Overview of the Immune System

Innate Immunity

Innate immune (resistance) factors are present before infection and nonspecific - i.e., work all the time and effective against many different kinds of microbes

- **External resistance factors** - those which act on body surfaces
  - physical - barriers, flushing action
  - chemical - activities carried out by molecules, including salts, acids, lipids, enzymes
  - cellular - activities carried out by cells, mostly normal microbiota

- **Internal resistance factors** - those which act within tissues
  - physical - barriers such as connective tissue, blood-brain barrier (blood brain barrier pic)
  - chemical - activities carried out by molecules, including enzymes, interferon and complement
  - cellular - activities carried out by cells, including inflammation, phagocytosis and natural killer cell activity

Adaptive Immunity

Adaptive immune factors are induced during infection by antigens, substances produced by microbes, and are specific for only those pathogens to which one is exposed

- **Antibody-mediated immunity (AMI)**
  - antibody responses
    - antibody is produced by B cells (B lymphocytes) stimulated by Th2 cells (type 2 T helper cells) in response to antigens (immunogens) made by infectious agents
    - antibody binds specifically to the antigen that induced its formation and potentiates the mechanisms by which Ab functions
  - mechanisms of action (ways in which AMI functions)
    - neutralization - inhibition of toxin function, viral infectivity, microbe attachment due to antibody binding to surface antigens of pathogens
    - opsonization - antibody and complement both enhance attachment of pathogens to phagocytes via receptors that bind them
    - antibody/complement-mediated lysis - complement is activated by binding to antibody molecules that have bound to antigens

- **Cell-mediated immunity (CMI)**
  - cellular responses
    - cytotoxic T lymphocytes (CTLs) are activated by T helper cells in the presence of viral antigens on virus-infected cells
    - macrophages are also activated by T helper cells
  - mechanisms of action (ways in which CMI functions)
    - CTLs kill “target” cells by destroying their membranes (necrosis) or inducing them to destroy themselves (apoptosis)
- activated macrophages up regulation of both enzymatic and non-enzymatic killing and degradation systems