

Immunology Exam 3
October 30, 2009
50 points

To remain as unbiased as possible when grading exams, I ask that you place your name and a neutral identifier on the half sheet of paper. Write the same identifier, **BUT NOT YOUR NAME**, on the line below. When you turn in the exam, you will place the name/identifier in an envelope which I will use only after grading to record your score.

Identifier Key

Section 1

Answer all the questions in Section 1. Use complete sentences, taking care to answer concisely. Pay attention to the detail that is asked for in each question. Use the space given on the exam for answers in section 1.

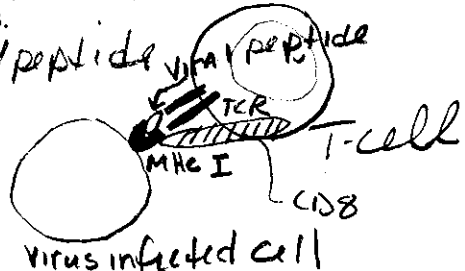
1. (6 points)

A. What type of antigen does MHC class I present to T-cells? Give an example.

MHC I presents cytosolic antigen to T-cells. Most viruses enter & remain in host cell cytoplasm during their life cycle. Viral ^{peptide} antigen would come from the cytoplasm.

B. What kind of T-cells bind to MHC class I/peptide antigen? Sketch the interaction showing important cells/molecules.

CD8+ T-cells bind to MHC I/peptide



C. What kind of T-cell effector mechanism is induced following this binding?

This type of interaction would induce the T-cell to release toxic chemicals to kill the virus infected cell. It would become a CTL.

2. (6 points) With regard to antigen processing and presentation, what is a chaperone? Give an example, describing the specific role of a chaperone?

A chaperone is a protein that controls the folding, location, or activity of another protein by binding directly to it. An example of a chaperone involved in antigen processing would be calnexin which holds MHC I in a partially folded form until β_2m joins it.

3. (6 points) Briefly, what are the roles of the invariant chain protein and of HLA-DM in antigen processing and presentation?

Invariant chain
 binds to MHC class II to do 2 things. 1) Invariant chain directs MHC II to vesicles where it will meet up with antigen. 2) A portion of Ii called CLIP binds the peptide-binding groove of MHC II, to prevent peptides binding in the ER. HLA-DM helps to remove CLIP and load peptides from vesicular pathogens into MHC II. HLA-DM can remove unstably bound peptides & replace with more stably binding peptides in a process called peptide editing.

4. (8 points) The MHC genes show the highest degree of polymorphism of any mammalian gene.

- a. (3) Explain what this means, specifically.

Polymorphism refers to the large # of different alleles for MHC in the population.

- b. (3) What is the advantage for any given individual of having polymorphism in these genes?

The high degree of polymorphism in the population increases the potential for an individual to present a large number of peptides from a large # of pathogens. This gives an advantage of dealing effectively with a large # of pathogens.

- c. (2) Are there any drawbacks to having such a high degree of polymorphism?

↓
 The only drawback occurs when someone requires a tissue transplant. The high degree of polymorphism leads to mismatched MHC among most people who would be donors & recipients of tissue. MHC must be closely matched to reduce Allo-reactive T-cells & tissue rejection. (via Adaptive immune response.)