**Immunology**

**Study Guide for Exam 2**

* Review all Powerpoints
* Review all chapters, review questions at the end of chapters
* Regarding antibodies, are heavy and light chain genes on the same chromosome? VJ segment on light chain codes for variable region (rearranges second), VDJ on heavy chain codes for variable region (rearranges first);
* Review B cell development, at what stages do you find gene rearrangement? Expression of IgM? Expression of IgD? Class switching? What are thymus dependent antigens? Thymus independent antigens? What is the antigen independent phase? Antigen dependent phase?
* What is allelic exclusion?
* What are the 7 ways antibody diversity is generated?
* What is the order of antibody constant gene segments?
* Review the complement system:
  + What are the 4 major functions?
  + what are the classical, alternative, and lectin pathways?
    - How do they differ as far as what activates them?
    - What portion of the pathways are similar?
    - What organisms are susceptible to the MAC? What is the goal of the MAC?
    - Can single pentameric IgM activate C1 of classical pathway?
* MHC
  + What is haplotype?
  + Which MHC reacts with what population of T cells?
  + On what cells do you find Class I MHC? Class II MHC?
  + Antigen presentation – review both the cystolic and endocytic pathways
    - Which pathway occurs in infected cells?
  + Review structure of MHC I and MHC II
  + Review MHC restriction, powerpoint slide 22 in chapter 8
* T cells – what does it mean to be double negative? Double positive? Is CD4 found on Tc or TH cells? Is CD8 found on Tc or TH cells? What is the function of a cytotoxic T cell? T helper cell?
* T cell receptors
  + Review gene rearrangement
    - Is there somatic hypermutation like there is with antibody gene rearrangement?
  + Review positive and negative selection in the thymus
* What is IL-2? (powerpoint slide 21 in chapter 10)
* What are 3 events that happen to B cells in germinal centers in secondary lymphoid tissue?
* Be able to distinguish between antibody, TCR, Class I MHC, Class II MHC structures
* In his classic chimeric mouse experiments, Zinkernagel took bone marrow from mouse 1 and a thymus from mouse 2 and transplanted them in mouse 3, which had been thymectomized and lethally irradiated (no T cells, now will be producing T cells from mouse 1, those T cells will mature in thymus and be exposed to self-antigens from mouse 2). He them challenged the reconstituted mouse with LCM virus and removed spleen cells. These spleen cells were incubated with LCMV-infected target cells (cells expressing MHC plus antigenic components of the virus) of different MHC haplotypes, and the lysis of the target cells was monitored. The results of 2 such experiments using H-2b strain C57BL/6 mice and H-2dstrain BALB/c mice are shown in the table. Remember that the TCR has to recognize the MHC-antigen complex. Be able to explain why certain cell types are lysed or not lysed.

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| **Experiment** | **Bone marrow donor** | **Thymectomized x-irradiated recipient** | **Lysis of LCM-infected target cells** |
| **H-2d H-2k H-2b** |
| A | C57BL/6 (H-2?) x BALB/c (H-2?) | C57BL/6 x BALB/c(H-2bxd) | + - - |
| B | C57BL/6(H-2?) x BALB/c(H-2?) | C57BL/6 x BALB/c(H-2bxd) | - - + |