

Notes for Exam 2

- Chapter 11
- Non-Specific host defenses
 - How we resist disease is called immunity
 - Three parts:
 - Innate- inborn, also known as “Specific immunity”
 - Due to genetic traits of a species
 - Non-Specific- function immediately, no matter what the function particle is
 - External compounds
 - Internal compounds
 - Acquired- specific for a particular pathogen
 - Actively acquired
 - Passively acquired
- Non-Specific Immunity
 - 1. External
 - 1. Parts of the body that prevent microorganisms from attaching or penetrating are body tissues.
 - 2. Normal flora- microorganisms that are found on or in the human body. Each may have its own niche. These normal floras provide significant protection by just occupying space.
 - Specific Barriers:
 - First line of defense in intact skin and mucous membranes
 - Mucous membranes line body cavities covered with mucous which traps microorganisms
 - Most pathogens cannot live on clean or healthy skin
 - Other non specific external defenses- SEE: 124 Figure 14-1 and text
 - Eye lysozyme-tears
 - Ear wax
 - Epithelium
 - Respiratory Tract
 - Digestive Tract
 - 2. Internal
 - 1. Occur at cellular level- a.k.a. “cellular defenses”
 - 2. Most important is process of “phagocytosis”
 - certain cells in the body capable of engulfing (taking inside themselves and destroying) and destroying foreign matter and particles, including microorganisms
 - Cells that do non-specific system mainly are neutrophils and macrophages (Pg. 127, Fig 14.4)
 - 3. Process of Phagocytosis- Know Steps
 - Attachment of bacterial cells
 - Vacuole formed

- Vacuole phagosome, fuses with structure in cell called lysosome (organelle which contains enzymes that destroy bacteria). Once fused is called a phagolysosome
- Enzymes degrade microorganism
- Debris eliminated

➤ Non-Specific Internal Mechanisms

Phagocytosis- detour #1 Components of blood

- Composition of Blood
 - 55-60% plasma
 - 40-45% formed elements (cells and remnants (parts) of cells)
- 1. Plasma- 90% water and contains the following
 - Proteins (albumin, globulins fibrinogen)
 - Electrolytes (Na⁺, K⁺, Cl⁻)
 - Gases (oxygen, carbon dioxide)
 - Nutrients
 - Waste Products
 - pH – 7.4
- Serum= fluid that remains after all the cells and clotting factors are removed
- Clotting = Fibrinogen (soluble) converted to Fibrin (a spongy protein) and then clots
- Prevent clot by adding heparin or citrate to the blood
- 2. Formed Elements= Red Blood Cells (RBC), White blood cells (WBC) and platelets
- All cells come from a pluripotent stem cell (capability to change) **Figure 11-1**, differentiations begin during development of the fetus and continues throughout life. Stem cells reside primarily in the bone marrow and can be found in umbilical cord blood.
- Red blood cells= erythrocyte (formed in the bone marrow) contains hemoglobin (Hb) which carries oxygen
 - Normal number of RBC- 5 million per micro liter= drop of that will sit on the edge of a pin
 - Hemolysis= break up RBC and release Hb
 - Hematocrit= the percent of blood that is composed of cells (not just red blood cells, all cells).
 - Anemia= a deficiency in oxygen carrying (maybe lack of red blood cells or lack of Hb in red blood cells)
- White Blood Cells- leukocytes (**table 11-3**)
 - Total number of white blood cells is 5,000-11,000 per micro liter
 - Two groups based on their stem cell origin (**Fig 11-1 pg 93**)
 - Myeloid cells= come from the myeloid line stem cell (derivatives include red blood cells and platelets).
 - One group of myeloid cells are known as Polymorphonuclear leukocytes (PMN or PMNL or “polys”- These cells have a granular cytoplasm and irregularly shaped lobes on the nuclei
 - Three kinds of PMNs based on staining properties
 - Basophils- stain with a basic dye

- <1% of the 5-11,000 white blood cells are basophils
 - Eosinophils- stain with acidic dye called eosin
 - 3-5% of white blood cells are eosinophils
 - Neutrophils- stain with either an acidic or basic dye
 - Neutrophils and eosinophils are phagocytic cells, basophils aren't phagocytic
 - Important characteristics of PMNs (especially Neutrophils) are the ability to move out of blood vessels and into tissues; will congregate around inflamed areas.
 - Ex. Pus in a boil = dead PMNs + bacteria + serum
 - another line of cells from the Myeloid line is the Mononuclear cell line (Pg 97)- However they lack granules and have round nuclei
 - Main cells of this line are monocytes (in blood stream)
 - Monocytes= phagocytic and can move into tissues
 - compose 3-8% of white blood cells
 - When these monocytes move into tissues they differentiate into macrophages
 - Some macrophages become fixed in particular tissues- name based on location. ex. histocytes in connective tissues, microglial cells in the brain
 - Some macrophages are "wandering" and can move into any tissue when they are needed
 - Monocytes in blood stream
 - Macrophages in tissues
 - All these differentiations are done in response to chemical stimulants called cytokines or colony stimulating factors (CSF)- See Table in book
 - Know what cytokines are and what they can do- they are protein produced by lymphoid and other cells that simulate and regulate the immune response
 - Macrophages are phagocytic cells
 - Platelets also formed from myeloid line (platelets formed element in the blood stream)
 - smaller cells
 - No nucleus
 - Made in bone marrow
 - involved in clotting, it makes up one of the components of fibrin
 - Lymphoid cells
 - Give rise to the B lymphocytes (B cells) and T lymphocytes (T cells) and natural killer cells
 - B cells and T cells make up 30-35% of WBCs
 - important in acquired immunity
 - B lymphocytes are found in lymphoid tissue; move out of the blood stream
- Summary: Figure 11-1 Pg 93