Introduction

- **Tissue Marker**
  - codes or “fingerprints” to assist the immune system to differentiate between “self” and “alien” cells
  - “alien” cells are destroyed to protect the body

- **Immune Response**
  - target specific defense against foreign or cancer cells
  - This Response is carried out by lymphocytes located in the blood and lymphoid tissue
  - In life threatening situations
    - Hyperactivity
    - Hypoactivity
The Structure of the Immune System

• The Immune System
  – is a group of specialized WBC's and lymphoid tissue for protection from outside invasion and from altered cells within the body
• Support by
  – Natural killer (NK) cells
  – Antibody
  – Proteins

White Blood Cells

• Leukocytes
• Produced by the bone marrow
• All cells begin as stem cells (nonspecific) and later become specific

Lymphocytes

• T-Cells or B-Cells
  – 20-30%
  – distinguish harmful substances
• T-Cells
  – made in the bone marrow
  – move to the thymus gland to mature
  – become regulator T-Cells or effector T-Cells
    • Regulator cells are a combo of helper and suppressor cells
    • Effector cells are killer or cytotoxic cells
Lymphocytes

• Helper T-Cells
  — Fight infection
  — Recognize antigens
  — Stimulated T-Cells clones to produce antibodies

• Cytotoxic Cells
  — attach to invading cells
  — Alter their cell membrane
  — destroys the invader
  — Produce chemicals - **lymphokines** to bring neutrophils and monocytes to clean up the area

Lymphocytes

• B-Cell lymphocytes
  — mature in the bone marrow
  — move to the spleen and lymph node

• Stimulation of the B-Cell by T-Cell causes the B-cell to become either plasma cells or memory cells

Lymphocytes

• **Plasma Cell** produce antibodies – this is called *Humoral Response*

• **Memory cells** convert to plasma cells when re-exposed to specific antigen
  — Swollen / tender lymph nodes occur when activated B-Cells accumulated in lymph tissue during an infection
  — Swollen spleen occurs during immune disorders
Neutrophils and Monocytes

- These are phagocytes – which do **phagocytosis**
- **Phagocytosis** is the process of engulfing and digesting bacteria and foreign material
- Can be stationary or mobile
Neutrophils

- Neutrophils
  - Microphages because of small size
  - Located in the blood and can move into tissue as needed
- Monocytes
  - Macrophages because of large size
  - Are located in the lungs, liver, lymph nodes, spleen, and peritoneum
  - Migrate after cell mediated response known as Reticuloendothelial System

Lymphoid Tissue

- Plays a role in immune response—help prevent infection
- Lymphoid tissue—also found on
  - Mucous membranes of intestine
  - Alveolar tissue in lungs
  - Lining of liver

Lymphoid Tissue

- Thymus gland—located in neck below thyroid gland
  - Produces lymphocytes during fetal development
  - Origin of spleen, liver, lymph nodes
  - After birth, programs T lymphocytes to become regulator or effector T-Cells
  - Reduces in size during adolescence
Lymphoid Tissue

- Tonsils are found on either side of the soft palate
- Adenoids located behind the nose on posterior wall of the nasopharynx
- Both tonsils and adenoids filter bacteria from tissue fluid

Lymphoid Tissue

- The spleen acts as an emergency reservoir for blood and filters the blood
- Old, dead or damaged blood cells in the circulation and bacteria are removed by macrophages located in the spleen

Lymphoid Tissue

- The lymph system contains Lymph nodes
  - lymph fluid is drained
  - contain B Lymphocytes & T Lymphocytes
  - in the axilla, groin and neck
  - palpable when enlarged
Natural Killer Cells (NK)

- Lymphocyte like cells - find virus infected cells and cancer
- Can ID atypical marker on cell – they don’t need T or B Lymphocytes
- Release chemical to alter target cell’s membrane and kill it

Natural Killer Cells (NK)

- Cancer cells can escape – this is how cancer cells become established and spread beyond primary site
Antibodies

- These are proteins produced by the B lymphocytes plasma cells
- Are called immunoglobulins (Ig)
- 5 Classes of Immunoglobulins
  - IgA
  - IgD
  - IgE
  - IgG
  - IgM

Antibodies

- Immunoglobulins attach to antigens and destroy invading cells by
  - Neutralizing the toxins
  - Agglutinating the cells
  - Causing the antigen to become soluble

Antibodies

- Facilitate the destruction of the antigens by
  - Non-antibody proteins
    - The complement system
    - Cytokines
Non Antibody Proteins

• The Complement System
  – Made up of many different proteins
  – When an antibody binds with an antigens, a chain reaction occurs between the different proteins

• Non Antibody Proteins
  – Proteins work with antibodies to attract phagocytes to coat the antigens
  – Making the antigens more recognizable for phagocytosis
  – This stimulates inflammation through the release of histamine from mast cells and basophils

Non Antibody Proteins

• Cytokines
  – Chemical messengers release by lymphocytes, monocytes and macrophages
  – Sub groups includes
    • Interleukins
    • Interferons
    • Tumor necrosis factor
    • Colony stimulating factors
Lymphocytes

• Suppressor T-Cells
  – Limit or turn off the immune response when there are no invaders
  – When T-Cell lymphocytes do their job it’s called a cell-mediated response – occurs when organ is transplanted

Non Antibody Proteins

• Interleukins carry messages between leukocytes and blood forming tissues

Non Antibody Proteins

• Interleukins activities include
  – Promotion of inflammation & fever
  – Formation of scar tissue by fibroblast
  – Growth and activation of NK cells and T cells
  – Production of mast cells
  – Growth of B cells, formation of plasma and antibodies
  – Angiogenesis
  – Stimulation of the pituitary to secrete corticotrophin
Non Antibody Proteins

- **Interferons** ~ Chemical to protect cells from viral invasion
  - Works by slowing viral replication
  - Used as adjunctive therapy for AIDS and some forms of Leukemia
  - They stimulate NK Cell activity

Non Antibody Proteins

- **Tumor Necrosis Factor** is a type of cytokine
  - Was first thought to be a means for shrinking tumors
  - It worked in lab animals but not in humans
  - Experimenting with injection straight into tumor to decrease toxicity
  - It aids in cellular repair if used in small amounts
  - It is being regulated for some autoimmune and inflammatory disorders

Non Antibody Proteins

- **Colony Stimulating Factors**
  - Are cytokines to regulate production, maturation and functions of blood cells
- Growth factors allow stem cells in the bone marrow to divide into specific types of cell
  - Leukocytes
  - Erythrocytes
  - Platelets
Non Antibody Proteins

• Pharmocologic preparations are used to promote natural production of blood cells
  – Epoitin Alfa ~ Epogen
  – Filgrastim ~ Neupogen
  – Sargramostin ~ Leukine

• These reduce the risk for infection in pts receiving antineoplastics drugs
• Speed recovery in pts receiving bone marrow transplants
• Decrease the need for repeat blood transfusions in renal failure pts

Types of Immunity

Three types of Immunity
• Naturally acquired active
• Artificially acquired active
• Passive immunity
Types of Immunity

**Naturally Acquired Active Immunity**
- Direct result of an infection by a specific microorganism
- Immunity to measles or chicken pox develops after initial infection
- Not all invading microorganisms give life long immunity

**Artificially Acquired Active Immunity**
- Results from administration of a killed or weakened microorganism or toxoid
- B Lymphocytes make a “memory cell” to recognize the weakened or killed microorganism for future invasion protection

**Artificially Acquired Active Immunity**
- Some immunization recommend for adulthood to provide adequate immunity
  - Tetanus
  - Influenza
  - Smallpox
Types of Immunity

**Passive Immunity**
- Develops when ready made antibodies are given to a susceptible person
- Provide short lived protection

**Passive Immunity**
- No memory cells are produced and antibodies diminish over weeks to months
- Ready made antibodies are obtained from the serum of another organism – animal or human

**Passive Immunity**
- Immune serum globulins
  - gamma globulin or immunoglobulins may be obtained from human plasma
  - Pt may received more than one specific antibodies
Passive Immunity

Immune serum globulins

- Human immune serum can be used for passive immunization against
  - Measles - Rubella
  - Whooping cough - Pertussis
  - Hepatitis B
  - Chicken Pox - Varicella
  - Tetanus

Passive Immunity

- Newborns receive passive immunity to some disease from Mom for disease which she develop
- The circulating antibodies cross the placental barrier last for only a few months after birth

Assessment

History

- Get Immunization Hx
- Recent and past infections
- Review drug Hx ~ Corticosteroids
- Hx of Allergies
- Practices that put pts risk for AIDS
Assessment

• Physical Examination
  – General health status
  – V/S wt
  – Skin Assessment
  – Assess abd for enlarged liver or spleen
  – Assess pharynx for enlarged, inflamed tonsils, purulent drainage
  – Palpate lymph nodes in neck, axilla and groin for enlargement and tenderness

Assessment

Diagnosis Test

• Lab Test
  – CBC with Diff
  – Protein electrophoresis
  – T cell or C cell assays
  – Genetic disorder test
• Skin Test
  – PPD for TB
  – Anergy ~ the ability to have immune response

Nursing Management

• Identification of any allergies
• Explain all diagnostic test
• Obtain written consent before HIV testing - Keep confidential
• Use standard precautions
• Follow agency policy and guidelines for protecting pt
• Include pt teaching for immunization and drug therapy
Considerations

- Nutritional
- Pharmacological
- Gerontologic

QUESTION????
Is the following statement true or false?
There is more than one type of hypersensitivity response.

QUESTION????
Is the following statement true or false?
T-cell lymphocytes mature in the thymus gland.
QUESTION???

Is the following statement true or false?

The complement system is involved in opsonization.