Lymphocyte Development and Antigen Receptor Gene Rearrangement   Chapter 8

I. Overview of Lymphocyte Development
   A. Steps
      1. source
      2. commitment
      3. proliferation
      4. rearrangement
      5. selection
         a. pre-receptor checkpoint a
         b. second proliferation
         c. pre-receptor checkpoint b
         d. positive
         e. negative
      6. subpopulation differentiation

II. DNA Organization
      a. segments
         1) V = variable
         2) D = diversity
         3) J = joining
         4) C = constant
      1. Organization of the Ig heavy gene loci
         a. V segments
         b. D segments
         c. J segments
         d. C segments
      2. Organization of the Ig kappa light gene loci
         a. V segments
         b. J segments
         c. C segment
      3. Organization of the Ig lambda light gene loci
         a. V segments
         b. J segments
         c. C segments
      4. Organization of TCR β gene loci
         a. V segments
         b. D segments
         c. J segments
         d. C segments
      5. Organization of TCR α gene loci

III. V(D)J Recombination
    1. overview
  A. Combinatorial diversity
    1. synapsis
      a. Rag
      b. recombination signal sequences (RSSs)
        1) structure
          a) heptamer
          b) spacer
          c) nonamer
      c. V(D)J recombinase
    2. cleavage
      a. circular deletion
  B. Junctional diversity
    1. hairpin opening & end-processing
        1) DNA-PK
    2. Artemis
    3. DNA polymerase
      a. P nucleotides
    4. TdT
      a. N nucleotides
    5. DNA ligase
  C. Summary

IV. B Lymphocyte Development
    1. pro-B cell
        a) allelic exclusion
    2. pre-B cell
    3. immature B cell
      a. negative selection
        1) receptor editing
      b. positive selection
    4. mature B cells

V. T Lymphocyte Development
    1. thymocytes
  A. Stages of T cell maturation
    1. stem cell
    2. double-negative thymocytes
    3. pre-T cell
    4. double-positive thymocytes
      a. positive selection
      b. single-positive thymocytes
      c. negative selection
        1) AIRE
  B. Enter and exit