

MCQs on Immunity to Extracellular and Intracellular Pathogens, Fungi, and Helminths – Medical Immunology

Immunity to Extracellular Bacteria

1. Which immune component is most important for opsonization of extracellular bacteria?

- A) IL-10
- B) Complement C3b
- C) IFN- γ
- D) IL-4
- E) TNF- α

2. Which antibody class plays the major role in neutralizing bacterial toxins?

- A) IgA
- B) IgE
- C) IgM
- D) IgG
- E) IgD

3. A deficiency in the classical complement pathway predisposes a patient to recurrent infections with:

- A) Intracellular viruses
- B) Gram-negative bacteria
- C) Encapsulated extracellular bacteria
- D) Fungi
- E) Parasites

4. Which cytokine enhances neutrophil recruitment to sites of extracellular bacterial infection?

- A) IL-2
- B) IL-8

C) IL-10

D) IL-4

E) IFN- β

5. A 4-year-old with defective neutrophil oxidative burst (NADPH oxidase deficiency) is prone to:

A) Viral infections

B) Fungal infections

C) Pyogenic bacterial infections

D) Helminth infections

E) Autoimmune disorders

6. Which of the following is the main defense mechanism against *Streptococcus pneumoniae*?

A) Cytotoxic T cells

B) Antibody-mediated opsonization

C) NK cells

D) Interferons

E) Macrophage apoptosis

7. The most important innate defense against extracellular Gram-positive bacteria is:

A) Interferon α

B) NK cell cytotoxicity

C) Phagocytosis by neutrophils

D) Mucosal IgA secretion

E) IL-17 production

8. Patients with C5-C9 deficiency are particularly susceptible to infection by:

A) *Streptococcus pyogenes*

B) *Neisseria* species

C) *Mycobacterium tuberculosis*

- D) *Candida albicans*
 - E) *Staphylococcus epidermidis*
9. **Which acute-phase protein binds to bacterial phosphorylcholine and activates complement?**
- A) Fibrinogen
 - B) C-reactive protein (CRP)
 - C) Ferritin
 - D) Serum amyloid A
 - E) Haptoglobin
10. **An effective vaccine against encapsulated extracellular bacteria should induce:**
- A) Cytotoxic T-cell response
 - B) IgE-mediated hypersensitivity
 - C) Strong opsonizing IgG production
 - D) NK-cell activation
 - E) IFN- γ release

Immunity to Intracellular Pathogens

1. **The primary cytokine responsible for activating macrophages to kill intracellular pathogens is:**
- A) IL-4
 - B) IFN- γ
 - C) IL-10
 - D) IL-6
 - E) TNF- β
2. **CD8⁺ cytotoxic T cells eliminate intracellular bacteria primarily by:**
- A) Antibody-dependent lysis
 - B) Perforin and granzyme-mediated apoptosis
 - C) Complement activation

- D) Opsonization
 - E) Mast cell degranulation
3. **Which immune pathway is most critical for defense against Mycobacterium tuberculosis?**
- A) Th2 and IL-4
 - B) Th1 and IFN- γ
 - C) Complement activation
 - D) IgE-mediated
 - E) IL-5 and eosinophils
4. **A patient with IL-12 receptor deficiency will have increased susceptibility to:**
- A) Viral infections
 - B) Mycobacterial infections
 - C) Helminth infections
 - D) Fungal infections
 - E) Streptococcal infections
5. **NK cells recognize and kill virally infected cells that:**
- A) Overexpress MHC I
 - B) Lack MHC I
 - C) Present bacterial peptides
 - D) Express IL-2 receptors
 - E) Secrete IFN- β
6. **A 35-year-old with chronic hepatitis B infection likely has a defect in:**
- A) B-cell activation
 - B) Complement production
 - C) Cytotoxic T-cell function
 - D) NK-cell degranulation
 - E) Macrophage chemotaxis

7. **Which cytokine is most important in activating NK cells during viral infection?**
- A) IL-1
 - B) IL-6
 - C) IFN- α
 - D) IL-10
 - E) IL-4
8. **Chronic granulomatous inflammation in intracellular infection results primarily from:**
- A) Th2 activation
 - B) Persistent Th1-mediated macrophage activation
 - C) Complement activation
 - D) Neutrophil infiltration
 - E) Antibody cross-linking
9. **Which intracellular bacterium survives by preventing phagosome-lysosome fusion?**
- A) *Listeria monocytogenes*
 - B) *Mycobacterium tuberculosis*
 - C) *Salmonella typhi*
 - D) *Neisseria meningitidis*
 - E) *Staphylococcus aureus*
10. **In viral infections, CD4+ Th1 cells assist CD8+ T cells by producing:**
- A) IL-2
 - B) IL-4
 - C) IL-5
 - D) IL-10
 - E) IL-17

Immunity to Fungi

1. **Which type of immune response provides the main defense against *Candida albicans* infection?**

- A) Th1-mediated macrophage activation
- B) Antibody neutralization
- C) Eosinophil degranulation
- D) IgE-mediated hypersensitivity
- E) NK-cell activation

2. A patient with neutropenia after chemotherapy is most susceptible to:

- A) Viral infections
- B) Bacterial sepsis
- C) Fungal infections
- D) Autoimmune reactions
- E) Allergic rhinitis

3. The cytokine most associated with antifungal defense is:

- A) IL-4
- B) IL-5
- C) IFN- γ
- D) IL-17
- E) IL-10

4. Chronic mucocutaneous candidiasis is caused by a defect in:

- A) Th1 response
- B) Th17 response
- C) B-cell activation
- D) Complement pathway
- E) NK-cell cytotoxicity

5. A patient on corticosteroids develops invasive *Aspergillus* infection because:

- A) Steroids activate Th2 immunity
- B) Steroids suppress macrophage and neutrophil activity

- C) Steroids enhance IL-17 production
- D) Steroids increase IgE secretion
- E) Steroids stimulate eosinophils

Immunity to Helminths

1. Helminth infections elicit a predominant:

- A) Th1 response
- B) Th2 response
- C) Th17 response
- D) Treg response
- E) CD8+ T-cell response

2. Which antibody class plays the most important role in defense against helminth parasites?

- A) IgG
- B) IgE
- C) IgA
- D) IgM
- E) IgD

3. The cytokine that promotes eosinophil activation in helminth infection is:

- A) IL-2
- B) IL-5
- C) IFN- γ
- D) IL-12
- E) TNF- α

4. Eosinophils kill helminths mainly through:

- A) Complement activation
- B) Antibody-dependent cellular cytotoxicity (ADCC)
- C) Phagocytosis

D) Oxidative burst

E) Cytotoxic T-cell lysis

5. A child with *Ascaris lumbricoides* infection shows marked eosinophilia due to elevated:

A) IL-17

B) IL-2

C) IL-5

D) IFN- γ

E) TNF- α

Answers and Explanations

Immunity to Extracellular Bacteria

1. Answer: B

Explanation: C3b acts as a potent opsonin, tagging extracellular bacteria for phagocytosis.

2. Answer: D

Explanation: IgG neutralizes toxins and prevents their binding to host cells.

3. Answer: C

Explanation: Complement deficiencies impair opsonization and clearance of encapsulated bacteria like *Streptococcus pneumoniae*.

4. Answer: B

Explanation: IL-8 (CXCL8) attracts neutrophils to sites of infection, promoting bacterial clearance.

5. Answer: C

Explanation: Chronic granulomatous disease impairs neutrophil killing of extracellular bacteria.

6. Answer: B

Explanation: Opsonization by antibodies and complement enhances phagocytosis of encapsulated *Streptococcus pneumoniae*.

7. Answer: C

Explanation: Neutrophils are first responders that engulf and kill extracellular Gram-positive bacteria.

8. Answer: B

Explanation: C5–C9 deficiency impairs MAC formation, predisposing to *Neisseria* infections.

9. Answer: B

Explanation: CRP activates complement via C1q binding, enhancing clearance of bacteria.

10. Answer: C

Explanation: Opsonizing IgG enhances phagocytosis of encapsulated bacteria and prevents infection.

Immunity to Intracellular Pathogens

1. Answer: B

Explanation: IFN- γ produced by Th1 cells activates macrophages for enhanced killing of intracellular microbes.

2. Answer: B

Explanation: Cytotoxic T cells induce apoptosis in infected cells using perforin and granzymes.

3. Answer: B

Explanation: Th1 cytokines, particularly IFN- γ , activate macrophages to kill Mycobacterium tuberculosis.

4. Answer: B

Explanation: IL-12 promotes Th1 differentiation; deficiency results in impaired IFN- γ production and mycobacterial susceptibility.

5. Answer: B

Explanation: NK cells detect and destroy cells with reduced MHC I expression, typical of viral infection.

6. Answer: C

Explanation: Persistent viral infections often result from impaired cytotoxic T-lymphocyte (CTL) activity.

7. Answer: C

Explanation: Type I interferons (IFN- α/β) activate NK cells to kill infected host cells.

8. Answer: B

Explanation: Prolonged Th1 responses and macrophage activation cause granuloma formation to contain pathogens.

9. Answer: B

Explanation: Mycobacterium tuberculosis inhibits phagosome-lysosome fusion, surviving within macrophages.

10. Answer: A

Explanation: IL-2 from Th1 cells promotes proliferation and activation of cytotoxic T lymphocytes.

Immunity to Fungi

1. Answer: A

Explanation: Th1 and macrophage activation are crucial for controlling fungal infections like Candida.

2. Answer: C

Explanation: Neutrophils play a major role in antifungal immunity; neutropenia predisposes to fungal infections.

3. Answer: D

Explanation: IL-17 recruits neutrophils and enhances antifungal immune responses.

4. Answer: B

Explanation: Th17 deficiency impairs IL-17-mediated neutrophil recruitment, leading to chronic fungal infections.

5. Answer: B

Explanation: Corticosteroids suppress innate phagocyte function, increasing susceptibility to fungal infections.

Immunity to Helminths

1. Answer: B

Explanation: Th2 cytokines such as IL-4, IL-5, and IL-13 mediate anti-helminth immunity.

2. Answer: B

Explanation: IgE binds mast cells and eosinophils, mediating degranulation against helminths.

3. Answer: B

Explanation: IL-5 from Th2 cells promotes eosinophil proliferation and activation.

4. Answer: B

Explanation: Eosinophils use IgE-mediated ADCC to release toxic granules onto helminth surfaces.

5. Answer: C

Explanation: IL-5 drives eosinophil proliferation in helminthic infections such as Ascaris.