

**CD4 CELL COUNT**
- Promoting health maintenance activities to prolong the asymptomatic period as long as possible
- Prevention of opportunistic infections
- Treatment of disease complications, such as cancers
- Providing emotional and psychological support

**GOALS OF CARE**

**DRUG THERAPY**

**GOALS OF THERAPY**
- Suppress the infection itself, decreasing symptoms and prolonging the life of the client
- Treat opportunistic infections and malignancies

**Client with HIV**

**Antiretroviral Treatment**

**NUCLEOSIDE REVERSE TRANSCRIPTASE INHIBITORS (NRTI’s)**

MOA: Inhibit viral reverse transcriptase and prevents reproduction of the HIV virus

**NRTI’s**

- ZIDOVUrine (Retrovir, AZT)
- DIDANOSINE (ddI, Videx, Dideoxyinosine)
- ZALCITABINE (ddC, Hivid, Dideoxycytidine)
- STAVUDINE (d4T, Zerit, Deoxythymidine)
NNRTI'S

- **MOA**: Bind directly to reverse transcriptase acting at the same site in the HIV life cycle as reverse transcriptase inhibitors
- **NEVIRAPINE** (Viramune)
- **DELAVIRDINE** (Resniptor)

PROTEASE INHIBITORS

- **MOA**: Inhibit the function of protease, an enzyme needed for HIV reproduction.
- **SAQUINAVIR** (Fortovace)
- **RITONAVIR** (Norvir)

OTHER DRUG THERAPIES

- **INTERFERONS** (Immunomodulators)
  - Used alone or in combination therapy
  - Have antiviral and antitumor properties
- **RECOMMENDED IMMUNIZATIONS**
  - Pneumococcal
  - Influenza
  - Hepatitis B
  - *Haemophilus influenzae b*
- **GENE THERAPY** (Still in research stage)

NURSING CARE

Client with HIV/AIDS

- **SUBJECTIVE DATA - HISTORY**
  - Identification of risk factors
    - High risk sexual practices
    - Homosexual / Bisexual
    - White males
    - Multiple partners
    - No condom use
    - IV drug use
    - HIV + mothers
    - Blood transfusion prior to 1985

- **OBJECTIVE DATA - PE / Labs**
  - **MENTAL STATUS / NEURO**
    - Looking for CNS changes
    - Cognitive, sensory, behavioral
  - **NUTRITIONAL STATUS / GI**
    - Diet history
    - Baseline and periodic weight, body mass, BUN, serum protein, albumin
    - Identify factors that interfere with nutritional intakes
      - Anorexia, mouth ulcers, diarrhea
  - **INTEGUMENTARY**
    - Looking for breakdown, ulcerations, infection, or tumors
    - Wound cultures
  - **RESPIRATORY**
    - Monitor for cough, sputum production, and SOB
    - CXR, ABG's, O2 Sat, PFT's
  - **FLUID AND ELECTROLYTES**
    - Monitor for S/S of dehydration
    - Baseline and periodic electrolytes

- **OBJECTIVE DATA (continued)**

- **INTEGUMENTARY**
  - Looking for breakdown, ulcerations, infection, or tumors
  - Wound cultures
- **RESPIRATORY**
  - Monitor for cough, sputum production, and SOB
  - CXR, ABG's, O2 Sat, PFT's
- **FLUID AND ELECTROLYTES**
  - Monitor for S/S of dehydration
  - Baseline and periodic electrolytes
**NURSING DIAGNOSES**
- Individualized

**GOALS**
- MAINTAIN OPTIMAL HEALTH
  - Adequate diet and nutritional intake
  - Balance of rest and exercise
  - Stress reduction
  - Life style changes
  - Maintain a positive outlook
  - Smoking cessation, eliminate use of alcohol and recreational or illicit drugs
  - Adhere to treatment plan

**NURSING INTERVENTIONS**
- Recognition and treatment of HIV/AIDS and opportunistic infections
- Medication regimes
- Physical outpatient and inpatient care
- Nutritional support
- Minimize effects of HIV/AIDS
- Minimize side effects of medications

**EDUCATION NEEDS**
- Current factual information about the disease, its spread, and expected course
- Safer sexual practices
- Cleaning of contaminated objects
- Abstain from donating blood, organs, or sperm

**COUNSELING**
- Grief process
- Social stigma
- Affects ability to obtain and retain useful work
- Guilt feelings
- Social isolation
- Foster parent support

**PROGRESSIVE DISEASE**
- Continued pharmacological therapy
- Diagnostic Studies
- Discuss S/S to report:
  - Persistent fever or night sweats
  - Swollen glands
  - Diarrhea
  - Chest pain / Dyspnea
  - Headaches
  - Skin lesions
- End stage of disease
  - Hospice and Respite Care

**EVALUATION**
- Maintain optimum system function for as long as possible
- Maintain adequate nutritional status
- Verbalize appropriate knowledge of causes of disease, treatment, and expected outcomes
EVALUATION

* Decreased social isolation
* Increased sense of comfort
* Death with Dignity

Case Study
The Client with AIDS

* History
- HIV+
- Drug abuse in past
- Recent physical complaints

* Physical findings
- ↑ T,P,R
- ↓ B/P
- + cough
- + oral lesions
- Electrolyte changes

* Discussion of findings
* Nursing Diagnoses
* Initial Priorities of Care
* Assessment Changes
* Priority Nursing Actions

AUTOIMMUNE DISORDERS

* DEFINITION: Development of auto-antibodies to one's own cells and/or tissues
* INCIDENCE: More common with females
* COMMON DISORDERS
- Rheumatoid Arthritis
- Systemic Lupus Erythematosus (SLE)
- Diabetes
- Thyroid Disease
- Hemolytic anemia
- Myasthenia Gravis
- And others

Systemic Lupus Erythematosus

* DEFINITION: Disturbed immune regulation that causes production of autoantibodies.
* CAUSE: Genetic, hormonal, and environmental.
- Females during childbearing years
- Sunlight, thermal burns
- Certain medications and foods
* PATHO: Abnormal suppressor T-cell function leading to immune complex deposits and tissue damage → inflammation → more damage

Clinical Manifestation of SLE

* MUSCULOSKELETAL
- Arthralgias and arthritis → morning stiffness
* DERMATOLOGICAL
- Butterfly rash
- Other skin and oral lesions
- Lesion usually appear with exacerbations
* CARDIOPULMONARY
- Pericarditis
- Pleural effusions
Clinical Manifestation of SLE

**VASCULAR / LYMPH**
- Inflammation of terminal arterioles leading to necrosis of fingertips, elbows, toes
- Lymphadenopathy

**RENAL**
- Glomeruli damage

**NEUROLOGICAL**
- Range from subtle changes in behavior and cognitive ability to severe depression and psychosis.

Assessment and Diagnostics

**ASSESSMENT**
- History
- Physical

**DIAGNOSTIC TESTS**
- CBC
  - Anemia
- Hematuria
- ANA
  - Positive results
- Urinalysis

MANAGEMENT

**MEDICAL**
- To control acute exacerbations to ↓ morbidity and mortality

**DRUGS**
- Corticosteroids
- Antimalarials
- Immunosuppressives

**NURSING**
- To help patient manage chronic disease state and minimize exacerbations

**CARE PLAN FOCUS**
- Alleviate fatigue
- Skin integrity
- Body image
- Knowledge deficit

THE END