Welcome to the FIT Board Review Corner, prepared by Miriam Samstein, MD, PhD, and Timothy Chow, 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:** Middleton’s Allergy Principles and Practice, 8th Edition
N. Franklin Adkinson Jr., MD, Bruce S Bochner, MD, A Wesley Burks, MD, William W Busse, MD, Stephen T Holgate, MD, DSc, FMedSci, Robert F Lemanske, Jr., MD and Robyn E O’Hehir, FRACP, PhD, FRCPath

**Chapter 25:** Resolution of Allergic Inflammation
Prepared by: Ohn Chow, MD

1. Which of the following is NOT a feature of apoptosis?
   a. Extrusion of naked DNA into the extracellular environment
   b. Extrusion of vesicles containing cellular components
   c. Preservation of an intact cell membrane
   d. Fragmentation of DNA (karyorrhexis)

2. Which cell type is thought to be primarily responsible for clearance of apoptotic cells?
   a. Neutrophils
   b. Macrophages
   c. Eosinophils
   d. Mast cells

3. Which of the following is NOT felt to be a feature of corticosteroids that contributes to their efficacy in resolution of allergic inflammation?
   a. Inducing eosinophil apoptosis
   b. Increased macrophage clearance of apoptotic cells
   c. Increased production of interleukin-10
   d. Increased production of TNF alpha

4. Mutations in which gene are found in the greatest percentage of patients with systemic mastocytosis?
   a. **ASXL1**
   b. **CBL**
   c. **c-KIT**
   d. **DNMT3A**

5. Which of the following lipid mediators is NOT considered to be anti-inflammatory?
   a. Lipoxin A4
   b. Leukotriene B4
   c. Resolvin E1
   d. Protectin D1

6. Which of the following is a NOT a potential adverse effect of corticosteroids?
   a. Cataracts
   b. Increased glucose tolerance
   c. Osteoporosis
   d. Avascular necrosis of the femoral head
7. What type of receptor is the glucocorticoid receptor?
   a. G-protein coupled receptor
   b. Receptor tyrosine kinase
   c. Ligand-gated ion channel
   d. Nuclear receptor

8. During apoptosis, which of the following directly results in release of cytochrome c into the cytoplasm?
   a. Increased mitochondrial membrane permeability
   b. Increased nuclear membrane permeability
   c. Increased plasma membrane permeability
   d. Increased lysosomal membrane permeability

9. Which of the following cytokines increases eosinophil apoptosis?
   a. Interleukin-3
   b. Interleukin-4
   c. Interleukin-5
   d. Interleukin-13

10. Activation of which of the following receptors leads to eosinophil apoptosis?
    a. Interleukin-5 receptor
    b. FAS ligand receptor
    c. TRAIL
    d. GM-CSF receptor

Answers:

1. **A.** Extrusion of naked DNA into the extracellular environment is a feature of “ETosis”, a form of cell death distinct from apoptosis which leads to the generation of extracellular traps. Apoptosis characterized by preservation of the cell membrane, and cellular components and fragmented DNA is packaged into extruded vesicles called apoptotic bodies.

2. **B.** Macrophages are the primary cells responsible for engulfment of apoptotic cells and apoptotic bodies.

3. **D.** Corticosteroids increase eosinophil apoptosis, clearance of apoptotic cells, and interleukin-10 production. Corticosteroids downregulate TNF-alpha, which likely contributes in part to their efficacy in a number of inflammatory conditions.

4. **C.** Although mutations in all of the genes listed above have been reported in patient with systemic mastocytosis, c-KIT mutations are by far the most common, specifically the D816V mutation.

5. **B.** Leukotriene B4. The remaining lipid mediators are considered to be anti-inflammatory and play a role in resolution of allergic inflammation.

6. **B.** Corticosteroids commonly lead to impaired glucose tolerance. The remaining adverse effects can be seen with corticosteroid use.
7. **D.** The glucocorticoid receptor is a nuclear receptor.

8. **A.** Cytochrome c is contained in the mitochondria. Certain pro-apoptotic proteins, such as BAX, can translocate into the mitochondria when activated, leading to increased mitochondrial membrane permeability and subsequent cytochrome c release.

9. **B.** Interleukin-4 notably increases eosinophil apoptosis, in contrast to most other Th2 cytokines.

10. **B.** Activation of the remaining receptors promotes eosinophil survival.