

Exercise for Lecture 3

BIO-479: Immunology

25-09-25

Some key concepts of Lecture 3

- **Principle of antigen recognition**
- **Antigen-presenting cells (APCs)**
- **Major Histocompatibility Complex (MHC)**
- **Class I vs Class II MHC**
- **MHC structure and peptide binding**
- **The immunoproteasome**
- **Immunodominance**
- **Antigen Processing Pathways**

Q1: The odds of a naïve T cell encountering its cognate antigen are approximately 1 in 10^6 . What ensures that antigen and T cell “find each other”?

- A. Naïve T cells express multiple TCRs recognizing different antigens
- B. Antigens are directly drained into the bloodstream and reach T cells in the spleen
- C. APCs capture antigens at the site of infection and transport them to lymphoid organs
- D. T cells secrete chemokines to attract antigens
- E. Antigens freely diffuse into lymph nodes and bind to T cells

Mechanism of antigen encounter

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Q2: Which professional APC is considered most effective at activating naïve T cells?

- A. B cells
- B. Macrophages
- C. Dendritic cells
- D. Epithelial cells
- E. All nucleated cells

APC types

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Q3: MHC restriction means...

- A. A T cell recognizes any antigen bound to any MHC molecule
 - B. A T cell must recognize both the antigen peptide and the presenting self-MHC molecule
 - C. MHC molecules only bind self-peptides
 - D. MHC molecules are only expressed on APCs
 - E. A T cell receptor is unrestricted and cross-reactive
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Specificity depends on peptide *and* self-MHC

Q4: Which statement correctly distinguishes MHC class I from class II?

- A. MHC I presents exogenous antigens; MHC II presents endogenous
- B. MHC I is expressed only on APCs; MHC II on all nucleated cells
- C. MHC I presents cytosolic antigens to CD8⁺ T cells; MHC II presents endosomal antigens to CD4⁺ T cells
- D. Both MHC I and II are induced by type I interferons
- E. MHC II molecules contain β 2-microglobulin

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Q5: Which feature is TRUE for peptide binding to MHC molecules?

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Q6. Which statement about antigen processing is correct?

- A. Proteasomes degrade extracellular proteins for MHC II loading
- B. TAP transports peptides from cytosol into ER for MHC I loading
- C. The invariant chain directs peptides into MHC I binding groove
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Q7. During MHC II antigen loading, what is the function of the invariant chain (Ii)?

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Q8. Cross-presentation is important because...

- A. It allows B cells to present lipids on CD1
- B. It allows dendritic cells to present exogenous antigens on MHC I to CD8⁺ T cells
- C. It ensures macrophages can activate NK cells
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Q9. Which population recognizes non-protein antigens without MHC restriction?

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- B. CD4⁺ αβ T cells
- C. NKT cells
- D. γδ T cells
- E. B cells

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