

Immunology

EQ: How does your body fight off an infection?

- I. Innate: Non-Specific
 - a. 1st Line of Defense
 - i. always “on”
 - ii. immediate but generic
 - iii. No memory (immunity)
 - iv. barriers to entry
 1. Skin
 2. Mucus & Cilia
 3. Antiseptic Body Fluids
 - a. saliva, tears, stomach acid
 - b. 2nd Line of Defense: General attack
 - i. the pathogen has gained entry, nonspecific & no immunity
 - ii. Macrophages (white blood cell-WBC)
 - iii. Natural Killer T-Cells
 - iv. Inflammatory Response
 1. Injured cells release histamines
 2. Histamine chemicals cause vasodilation and that causes capillaries expand
 3. WBC follow ‘scent’ of histamines to infection site
 4. stretched capillaries allow WBC to leak through
 - v. Fever
 1. macrophages send chemicals to the hypothalamus in brain
 2. temperature increases are harmful to bacteria (<104°F)
- II. 3rd line of defense: Acquired Immunity
 - a. WBC’s respond to **antigens**
 - b. B-plasma cells make **antibodies** –Y shaped proteins that immobilize and clump (agglutinate) pathogen.
 - c. Antibodies tag it for macrophage to eat.
 - d. Humoral Response
 - i. B-cells engulf pathogen and presents antigen on surface
 - ii. T-cell bind antigen and activates B-cell to mature & divide
 - iii. Mature B-cell called Plasma cell releases antibodies
 - iv. Memory B-cells remain for future exposure (Immunity!)
 - v. Attacks bacteria, fungus, pollen etc. (extracellular)
 - e. Cell Mediated Response
 - i. T-cell activated by binding with antigen on Antigen-presenting cell
 - ii. T-cells divide some remaining as Helper-T cells to communicate & others becoming Cytotoxic T-cells attacking infected body cells
 - iii. Memory T-cells remain for future exposure to virus
- III. Immunity
 - a. 1st Exposure to pathogen
 - i. Longer & less antibodies
 - ii. Body ‘learns’ pathogen
 - b. 2nd Exposure
 - i. Faster & more antibodies
 - ii. Body ‘remembers’ pathogen
 - iii. Memory cells respond so quickly you never get sick

- c. Active Immunity
 - i. You have Memory B-cells that produce antibodies
 - 1. Naturally: you were exposed, got sick, & recovered
 - 2. Artificially: you got a vaccine - weakened pathogen or part of pathogen (antigen). The exposure created B-cells that produce antibodies
 - d. Passive Immunity
 - i. You don't produce antibodies
 - 1. Natural: Mother-child in utero & Breast milk pass antibodies
 - 2. Artificial: Antibodies collected from immune person and put into shot (Snake bite, travelers' shots)
 - ii. Lasts until antibodies break down
- IV. Viral Reproduction-2 types
- a. Lytic Cycle -ends in host cell death + release of 100's + of new viruses
 - b. Lysogenic Cycle- ends with Viral DNA incorporated into host DNA
 - c. Temperate Viruses -move from lysogenic back to lytic
 - i. Varicella Virus - Chicken pox (lytic) and Shingles (lytic after lysogenic term)
 - ii. HPV Virus – can cause cancer by damaging host DNA
 - iii. Herpes - "outbreak" of cold sores is the lytic cycle
- V. **Acquired Immune Deficiency Syndrome**
- a. Caused by the Human Immunodeficiency Virus (HIV)
 - b. Specifically targets and kills T-cells
 - c. Because normal body cells are unaffected, immune response is not launched
 - d. Transmitted by sexual contact, blood transfusions, contaminated needles
 - e. As of 2007, it affects an estimated 33.2 million people