

Allergy and Immunology Review Corner: Chapter 1 of *Immunology IV: Clinical Applications in Health and Disease*, by Joseph A. Bellanti.

Chapter 1: Overview of Immunology

Prepared by David Scott, MD, Scripps Clinic/Scripps Green Hospital Program, and Meagan Shepherd, MD, Ohio State University

1. In pregnancy, estrogen (E₂)-induced immunomodulation involves dual effects on antigen-presenting cells and CD4⁺CD25⁺ Treg cells, but does not have a direct effect on effector T cells. Thus, the maintenance of the fetus during normal pregnancy appears to be modulated by which of the following effects of estrogens on the immune response?
 - A. B-cell regulatory
 - B. Innate attenuating
 - C. CD8 cell regulatory
 - D. T reg-enhancing

2. Occasionally a viral infection or a tumor may evade the deleterious effects of CD8 killing by deleting the MHC-I antigen. In this case, the immune system may compensate by use of killing of the target cells by which of the following?
 - A. Neutrophils
 - B. Complement
 - C. Natural Killer Cells
 - D. Macrophages

3. Each individual antigen is composed of _____, the structure of which determines an antigen's ability to bind to antibody or T or B-cell receptors.
 - A. Haptens
 - B. Epitopes
 - C. Proteins
 - D. PAMPS

4. A _____ is the term used by immunologists to refer to any substance that has the capacity to induce an immune response, whereas the term _____ is used to refer to a substances that reacts with specific products of B cells (i.e., antibodies) or receptors on the surface of T cells and B cells (i.e., T cell receptor [TCR] and B cell receptor [BCR]).
 - A. Epitope, hapten
 - B. Immunogen, antigen
 - C. Tolerogen, antigen
 - D. Hapten, epitope

5. A substance incapable of evoking an immune response is called what?
 - A. Tolerogen

- B. Allergen
- C. Happen
- D. Immunogen

6. Which of the following Toll-like receptors (TLR) recognizes lipopolysaccharide?

- A. TLR3
- B. TLR4
- C. TLR5
- D. TLR7

7. Which of following transcription factors is found in Treg CD4⁺CD25⁺ cells?

- A. FOXP3
- B. GATA3
- C. STAT3
- D. NFAT

8. Which of the following high-affinity receptors is located on the cell membrane of mast cells and basophils?

- A. FcεRI
- B. FcεRII
- C. FcγRI
- D. FcγRII

9. On which cells are class-2 MHC (Major Histocompatibility Complex) molecules found?

- A. All nucleated cells
- B. Neutrophils
- C. Red blood cells
- D. Professional antigen-presenting cells

10. What is another name for FCγRI, the high-affinity receptor for the IgG Fc?

- A. CD16
- B. CD32
- C. CD64
- D. CD128

Answers

1. D, page 36-37

Table 1-17 shows examples of clinical conditions or diseases involving the neuroendocrine-immune network. “In pregnancy, estrogen (E2)-induced immunomodulation involves dual effects on antigen-presenting cells and CD4⁺CD25⁺ Treg cells, but does not have a direct effect on effector T cells. Thus, the maintenance of the fetus during normal pregnancy appears to be modulated by the Treg-enhancing effects of estrogens on the immune response.”

2. C, page 33

Occasionally a viral infection or a tumor may evade the deleterious effects of CD8 killing by deleting the MHC-I antigen (Chapters 13 and 20). In this case, the immune system may compensate by use of killing of the target cells by NK killing.

3. B, page 11

“Antigens are composed of epitopes (i.e., antigenic determinants), which are the small regions of the immunogen that are the sites recognized by antibodies or by TCR and BCR.”

4. B, page 11

“Those substances that share the characteristic of being recognized as foreign and have the capacity to evoke the immune responses of adaptive immunity are referred to as immunogens or antigens. Although these terms are commonly used interchangeably, some immunologists restrict the use of the word “immunogen” to those substances that have the capacity to induce the immune response; the term “antigen” to those substances that react with the specific products of B cells (i.e., antibodies) or receptors on the surface of T cells and B cells (i.e., T cell receptor [TCR] and B cell receptor [BCR]).”

5. A, page 11, Table 1-4

“In specific circumstances (e.g., antigen interaction with immature B or T cells), the encounter with a foreign substance may lead to an inability of the immune system to respond to that specific substance, a state that is called immune tolerance; such configurations are referred to as tolerogens and have the capacity to “silence” the critical cells involved in the induction of the immune response.

6. B, page 14

An example of one of the important PAMPs (pathogen-associated molecular patterns) is the lipopolysaccharide of gram-negative bacteria that is recognized by the TLR4 member of the Toll-like receptor family.

7. A, page 22

“A third category of T cells, Treg cells, with the phenotype CD4+CD25+, express the signature transcription factor FOXP3 and usually secrete IL-10 and transforming growth factor beta (TGF- β).”

8. A, page 31

“Certain classes of immunoglobulins, e.g., IgE, can attach to mediator cells by virtue of their Fc fragments. This occurs by binding to a special high-affinity IgE Fc receptor (Fc ϵ RI) on the cell membrane of a mast cell or basophil.”

9. D, page 21, Table 1-10

MHC-II molecules are located on professional antigen-presenting cells: dendritic cells, macrophages, B cells

.

10. C, page 25, Table 1-13

CD64 is FC γ RI, CD32 is FC γ RII, and CD16 FC γ RIII.

Allergy and Immunology Review Corner: Chapter 2 of *Immunology IV: Clinical Applications in Health and Disease*, by Joseph A. Bellanti.

Chapter 2: Developmental Immunology: The Changing Immune System and its Clinical Applications

Prepared by Paul Keiser, MD, Walter Reed National Military Medical Center, and Wayne Wolverton, MD, Walter Reed National Military Medical Center

1. In nonallergic children, which of the following immunoglobulins attains adult levels by one year of age?
 - A. IgA
 - B. IgE
 - C. IgG
 - D. IgM
2. Which of these surface markers are characteristically expressed by Treg cells?
 - A. CD4+ CD8+
 - B. CD3+ CD4+ CD25+
 - C. CD3+ CD4- CD8-
 - D. CD3+ CD4+ CD25-
3. Activation of KIT on pro B cells in the bone marrow occurs upon binding which stromal cell molecule?
 - A. IL-7
 - B. CD34
 - C. VCAM-1
 - D. Stem-cell factor
4. The presence of which of the following microscopic features distinguishes a stimulated (active) lymph node from a resting (inactive) lymph node?
 - A. Mantle zones
 - B. A subcapsular sinus
 - C. A single efferent lymphatic vessel
 - D. Medullary cords
5. Which of the following immunoglobulins are present in the blood of newborn infants?
 - A. IgA
 - B. IgE
 - C. IgG
 - D. IgM
6. You suspect an immune deficiency in a patient with congenital heart disease, hypocalcemia and high arched palate. What is the diagnostic test of choice for this

patient?

- A. FISH (fluorescent in situ hybridization)
- B. DNA microarray
- C. Gene sequencing
- D. G banding

7. Common lymphoid progenitor cells and common myeloid progenitor cells are derived from hematopoietic stem cells (HSC's) which express what CD marker?

- A. CD31
- B. CD28
- C. CD34
- D. CD80

8. T cell receptors (TCR) and B cell receptors (BCR) are characterized by vast diversity generated through somatic recombination which is facilitated by which genes?

- A. TAP1/TAP2
- B. RAG1/RAG2
- C. AIRE (autoimmune regulator)
- D. AICD (activation-induced cytidine deaminase)

9. The expression of what class of membrane BCR defines an "immature" B cell?

- A. IgM
- B. IgG
- C. IgE
- D. IgD

10. In regard to the spleen, the periarteriolar lymphoid sheath (PALS) is located around the arterioles and composed of primarily what type of cells?

- A. Neutrophils
- B. Dendritic cells
- C. Lymphocytes
- D. Macrophages

Answers

1. D, page 68

"There appears to be a sequential development in gamma globulin at differing rates. The IgM immunoglobulins attain adult levels by one year of age, the IgG immunoglobulins by five or six years of age, and the IgA globulins by ten years of age. In the normal nonallergic infant, IgE immunoglobulins develop slowly over the first ten years of age."

2. B, page 52

"The CD3+ CD4+ CD8+ DP population further differentiates into three (1) a CD3+ CD4- CD8+ single positive (SP) T cell that migrates to the peripheral tissues as a CD8+ T cytotoxic (Tc) population; (2) a CD3+, CD4+, CD25+ SP T cell that migrates to the peripheral tissues as a T regulatory (Treg) population; and (3) a CD3+, CD4+, CD8- SP T cell that migrates to the peripheral tissues as a CD4+ T helper (Th) population."

3. D, page 54

“Contact with bone marrow stromal cells is necessary to supply the correct environmental signals for the pro-B cell to further differentiate. B cells initially need direct contact with stromal cells (VLA-4 on pro-B cells and VCAM-1 on stromal cells). After initial contact, a receptor on pro-B cells encoded by c-Kit, called KIT interacts with a stromal cell molecule called stem cell factor; c-Kit is then activated, causing the B cell to divide and to express receptors for IL-7.

4. A, page 57

“T B cells in the cortex are organized into loose collections of cells referred to as primary follicles when the lymph node is inactive). Following antigen stimulation, these give rise to secondary follicles, which consist of a germinal center composed of dividing cells (centrocytes and centroblasts) and a mantle zone comprised of small lymphocytes.”

5. C, page 65

“The amount and type of antibody in the blood of the newborn infant at birth are equivalent to those of the mother and are made up almost exclusively of the IgG immunoglobulins. There are virtually no IgA, IgM, or IgE immunoglobulins present in the cord sera of healthy newborn infants.”

6. A, page 42, Box 2-1

“The CH22qD syndrome is now diagnosed by fluorescence in situ hybridization (FISH) using DNA probes from the Digeorge chromosomal region (DGCR).”

7. C, page 49

“Both cell types destined for hematopoiesis or lymphopoiesis appear to arise from a common population of pluripotent CD34+ hematopoietic stem cells (HSCs) of the bone marrow.”

8. B, page 51

“These receptors are generated in each developing lymphocyte through a process called somatic recombination, in which enzymes encoded by recombination-activating genes (RAGs) splice gene segments to generate unique variable (antigen-binding) regions of the BCR (immunoglobulin) and TCR molecules.”

9. A, page 54

“Somatic recombination of gene segments encoding the heavy chain variable region commit the progenitor cell to the B cell lineage and it becomes a pre-B cell; expression of membrane IgM (sIgM) defines the immature B cell. “ See also page 64: “B cells are generated in the bone marrow and exit from it as immature (IgM+IgD-) B cells.”

10. C, pages 58-59

“Lymphocytes surrounding the follicles and periarteriolar sheaths of the white pulp are referred to as the periarteriolar lymphoid sheaths (PALS) and consist of both T and B lymphocytes.”