T cells:

Development

- Hemopoietic in Bone marrow, Notch-1 and Gata-4 → T progenitor, Thymosin and thymic factors attract to thymus
- DN thymocyte, Thymosin activates Rag1/2, VDJ recombination of B chain, DJ → VDJ, combinational + junctional diversity
- VDJ: 12/24 rule, recognized by RAG, Stem loops, Artamus, DNA Ligase, TdT adds junctional diversity
- Pre-TCR → Stops B, Starts A, Starts CD4/8, Beta selection
- Negative Positive selection of DP, AIRE, negative selection of SP, alpha selection after TCRa VJ recombinase,
- SP by MHC-I (CD8) or MHC-II (CD4), differences in MHC-1/2: Sources, locations, loading procedure

Activation

- Homing to Lymph nodes or spleen, Secondary lymph organs, Exogenous antigen dependent maturation
- Mature Naive in paracortical zone of lymph node
- 1) APC with MHC-exogenous peptide 2) B7-1/2 to CD28, CD40 to CD40L 3) Cytokines for Th1 ,2 ,17
- Differential:
    - Th1 → IFN-Y, IL-12, TBET
    - Th2 → IL-4, GATA-3
    - Th17 → IL-6, IL-23, ROR-yt
    - Tfh → IL-21, IL-6, Bcl6
- Leads to clonal expansion of activated T, controlled by CTLA-4 competitively binding B7
- Activates E/P selectin, LFA-1 (Integrin) , homing to site of infection
- Spingosine-1-P

Function:

- Th1: M1 Phage activation, IFN-Y → Activation of macrophages, intracellular pathogens
- Th2: IL-4,5,13 → M2 Phage activation, IL4 → IgE class switching, mass cell and eosinophile activation
- Th17: IL-17, 21 → Neutrophile activation, extracellular bacteria and fungi
- Tfh: IL-10, 21, 4 → long term humoral immunity
- CTL: Perforin, granzymes, Fas → Kill abnormal cells, do not need costimulators