LEARNING OBJECTIVES

- List and describe the major components of the immune system and their function(s)
- Explain the antigen–antibody relationship
- Name and describe the functions of the blood cells responsible for protecting the body from invasion
- Discuss how inflammatory responses and fevers relate to infection
- Compare innate immunity to adaptive immunity
- Describe the function of lymphocytes and helper cells in the immune response
- List and describe several common diseases of the immune system
FACTOIDS

1. The lymphatic system is not a closed system, has no central pump, and functions as a low-pressure system. As a result, lymph fluid circulates.

ETHICAL DILEMMAS

1. If a patient with HIV develops cancer of an organ, should he or she receive an organ transplant? Some people believe that organs for

ANSWERS TO TEST YOUR KNOWLEDGE

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1. d
2. d
3. c
4. b

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The doctor might initially suspect that John has AIDS because John has a mysterious illness and is a former IV drug user. AIDS is ruled out because John’s T-cell count is normal. However, increased neutrophil, basophil, and eosinophil concentrations suggest an infection or allergy. Given John’s symptoms, the doctor should expect a sinus infection secondary to allergic rhinitis (hay fever).

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Multiple Choice
1. d, 2. b, 3. a, 4. b, 5. b, 6. d, 7. b

Fill in the Blank
1. adaptive or acquired
2. NK cells
3. helper T cells  
4. mast cells  
5. Positive  
6. allergies (hay fever)

Short Answer

1. The regions of the body containing lymph nodes are cervical, axillary, inguinal, pelvic, abdominal, thoracic, and supratrochlear areas. Adenoids and tonsils, the spleen, and the thymus also contain lymph tissue.

2. The circulation of lymphatic fluid follows this pattern: blood to tissue, tissue to lymphatic capillaries, lymphatic capillaries to lymphatic vessels, lymphatic vessels to lymph nodes, lymph nodes to lymphatic vessels, lymphatic vessels to lymphatic trunks, lymphatic trunks to collecting ducts, collecting ducts to subclavian veins, reentering the bloodstream. Thus, lymph fluid starts in the bloodstream and ends in the bloodstream after being filtered.

3. Neutrophils: perform phagocytosis, ingest pathogens and cellular debris, and release chemicals that increase tissue damage and inflammation, stimulating immune response. Basophils: release chemicals to promote inflammation. Eosinophils: counteract the activities of basophils and mast cells, breaking down the chemicals released by basophils and mast cells, thereby reducing inflammation. Macrophages: phagocytic, active in the later stages of an infection; release chemicals that stimulate the immune system. Dendritic cells: weakly phagocytic, antigen-displaying cell (ADC); ingest foreign cells, placing the foreign antigens into their cell membrane, then cruise the lymph nodes displaying the foreign antigen, looking for lymphocytes that match the antigen. Natural killer cells: releases chemicals to kill any cells displaying foreign antigens, pathogenic or the body's own. T lymphocytes: cell-mediated immunity. Cytotoxic T cells: kill infected cells and release immune-stimulating chemicals. Helper T cells: activate parts of adaptive immunity. Regulatory T cells: regulate immune response. Memory T cells: remember pathogens after exposure. B lymphocytes: antibody-mediated immunity. Plasma cells: produce antibodies to non-self antigens. Memory B cells: remember pathogens.

4. Innate immunity is inborn. It cannot recognize specific pathogens or remember pathogens it has encountered before. Adaptive immunity recognizes specific pathogens and remembers pathogens once exposed. The ability to remember specific pathogens allows adaptive immunity to improve with experience. Adaptive immunity mounts a stronger, faster response the second time it meets a pathogen.

5. Anti-inflammatory medications decrease inflammation. Inflammation is an important part of innate immunity, and chemicals released during inflammation stimulate adaptive immunity as well. Without inflammation, then, immune response is decreased.
6. Leukemia and lymphoma often result in large numbers of immature, ineffective white blood cells. These ineffective WBCs crowd out mature WBCs, decreasing immune response. Chemotherapy drugs often target rapidly dividing cells. WBCs are rapidly dividing cells. Thus, some forms of chemotherapy decrease the numbers of WBCs available to fight infection.