35.2 Defenses Against Infection

Lesson Objectives

- Describe the body’s nonspecific defenses against invading pathogens.
- Describe the function of the immune system’s specific defenses.
- List the body’s specific defenses against pathogens.

Lesson Summary

**Nonspecific Defenses** The body has many nonspecific defenses, which defend against a wide range of pathogens.

- The first line of defense is skin. Skin keeps pathogens out of the body by forming a barrier that few pathogens can get through. Mucus, saliva, and tears contain an enzyme that can kill bacteria. Mucus can also trap pathogens.

- When pathogens do enter the body, the second line of defense goes to work. These nonspecific defenses include:
  - the **inflammatory response**, in which chemicals called **histamines** cause blood vessels near a wound to expand and phagocytes to move into the tissue to fight infection.
  - the production of proteins called **interferons**, which help block the replication of viruses.
  - the release of chemicals that produce a **fever**, an increase in normal body temperature, which may slow the growth of pathogens and speed up immune response.

**Specific Defenses: The Immune System** The function of the immune system is to fight infection by inactivating foreign substances or cells that have entered the body. The specific immune response works in several ways, including:

- recognizing “self,” including cells and proteins that belong to the body.
- recognizing “nonself”, or **antigens**, molecules found on foreign substances. Antigens stimulate the immune system to produce cells called lymphocytes that recognize, attack, destroy, and “remember” specific pathogens.
- producing specific lymphocytes that recognize specific antigens. They work by attacking infected cells or producing **antibodies**, proteins which tag antigens for destruction by immune cells.

**The Immune System in Action** The immune response works in two ways.

- In **humoral immunity**, white blood cells, called B lymphocytes (B cells), make antibodies that attack pathogens in the blood.
- In **cell-mediated immunity** white blood cells, called T lymphocytes (T cells), find and destroy abnormal or infected cells.

After a pathogen is destroyed, memory B cells and memory T cells stay in the body. These cells help create a faster immune response if the same pathogen enters the body again.
Nonspecific Defenses

For Questions 1–8, write the letter of the definition that best matches each term.

Term   Definition
______ 1. skin  A. An increase in body temperature, which slows or stops pathogens
______ 2. lysozyme  B. A secretion of the nose and throat that traps pathogens
______ 3. inflammatory response  C. An enzyme found in tears and saliva that breaks down bacterial cell walls
______ 4. histamines  D. Chemicals that increase blood flow to tissues
______ 5. interferons  E. Combination of physical and chemical barriers that defend against pathogens
______ 6. fever  F. Redness, pain, and swelling at the site of an injury
______ 7. mucus  G. Proteins that fight viral growth
______ 8. nonspecific defenses  H. The body’s most important nonspecific defense

Specific Defenses: The Immune System

For Questions 9–14, complete each statement by writing the correct word or words.

9. The ____________ response is the body’s response to specific invaders.

10. A substance that triggers the immune response is known as a (n) ____________.

11. The main role of ____________ is to tag ____________ for destruction by immune-system cells.

12. The main working cells of the immune system are two types of ____________. Their specific types are determined by a person’s ____________.

13. ____________ discover antigens in body fluids.

14. ____________ defend the body against pathogens that have infected body cells.

15. THINK VISUALLY In the space provided, draw an example of each type of lymphocyte indicated to show a basic difference between the two types of cells.

B Cell

T Cell
The Immune System in Action

For Questions 16–22, write True or False on the line provided.

16. Humoral immunity is a response to pathogens in blood and lymph.  True
17. The first response of humoral immunity to infection is much faster than the second response.  True
18. Plasma cells are specialized B cells.  True
19. Cell-mediated immunity involves antibodies.  False
20. Cell-mediated immunity causes infected body cells to die.  True
21. Cell-mediated immunity only works on viral diseases.  False
22. Cytotoxic T cells are a cause of rejection of transplanted organs.  True

23. Complete the table to compare how humoral and cell-mediated immunity work after a virus invades the body for the first and second times.

<table>
<thead>
<tr>
<th>Humoral Immunity vs. Cell-Mediated Immunity</th>
</tr>
</thead>
<tbody>
<tr>
<td>Action of Humoral Immunity</td>
</tr>
<tr>
<td>Primary response:</td>
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<tr>
<td></td>
</tr>
<tr>
<td>Activated B cells grow and divide rapidly.</td>
</tr>
<tr>
<td>Plasma cells release antibodies that capture antigens and mark them for destruction.</td>
</tr>
<tr>
<td>Secondary response:</td>
</tr>
</tbody>
</table>

24. A runny nose is a symptom of a cold. How is this evidence that the body’s immune defenses are working?  A runny nose is a symptom of a cold, indicating an immune response to the virus.