

MCQs on Phagocytic and Granulocytic Cells – Medical Immunology

Neutrophils

1. Which of the following best describes the primary function of neutrophils in innate immunity?

- A) Production of antibodies
- B) Antigen presentation to CD8+ T cells
- C) Phagocytosis and killing of extracellular bacteria
- D) Destruction of virus-infected cells
- E) Histamine release during allergy

2. Neutrophil extracellular traps (NETs) are composed mainly of:

- A) Cytokines and histamine
- B) Microtubules and actin filaments
- C) Chromatin and antimicrobial proteins
- D) Immunoglobulin complexes
- E) Complement fragments

3. The first step in neutrophil recruitment to an inflamed tissue involves:

- A) Diapedesis
- B) Chemotaxis
- C) Rolling along the endothelium via selectins
- D) Firm adhesion through integrins
- E) Phagocytosis of microbes

4. A deficiency of NADPH oxidase in neutrophils leads to which condition?

- A) Chediak-Higashi syndrome
- B) Chronic granulomatous disease
- C) Job's syndrome (Hyper-IgE)
- D) Leukocyte adhesion deficiency
- E) Severe combined immunodeficiency

5. Neutrophil granules that contain lysozyme, myeloperoxidase, and defensins are called:

- A) Specific granules
- B) Azurophilic granules
- C) Secretory vesicles
- D) Lysosomes
- E) Lipid bodies

Macrophages

1. The main precursor of tissue macrophages in the blood is the:

- A) Monocyte
- B) Neutrophil
- C) Basophil
- D) Lymphocyte
- E) Megakaryocyte

2. Which macrophage phenotype is primarily associated with inflammation and microbicidal activity?

- A) M2 macrophages
- B) M1 macrophages
- C) Kupffer cells
- D) Alveolar macrophages
- E) Splenic macrophages

3. Which of the following molecules produced by macrophages promotes fever and acute phase responses?

- A) IL-10
- B) IL-1 β and TNF- α
- C) IL-4 and IL-13
- D) TGF- β
- E) IL-2

4. The role of macrophages in adaptive immunity includes:

- A) Producing immunoglobulins
- B) Activating complement

- C) Presenting antigens to T cells via MHC class II
- D) Destroying virally infected cells via perforin
- E) Inducing antibody class switching

5. The macrophage surface receptor most responsible for recognizing opsonized particles via IgG is:

- A) Complement receptor 1 (CR1)
- B) Fcγ receptor
- C) Toll-like receptor 4
- D) Mannose receptor
- E) Scavenger receptor

Monocytes

1. Compared with neutrophils, monocytes:

- A) Are shorter-lived and more abundant in blood
- B) Circulate longer and can differentiate into macrophages or dendritic cells
- C) Are major producers of histamine
- D) Do not phagocytose pathogens
- E) Are terminally differentiated

2. Which of the following best describes a distinguishing feature of monocytes under light microscopy?

- A) Multi-lobed nucleus
- B) Presence of basophilic granules
- C) Kidney-shaped nucleus and grayish cytoplasm
- D) Bilobed nucleus
- E) Abundant eosinophilic granules

3. Which cytokine primarily promotes monocyte differentiation into macrophages?

- A) IL-2
- B) IL-4
- C) M-CSF (Macrophage colony-stimulating factor)
- D) GM-CSF

E) IL-17

Basophils

1. The granules of basophils contain which key mediator that contributes to allergic reactions?

A) Myeloperoxidase

B) Defensins

C) Histamine

D) Lysozyme

E) Perforin

2. Basophil activation is mainly mediated through which immunoglobulin class bound to Fc receptors?

A) IgG

B) IgA

C) IgE

D) IgM

E) IgD

Eosinophils

1. Eosinophils play a major role in defense against which type of pathogens?

A) Viruses

B) Intracellular bacteria

C) Parasitic helminths

D) Fungi

E) Gram-negative bacilli

2. Which cytokine is most important for eosinophil differentiation and activation?

A) IL-1

B) IL-6

C) IL-10

D) IL-5

E) TNF- α

Mast Cells

1. Which of the following best describes the primary role of mast cells in immunity?

- A) Phagocytosis of extracellular bacteria
- B) Antigen presentation to T cells
- C) Initiation of immediate hypersensitivity reactions through degranulation
- D) Activation of complement via the classical pathway
- E) Cytotoxicity against virally infected cells

2. Mast cell degranulation occurs most commonly after:

- A) Direct contact with bacterial endotoxin
- B) Cross-linking of IgE bound to FcεRI receptors by antigen
- C) Exposure to IL-10
- D) Activation by complement fragment C3b
- E) Binding of IgG immune complexes

3. Which of the following mediators released from mast cells contributes most to the late phase of allergic inflammation?

- A) Histamine
- B) Leukotrienes and prostaglandins
- C) Serotonin
- D) Heparin
- E) Myeloperoxidase

Answers and Explanations

Neutrophils

1. Answer: C

Explanation: Neutrophils are primary phagocytes that ingest and destroy extracellular bacteria using enzymes and reactive oxygen species.

2. Answer: C

Explanation: NETs consist of decondensed chromatin coated with antimicrobial proteins that trap and kill microbes extracellularly.

3. Answer: C

Explanation: Neutrophil rolling is mediated by selectins and represents the initial weak adhesion to endothelium.

4. Answer: B

Explanation: NADPH oxidase deficiency impairs respiratory burst, leading to chronic granulomatous disease with recurrent infections.

5. Answer: B

Explanation: Azurophilic (primary) granules contain potent enzymes such as myeloperoxidase and defensins for microbial killing.

Macrophages

1. Answer: A

Explanation: Blood monocytes migrate into tissues and differentiate into macrophages that serve immune and homeostatic roles.

2. Answer: B

Explanation: M1 macrophages are classically activated and produce pro-inflammatory cytokines and nitric oxide.

3. Answer: B

Explanation: IL-1 β and TNF- α are pyrogenic cytokines that induce fever and stimulate hepatic acute-phase protein synthesis.

4. Answer: C

Explanation: Macrophages process and present peptides on MHC class II to CD4+ helper T cells.

5. Answer: B

Explanation: Fc γ receptors bind to the Fc region of IgG, facilitating phagocytosis of opsonized microbes.

Monocytes

1. Answer: B

Explanation: Monocytes have a longer lifespan and can differentiate into macrophages or dendritic cells in tissues.

2. Answer: C

Explanation: Monocytes have a characteristic kidney-shaped nucleus and grayish-blue cytoplasm.

3. Answer: C

Explanation: M-CSF drives differentiation of monocytes into tissue macrophages.

Basophils

1. Answer: C

Explanation: Basophil granules contain histamine, which increases vascular permeability during allergic inflammation.

2. Answer: C

Explanation: Basophils express FcεRI receptors that bind IgE and trigger degranulation upon allergen exposure.

Eosinophils

1. Answer: C

Explanation: Eosinophils release major basic protein and peroxidase to combat parasitic worms.

2. Answer: D

Explanation: IL-5 stimulates eosinophil growth, differentiation, and activation, especially in parasitic and allergic responses.

Mast Cells

1. Answer: C

Explanation: Mast cells play a central role in initiating immediate hypersensitivity by releasing histamine and other mediators after IgE cross-linking.

2. Answer: B

Explanation: When an allergen binds to IgE already attached to FcεRI receptors on mast cells, cross-linking triggers rapid degranulation.

3. Answer: B

Explanation: Leukotrienes and prostaglandins are lipid mediators synthesized after degranulation and sustain inflammation during the late phase reaction.