• Origins of a disease state: inherited, chemical toxicity, trauma, dietary, infectious pathogen, immune response to self

• The Immune Response
  ○ Pathogen enters body and travels to nearest lymph node/spleen
  ○ Innate immunity (non-specific) cells take up pathogen
    ▪ Macrophages specialized to phagocytose
    ▪ Neutrophils for phagocytosis and activation of bactericidal mechanisms
    ▪ Dendritic cells acquire and present pathogens to the immune system
  ○ Lymphocytes w/ specific antigen receptors recognize antigen
    ▪ Recognition phase of immune response - T and B cells recognize the pathogen by binding to receptors on cell surface
    ▪ Binding of antigen to specific receptor on cell surface
    ▪ Antigens - foreign molecules w/ a distinctive shape
    ▪ Carrier, immunogen - large molecules (>8aa) that are able to elicit a response
    ▪ Hapten, determinant, epitope - small molecules that cannot elicit an immune response but can bind to an antibody
  ○ B cells - produce antibodies to bind antigens; fxn'l term; one antibody/epitope
    ▪ Immunoglobulin - structural term for antibody
    ▪ Small, round, WBCs; 8-10 microns
  ○ Activation phase: T and B cells differentiate and divide
  ○ Adaptive immunity: protection against pathogens that involves specific immunity
  ○ T cells - development in thymus, CD3 on surface
    ▪ CD4 - helper T - interact with B cells to help them make large amounts of antibody
    ▪ CD8 - cytotoxic T - recognize antigens on the surface of cells infected w/ viruses or intracellular bacteria and kill those cells
    ▪ Do everything via cell to cell contact - cell mediated immunity
  ○ Effector phase - pathogen is neutralized or otherwise eliminated
    ▪ Helper T cells produce cytokines to act on other cells
    ▪ Lymphokines secreted by one WBC to act on another
      □ Interleukins act on other WBCs
    ▪ B cells --> plasma cells --> secrete antibodies; humoral immunity
  ○ Active Immunization: organism's own immune cells and antibodies mediate response
  ○ Passive immunization: administration of immune cells or antibodies from another individual

• Immunological Memory
  ○ Generation of memory T cells and B cells during activation phase
  ○ Subsequent encounter w/ pathogen, memory cells make a faster, more vigorous, qualitatively different/better response
  ○ Basis of vaccination

• Most of the time, active immune response desired w/ notable exceptions
  ○ Transplantation
  ○ Allergy
  ○ Autoimmune disease

• Characteristics of Immune Response
  ○ Specificity of recognition
  ○ Diversity of recognition
  ○ Memory/secondary responses
  ○ Tolerance