Welcome to the FIT Board Review Corner, prepared by Timothy Chow, MD, and Christopher Foster, MD, senior and junior representatives of the College's Fellows-In-Training (FITs) to the Board of Regents. The FIT Board Review Corner is an opportunity to help hone your Board preparedness.

Review Questions
Allergy and Immunology Review Corner: Janeway's Immunobiology, 9th edition
Chapter 6: Antigen Presentation to T Cells
Prepared by: Melissa Gans, MD

1. What is it called when dendritic cells capture exogenous antigens and load the peptides onto MHC class I to activate CD8 cells?
    a. Cross-presentation
    b. Apoptosis
    c. Ubiquitination
    d. Rearrangement

2. How are MHC class II molecules loaded with peptides?
    a. Antigen capture by B-cell receptor
    b. Cytoplasmic proteins are delivered into endocytic system for degradation in lysosomes by autophagy
    c. Macrophages take up particulate material by phagocytosis
    d. All of the above

3. What is NOT a cause of MHC class I deficiency?
    a. TAP 1
    b. TAP 2
    c. Tapasin
    d. Calnexin

4. What is the defect in MHC class II deficiency?
    a. Class II ubiquinator
    b. Class II transactivator
    c. Class II transcriptsome
    d. Class II synthetase

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5. What contributes to the heterogeneity of MHC?
    a. Silent mutations are more common than replacement substitutions.
    b. MHC molecules are not codominant.
    c. Evolutionary pressures do not select for MHC polymorphisms at individual MHC genes.
    d. Products of individual MHC alleles (isoforms) can differ from one another by up to 20 amino acids, making each variant protein quite distinct.

6. What is a mixed lymphocyte reaction?
    a. Used to see B cell responses to allogenic MHC molecules.
    b. T cells from one individual are mixed with lymphocytes from a second individual.
    c. T cells will stop proliferating if the individual T cells recognize the other individual's MHC molecules as foreign.
    d. Shows that generally 90% of T cells from an individual will respond to stimulation by cells from another unrelated member of the same species.

7. Which of the following is a *Streptococcus pyogenes* superantigen?
    a. SEB
    b. SEC2
    c. SPE-C
    d. TSST

8. What is a transcription factor that is very important for dendritic cell development and for cross-presentation?
    a. BATF3
    b. CXCR1
    c. CIITA
    d. MARCH-1

9. What is the mechanism of superantigens?
    a. Primes an adaptive immune response specific for the pathogen
    b. Massive production of cytokines by CD4 cells
    c. Massive production of cytokines by CD8 cells
    d. Massive production of cytokines by B cells

10. Which of the following correctly lists the HLA molecules?
    a. A, B, C for MHC Class I; DP, DM, DN, DQ, DR for MHC Class II
    b. A, B, C for MHC Class II; DP, DM, DN, DQ, DR for MHC Class I
    c. A, B, C for MHC Class I; DP, DM, DO, DQ, DR for MHC Class II
    d. A, B, C for MHC Class II; DP, DM, DO, DQ, DR for MHC Class I

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Answers:

1. **A**. Page 215-216. The exogenous pathway of loading MHC class I molecules is called cross-presentation.

2. **D.** Page 216. All of these are mechanisms for loading peptides onto MHC class II molecules.

3. **A.** Page 219-221. MHC class I deficiency is when there are few MHC class I molecules on the cell surface. TAP1 and TAP2 are important for peptide transporters in the endoplasmic reticulum membrane. Tapasin is a component of the complex in TAP. Calnexin is what MHC class I molecules bind to in the endoplasmic reticulum.

4. **B.** Page 233. CIITA is a positive transcriptional co-activator of MHC class II genes. Another cause of MHC class II deficiency is deficiency of the RFX complex (RFXANK, RFXAP, RFX5) which binds to the promoter of the MHC class II genes.

5. **D**. Page 234-235. Replacement substitutions are more common than silent mutations. MHC molecules are codominant and alleles are expressed equally in the cell. Evolutionary pressures do select for MHC polymorphisms at individual MHC genes.

6. **B.** Page 239. Used to see T cell responses to allogenic MHC molecules. T cells will continue proliferating if the individual T cells recognize the other individual's MHC molecules as foreign. Shows that generally 1-10% of T cells from an individual will respond to stimulation by cells from another unrelated member of the same species.

7. **C.** Page 241. SPE-C is the *Streptococcus pyogenes* toxic shock syndrome superantigen. The *Staphylococcus aureus* superantigens are SEB (food poisoning), SEC2 (food poisoning), and TSST (toxic shock syndrome).

8. **B.** p. 222, 233. CXCR1 is a chemokine receptor that is uniquely expressed by the dendritic cell subset that acts in cross-presentation. CIITA (MHC class II transactivator) is a positive transcriptional co-activator of MHC class II genes. MARCH-1 is a gene that leads to degradation of MHC molecules (activation of dendritic cells will reduce MARCH-1 expression to increase the lifetime of MHC molecules).

9. **B.** p. 241. Superantigens do not prime an adaptive immune response specific for the pathogen.

10. **C.** p. 228.

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