Review 11

Immune System

1. Recognition of foreign substances
   - distinguish between SELF, ALTERED-SELF & NON-SELF
2. Communication between cells
   - recognition of foreign molecules and signaling to other white blood cells
3. Elimination of foreign substance
   - antibodies and killer cells

Non-specific body defenses

Anatomic barriers (skin, internal linings of organs, etc.)

Inflammatory response

- ✓release of prostaglandin E_1 (PGE_1) → increases local temperature
- ✓release of histamines--increase in leakiness of capillaries + relax smooth muscle of arterioles causing.....
- ✓increased blood flow to area of infection and
- ✓invasion of area by macrophages and natural killer cells

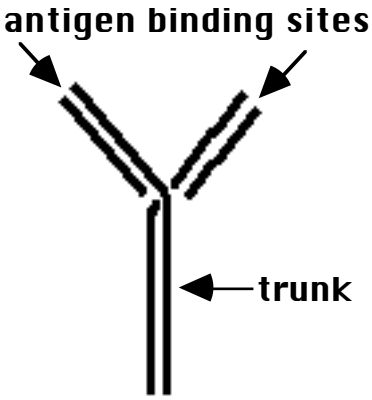
Specific body defenses--immune response

Antigens--substances which evoke an immune response

HUMORAL RESPONSE (fluid-based)

- antibodies are proteins which circulate in body fluids
- "Y" shaped with two binding sites for antigens plus trunk which used for signaling or, in some cases, positioning of antibody within cell membrane
- antibodies mark antigens and antigen-containing structures for destruction and/or removal by either
  a. coating a foreign protein (e.g. toxin), inactivating it
  b. coating the outside of an invader (trunks sticking out) OR
  c. causing agglutination (clumping) of cells,

  which attracts either
  a. macrophages, which engulf and destroy invaders OR
  b. complement proteins, which form holes in invader's cell membrane, allowing contents to leak out and killing cell



general structure of an antibody

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- antibodies are IMMUNOGLOBULIN (Ig) PROTEINS
  - IgG...circulate in blood
    - recognize bacteria, viruses, toxins, other antigens
  - IgA...found in body secretions (tears, saliva, milk, mucus)
    - protect against above; give breast-fed babies immunity
  - IgE...bound to certain cells of skin, mucus membranes, blood
    - act against parasites; cause allergic reactions
- antibodies are produced by B-lymphocytes (B-cells), which are formed in bone marrow and then released into circulation
  - each type of B-cell produces only one type of antibody
  - millions of antibodies---millions of B-cells

PRIMARY RESPONSE:

1. antigen binds to antibody on surface of B-cell
2. B-cell begins to proliferate (about 1000 cells in 10 days)
3. some B-cells specialize to form PLASMA CELLS, which are factories for antibody production; antibodies flood system
4. other B-cells continue dividing, never specializing into plasma cells; called MEMORY CELLS; continue to circulate in system after threat of infection gone

SECONDARY RESPONSE

subsequent exposures to antigen.....much quicker and more intense response because of existing memory cell population

immunizations

CELL-MEDIATED IMMUNE RESPONSE

against non-self and altered-self cells (usually parasites, cancer, transplants, viral infected cells, etc.)

T-cells--originate in bone marrow; migrate to thymus gland where continue to divide and mature

- maturation includes "weeding out" of T-cells that would turn on and destroy self

Helper T-cells (have CD-4 receptors)--sensitize immune system to presence of foreign antigen and stimulate immune response in both B-cells and Killer T-cells

Killer T-cells (have CD-8 receptors)--do the dirty work by either

- killing foreign (or altered-self) cells or
- causing them to become walled off within the body (e.g. tuberculosis)

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TYPES OF IMMUNITY:

- **Passive--acquired by being given antibodies**
  no exposure to antigen/pathogen; no memory cells; no B- or T-cell activation; anti-toxins or colostrom or rhogam
- **Active--acquired via exposure to antigen/pathogen**
  activation of B- or T-cells; memory cells; occurs via "natural" events or injection of dead or modified pathogens (innoculation)