Immune System - Med surge cheat sheet

Medical Surgical Nursing (Western Dakota Technical Institute)

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IMMUNE SYSTEM: IMMUNITY AND INFLAMMATION

Protects the body from disease-causing microorganism through innate and acquired immunity.

INNATE IMMUNITY: **Inborn immunity**. Defense mechanism that acts **immediately against all antigens.**

- **Inflammatory response:**
- **Skin:** Barrier from microorganism
- **Stomach acid**
- **Mucus:** Traps pathogens
- **Phagocytic cell:** Work immediately against all antigens.

INFLAMMATORY RESPONSE:

Body's ***protective reaction to injury, diseases, or damage to tissues*** in your body.

THREE STAGES:

FIRST:

1. **Warmth**; **erythema, redness**; Due to the constriction of small veins and dilation of arterials which increases blood flow that helps deliver nutrients to the injured area and helps heal.
2. **Edema**: swelling. This is when blood flows to an infected area which can lead to pain.
3. **pain**
4. Decreased function/pain at site of injury.

Drainage is seen because this is pushed by the body out of our body so new tissues can grow.

SECOND:

1. **WBC kills microorganism** and exudate containing those WBC.
2. **Dead tissue cells accumulate** at site of injury.
3. **Neutrophilia and pus**

THIRD: Damaged tissues will be **replaced by a scar tissue.**

ACQUIRED IMMUNITY:

1. Developed **through the actions of B and T cells**.
2. Protective response that results in **long-term resistance** to the effects of invading microorganism,

- **Humoral immunity:**

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Antigen binds with B cell → B cell engulfs antigen → Presents B cells on the surface of cell by MHC II proteins → Helper T cell will bind with MHC II to release cytokine (chemical messengers) → B cells induce into Plasma cells and Memory Cells. Plasma Cells: Produce antibodies that work on specific antigens→ BINDING triggers neutralization and destruction of antigens. Memory Cells: sensitized but will not function until the next exposure of antigen.

- **Cell-mediated immunity:** When naïve T-cell comes in contact with MHC antigen complex, it gets activated = **RELEASES cytokines (chemical messengers) → allows for proliferation and activation of a number of T cells (helper or inducer T cells, as well as regulatory T cells and cytotoxic T cells).**
  Prevents the development of cancer and metastasis after exposure to carcinogens.
- **Helper T cells:**
  1. **CD4+ Cells = Recognizes self vs non-self-cells.**
  2. **CD4 vs Non-self cells = *Release cytokines to communicate with WBC to destroy non-self cell.***
- **Regulatory T cell:** prevent hypersensitivity or overreaction of the immune system by **releasing cytokines that suppress immune response**.
- **Cytotoxic T cells** (CD8+ cells)**: destroy infected, cancerous, damaged cells**.

TYPES OF IMMUNITY:

1. **Active immunity:** Actively producing antibodies**.**
2. **Active Natural immunity:** Produces antibodies **in response to exposure to a live pathogen.**
3. **Active Artificial immunity:** Body produces antibodies **in response to exposure to vaccine.**
4. **Passive immunity: Body is not making antibodies; antibodies are given to you.**
5. **Passive natural immunity: Mom passes antibodies to baby through the placenta and through the breast milk.** Antibodies are not created by babies but instead given by mother.
6. **Passive artificial immunity: Patient is administered immunoglobulin**. They are *given antibodies to fight CURRENT infections*; body did not create the antibodies. **NO MEMORY cells available to fight the infection if they get exposed again.**

IMMUNE SYSTEM MALFUNCTION

1. **Hypersensitivity:** Immune system has an **exaggerated or inappropriate response upon exposure to an antigen or allergen.** Goes after that antigen and *goes overboard causing inflammation or destruction of healthy body tissue as well*.
2. **Autoimmune reaction**: **Body defenses recognize self cells as non-self cells and target them. Dt genetic, hormonal, or environmental factors**.
3. **Immunodeficiency**: **Absent or depressed immune response dt infection, medications, or genetic disorders**. When pt's immune system is not functioning at full capacity, **Poses RISK for INFECTION.**

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CHAIN OF INFECTION

CAUSATIVE AGENT (Bacteria, virus, toxin) → Resides in RESERVOIR (human body, soil) → leaves through PORTAL OF EXIT (respiratory tract, blood) through a MODE OF TRANSMISSION (droplets, contact, or airborne) → enters through the PORTAL OF ENTRY → into the SUSCEPTIBLE HOST.

STAGES OF INFECTION

1. **Incubation period:** Pathogen **enters the body and starts to multiply**. **NO SYMPTOMS**
2. **Prodromal stage:** Pathogen **continues to multiply, triggers ONSET OF GENERAL SYMPTOMS (e.g., malaise, fever, not feeling well)**
3. **Illness stage: ONSET OF SPECIFIC SYMPTOMS** related to that particular infection **(eg., respiratory infection: runny nose and coughing).**
4. **Convalescence Stage: SYMPTOMS SUBSIDE and eventually disappears; gradual recovery from illness.**

RISKS FOR INFECTION:

- **Compromised Immunity**
- **Chronic or acute disease: e.g., Diabetes which places pt higher risk for infection**
- **Poor hygiene**
- **Poor sanitation**
- **Crowded living environments e.g., dormitories**
- **IV drug use**
- **Unprotected sex**
- **Impaired skin integrity**

DIFFERENCE BETWEEN SYSTEMIC AND LOCAL INFECTION: PRIORITIZE SYSTEMIC THAN LOCAL

Patient with **systemic infection** will have symptoms *e.g., fever, malaise, chills, fatigue, tachycardia, tachypnea.*

Local infection: Infection on *one part of the body e.g., edema, pain, erythema, redness, decreased function and warmth.*

FUNCTIONS OF EACH LEUKOCYTES:

Monocytes mature into macrophages, plasma cells secrete immunoglobulin in the presence of specific antigens

Natural killer cells nonselectively attack non-self cells.

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Basophils release histamines, kinins, and heparin in areas of tissue damage.

Cytotoxic T-cells selectively attack and destroy non-self cells, including virally infected cells, grafts, and transplanted organs.

Regulator T-cells become sensitized for self-recognition in the thymus.

The normal range for segmented neutrophils is 55% to 70%.

The normal range for bands is 5%.

The normal range for monocytes is 2% to 8%.

The normal range for lymphocytes is 20% to 40%.

The normal range for eosinophils is 1% to 4%.

The normal range for basophils is 0.5% to 1%.

LECTURE NOTES:

Immune system: Comes from the bone marrow.

Stem Cell: becomes something else

Leukocyte: Main protection; WBC count

IMMUNITY AND THE OLDER ADULT: Decreases

- Lower T cell function
- B-lymphocytes take longer to become sensitized and begin to make antibodies to new antigen exposures.

Mature neutrophils: Segments

Immature neutrophils: Bands

Left shift: When bands increases in result to an infection. Bone marrow cannot keep up with the body's demands to keep up with the infection. We want more segments so that they can fight more.

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HIV AND AIDS

HIV: a retrovirus that causes decreased immunity in the pt and increased susceptibility to infections.

Results in: Immunodeficiency, autoimmunity, and neurologic dysfunction.

Risk factor:

- unprotected sex
- multiple sex partners
- perinatal exposure (baby born)
- IV drug use
- healthcare workers.

S/sx:

- Flu-like symptoms
- Lymphadenopathy (enlarged lymph nodes)
- Thrush
- Weakness
- Night sweats
- Fever
- Weight loss
- Rashes

LABS:

- **WBC**: decreased
- **T cells**: Decreased
- **CD4+:** Decreased. Under 500

AIDS: untreated HIV that leads CD4+ cells to go all the way down to 200.

Signs and symptoms:

- Kaposi's sarcoma (Cancer of cells and soft tissue)
- Tuberculosis
- Pneumonia
- Wasting syndrome
- Candidiasis of the airways

TREATMENT:

- Antiretroviral Therapy (ART)

TEACHING

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- Reiterate the need for **SAFE SEX**
- **PrEP: Pre-exposure prophylaxis** for uninfected sexual partners
- Ongoing monitoring of the pt's CD4+ count

Prevent infection by:

1. Handwashing
2. bathe daily with antibmicrobial soap.
3. avoid raw undercooked foods.
4. avoid fresh plants.
5. don't clean litter boxes.
6. avoid crowd and sick people.

CANCER AND PT CARE

CANCER: DNA damage that causes abnormal cell growth and development.

1. **INITIATION:** Damage and mutation to DNA can cause **excessive cell division**; excessive oncogene function and decrease suppressor gene.
2. **PROMOTION:** Mutated cells are **exposed to promoters that enhance their growth**; oncogenes.
3. **PROGRESSION:** Tumor cells acquire additional mutation; growth rate increases; allows to **metastasize**.

RISK FACTORS:

- **Older age**
- **Genetics**
- **Immunosuppression**
- **Viruses**
- **Sun exposure**
- **High-fat low fiber diet**

SIGNS AND SYMPTOMS:

- **Unexplained weight loss**
- **Fatigue**
- **Pain**
- **Infection**
- **Bleeding**

HOW TO DIAGNOSE CANCER:

- **BIOPSY!!**

TREATMENT:

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- **Chemotherapy:** Administered through a port or central line
- **Hormonal Therapy**
- **Immunotherapy**

PROCEDURES:

- **Radiation**
- **Surgery to remove tumor; Tumor excision.**

COMPLICATION:

- **Malnutrition**
- **Infection**
- **Mucositis**
- **Anemia**
- **Thrombocytopenia**
- **Alopecia**

TUMOR CLASSIFICATION

1. **Carcinoma:** Makes up **majority** of cancers; **80-90%** that originate in the epithelial tissues.
    - *Adenocarcinoma*: Organ or glands that secrete mucus
    - *Squama cell*: Squamous epithelium
2. **Sarcoma**: Originates in the supportive or connective tissues; bones muscles, tendons, cartilage, and fat.
    - *Osteosarcoma*: Cancer in bones.
    - *Chondrosarcoma*: Cancer in cartilage.
3. **Leukemia**: Originates in the bone marrow
4. **Myeloma**: Originates in the plasma cell specifically in the bone marrow.
5. **Lymphoma**: Originates in the lymphatic glands or nodes.

GRADING CANCER:

1. Grade I: Cancer is well differentiated and resembles tissue of origin.
2. Grade II
3. Grade III: No similarity with tissue of origin.
4. Grade IV: Grows quickly and rapidly.

STAGING CANCER:

T: Tumor; T1, T2, T3, T4 = Size and extent of tumor.

N: Node; NUMBER of regional lymph nodes. Number of lymph nodes affected

M: Metastasis: M0 or M1: With metastasis or NO metastasis.

NURSING CARE AND PATIENT TEACHING FOR PTS W CANCER

CHEMOTHERAPY:

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- **Wearing appropriate attire**: Special gowns and gloves according to policy
- **Double bag lines** with impervious bag outside; making substance not LEAK through. LEAK PROOF
- **SPILL management guidelines**.
- **DOUBLE FLUSH** the toilets!
- **SPLASH guard** prior to flushing toilets.

INTERNAL RADIATION / BRACHYTHERAPY

On or very close to the cancer site (internally)

STEPS:

1. **Keep door close**.
2. **Warning sign** on door
3. **Limit visitors to 30 minutes** **staying 6 ft away**
4. Wear **Lead apron and Dorsimeter** film bag
5. FACE patient

EXTERNAL RADIATION

1. Area of radiation will be **MARKED AND LET PT NOT WASH OFF**
2. Be gentle on the skin marked for radiation. **Clean area with soap and pat dry, DO NOT apply lotion or ointments unless rx by HCP**.
3. ADVISE to wear **loose and soft clothing**.
4. **AVOID sun and heat on the area**.

PATIENT TEACHING

1. **Malnutrition**: Chemotherapy causes malnutrition.
   INTERVENTION: *Anti-emetics 30 mins prior to chemotherapy. Ondansetron*
   Appetite simulant; Megestrol
2. **AVOID drinking liquids with their meals**! Don't fill up on liquids. **FOCUS on CONSUMING HIGH CALORIE HIGH PROTEIN NUTRIENT DENSE DIET**.
3. **ROOM temperature or COOLER foods** are easier to get down when they are nauseas.
4. Administer **supplements** for nutrients.
5. **Mucositis**: Mucosal membranes become inflamed, irritated, and ulcerated = more PAIN.
   INTERVENTION:
   - **Meticulous oral care** for patient before and after meals.
   - Let the pt **AVOID mouthwash with Glycerine and Alcohol**
   - SWISH with **saline solution 2x day**.
   - USE **soft toothbrush**.
   - AVOID FOOD that can cause pain in that mucosa; crackers and chips. **SCRAMBLE EGGS ARE BETTER CHOICE.**

HYPERSENSITIVITY AND ALLERGY

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Type 1: Hypersensitivity

- Rapid hypersensitivity, or atopic allergy
- Increased production of Immunoglobulin E (lgE).
- Most common type.
- Ex: **Angioedema, Anaphylaxis, allergic asthma**
- Ingested, inhaled, injected, or through skin

Type II: Cytotoxic reactions

- Autoantibodies directed against self-cells.
- Ex: Hemolytic anemia, immune thrombocytopenic purpura, hemolytic transfusion reaction, good pasture syndrome, drug induced hemolytic syndrome

INTERVENTION:

1. D/c Drug or blood product
2. Use plasmapheresis to filter antibody out of blood.

TYPE III Immune complex reactions

- Most autoimmune disorders are caused by this type
- Sites: Kidney, skin, and joints
- EX: Rheumatoid arthritis, SLE, serum sickness; caused by serum injected into body e.g., penicillin, antibiotic, animal serum based drugs.

TYPE IV: Delayed hypersensitivity

- Occurs **hours to days** after exposure.
- *Causes: Edema, induration, ischemia, tissue damage, dermatitis*
- Self-limiting; ***last 5 to 7 days***
- **Ex: TB skin test, poison Ivy, contact dermatitis, skin rash, local response to insect, tissue transplant reactions (Acute rejection that occurs 1 week- 3 months; ischemic tissue)**

INTERVENTION:

- Continuous immunosuppression for life.
- Rescue therapy is used to acute rejection during organ transplant.
- TB test: induration and erythema. TB positive; Chest X-ray to test for infiltrates in lungs.

ANGIOEDEMA

- Severe type I hypersensitivity reaction.
- CAUSED BY: Ace inhibitor drugs
- Location: Deep tissues rather than superficial.

SIGNS AND SYMPTOMS:

- Lip swelling, itching back of throat
- Deep, firm swelling of face, lips, tongue, neck
- Difficulty speaking; drinking
- Nasal swelling

INTERVENTION:

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- AIRWAY FIRST!
- Stop the reaction
- Ensure adequate airway
- Oxygenate; tracheostomy, drug therapy.

ANAPHYLAXIS

- Life threatening type I hypersensitivity
- **INTERVENTION: GIVE EPI!**
- CAUSED BY: Drugs and dyes, insect bites.
- **WHAT TO DO**: Avoid allergen, wear medical alert bracelet, carry epi pens at all times,

SIGNS AND SYMPTOMS:

- 1st: Apprehension, weakness, impending doom
- Dyspnea, rhinorrhea, congestion
- Hypotension; Decline of systolic of more than 30% from baseline.
- Diaphoresis
- Urticaria/ hives
- Erythema/ angioedema

INTERVENTION:

1. EPI- first line
2. Benadryl: IM or IV SECOND line
3. **AIRWAY FIRST**
4. D/C med cause
5. CALL RRT
6. O2
7. Epinephrine
8. Can give: Beta adrenergic agonist/ Corticosteroid or oral steroid

SYSTEMIC LUPUS ERYTHEMATOSUS (GENRAL AUTOIMMUNITY)

Can lead to: organ failure leading to death.

Lupus Nephritis: The leading cause of death in SLE.

- Pain
- Hypoxia
- Fatigue
- Loss of tissue integrity
  INTERVENTION: Steroids

LYME DISEASE

Chronic inflammation.

S/sx:

- Stage 1: Flu-like symptoms, bull's eye rash, erythema, pain on joints, stiffness on muscle and joints,
- Stage 2: Carditis, dysrhythmia, meningitis, syspnea, facial paralysis, peripheral neuritis

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INTERVENTION:

- Tx with ABX
- Prevention is key: Avoid wooded areas, use insect repellant, wear long sleeves and long pants.
- Remove ticks; can transmit.

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