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