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Flaherty: Immunology for Pharmacy

Chapter 02: Innate Immunity

Test Bank

MULTIPLE CHOICE

- 1. Which of the following are innate immune components that create a hostile environment for bacteria on the skin?
- a. Mucus and cilia
- b. Bile salts and pH
- c. Sweat and sebum
- d. Normal flora and pH

ANS: C

The acidity of sweat and sebum, along with the saltiness of sweat, creates a hostile environment for pathogens. While mucus is found lining all mucosal surfaces, mucus and cilia together are found in the respiratory tract. Bile salts and pH are components of gastrointestinal (GI) innate immunity. The normal flora and pH are innate components of the GI tract and the genitourinary tract.

- 2. Which are the molecules that are common to many pathogens and are recognized by phagocytes and other innate immune cells?
- a. PAMPs
- b. Complement
- c. Toll-like receptors
- d. Mannose-binding lectin

ANS: A

PAMPs are molecules that are common among pathogens, but are not present on host cells, so cells of the immune system use these markers to identify that an organism is foreign and should be targeted for destruction. Toll-like receptors (TLRs) are found on immune cells and bind to PAMPs. Mannose-binding lectin is a component of the complement cascade, which is another host immune defense and not part of the pathogen.

- 3. Toll-like receptors (TLRs) activate the adaptive immune system by stimulating production of:
- a. Interleukin-1 (IL-1)
- b. Interleukin-6 (IL-6)
- c. Interleukin-12 (IL-12)
- d. Tumor necrosis factor-alpha (TNF- α)

ANS: B

Toll-like receptors (TLRs) cause phagocytic cells to produce IL-6 and IL-12. IL-6 activates cytotoxic T lymphocytes (CTLs), which are part of the adaptive immune response, while IL-12 activates natural killer (NK) cells, which are part of the innate immune response. Phagocytic cells produce IL-1 and TNF- α following ingestion of a pathogen, and those cytokines serve to enhance the innate immune response through upregulation of endothelial adhesion molecules and through chemotaxis.

- 4. Binding of a pathogen to Toll-like receptors (TLRs) on phagocytes causes the release of cytokines that activate which type of adaptive immune cell?
- a. Mast cell
- b. Neutrophil
- c. Macrophage
- d. Cytotoxic T cell

ANS: D

In response to engagement of the TLRs, phagocytes produce IL-6, which activates CTLs. Neutrophils, macrophages and mast cells are not adaptive immune cells.

- 5. Activation of a phagocyte by Toll-like receptors (TLRs) bound to a pathogen triggers what innate immune response?
- a. Phagocytosis
- b. Complement activation
- c. Cathelicidin production
- d. Decrease in body temperature

ANS: A

When a phagocyte binds to a pathogen using TLRs, the phagocyte is stimulated to phagocytose the organism and destroy it. Cathelicidins are produced in neutrophils and epithelial cells, and the cells are induced to release them by cytokines. Complement is activated in a variety of ways (refer to Figure 2-1), but not by TLR activation. During infection, body temperature increases, not decreases, as a result of cytokine production.

- 6. Which of the following acute phase reactants can reduce levels of nutritional iron available for bacterial uptake?
 - I. Haptoglobin
 - II. Ceruloplasmin
 - III. C-reactive protein (CRP)
- a. I only
- b. III only
- c. I and II
- d. II and III
- e. I, II, and III

ANS: C

CRP is a proinflammatory molecule that does not interfere with iron metabolism by the host or pathogen. Haptoglobin binds free hemoglobin and prevents iron uptake. Ceruloplasmin oxidizes iron so that it is not in a useful form for the pathogen. Therefore, both render the iron unavailable for bacteria to take up and use for nutritional purposes.

- 7. Cathelicidins perform which of the following functions?
 - I. Chemotaxis
 - II. Neutralization of endotoxins
 - III. Broad spectrum antimicrobial activity
- a. I only
- b. III only
- c. I and II
- d. II and III
- e. I, II, and III

ANS: E

Different subsets of cathelicidins have different functions, and there are subsets that function in each of these ways. Those produced by polymorphonuclear leukocytes (PMNs) are broad spectrum antimicrobials. Cathelicidins produced by epithelial cells are capable of neutralizing lipopolysaccharide (LPS), and those found in the skin are chemotactic.

- 8. Where are antimicrobial cryptocidins produced?
- a. Skin
- b. Liver
- c. GI tract
- d. Neutrophils

ANS: C

Cryptocidins are a type of α -defensins that are produced by Paneth cells in the GI tract. Other types of α -defensins are produced by neutrophils. Epithelial cells produce β -defensins, and the liver produces complement proteins but no defensins.

- 9. Nitric oxide (NO) produced by phagocytes is cytotoxic to pathogens by inhibiting pathogen:
 - I. DNA synthesis II. Mitochondrial respiration III. Cell wall synthesis
- a. I only
- b. III only
- c. I and II
- d. II and III
- e. I, II, and III

ANS: C

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Nitric oxide (NO) inhibits pathogen DNA synthesis and mitochondrial respiration, but does not interfere with cell wall synthesis.

2-4

- 10. The main immune component mediating septic shock is:
- a. TNF-α
- b. Defensins
- c. Complement
- d. Interleukin-10 (IL-10)

ANS: A

IL-10 and TNF- α are regulatory cytokines, but TNF- α is a proinflammatory cytokine that can lead to septic shock when released in large amounts. Defensins and complement have a variety of functions, including a proinflammatory function, but do not play a key part in the symptoms of septic shock.