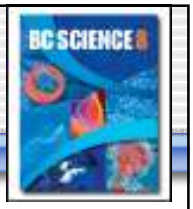
3.1 The Immune System



- Infectious diseases are caused by pathogens.
  - Pathogens are "germs" or disease-causing invaders that enter the body.
- The immune system attacks and destroys these disease-causing invaders.

Table 3.1 Four Ways to Transmit Infectious Diseases

Transmission Method	Example
Direct contact	Shaking hands or sharing drinking containers or bodily fluids with an infected person (Figure 3.2).
Indirect contact	Being near an infected person who sneezes without covering his or her mouth. Some pathogens can travel up to 5 m and infect people within that range.
Water and food	Eating foods, such as eggs and some meats, that are infected with *Salmonella* bacteria. Drinking water infected with *E. coli* bacteria can also result in serious illness.
Animal bites	Being bitten by an animal carrying the rabies virus.

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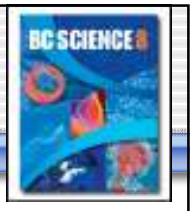
First Line of Immune Defense



There are two lines of immune defense.

First line of Defense

- The skin is a physical barrier that stops most pathogens from entering the body.
- The sweat and oils on skin are slightly acidic.
- Gastric juices in your stomach can destroy some pathogens.
- Mucus and cilia in your nose prevent pathogens from entering your respiratory system.

Mucus cells

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Second Line of Immune Defense

If a pathogen makes it past the first line of defense.

Second line of Defense

- The second line of defense includes two types of immune response:
  - Innate Immune Response
    - A response you are born with.
  - Acquired Immune Response
    - A highly specific attack on a pathogen.

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Innate Immune Response

- The response is quick and general, or non-specific.
  - Response is the same for any type of invader.
- First action is a flow of fluid into site of infection.
  - Causes fever, swelling, and redness in area.
  - The swelling and redness is called inflammation.
- Increase in the types of white blood cells called phagocytes.
  - Phagocytes destroy pathogens.

Inflammation of an infected toe.

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Acquired Immune Response

- Highly specific attack on a specific pathogen or antigen.
  - An antigen is a non-living particle or substance that body cannot recognize.
- All acquired immune responses help give you active immunity.
  - This means your body remembers how to fight a pathogen that has infected it before.
  - This is why you get diseases such as chicken pox only once.

Chicken Pox

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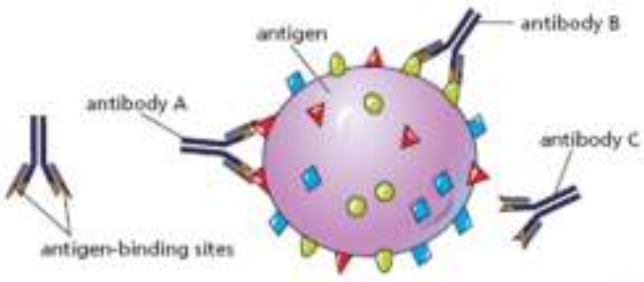
Acquired Immune Response

B cells in action

- First process in the acquired immune response:
  - B cells recognize antigens present in the body.
  - Produce particles, called antibodies, used to fight antigens.



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Acquired Immune Response

T cells in action

- Second process in the acquired immune response:
- Two types of T cells:
  - Helper T cells
    - Recognize antigen or pathogen and activate B cells
  - Killer T cells
    - Recognize and destroy antigen or pathogen without B cells.

Two killer T cells (yellowish in colour) attack a cancer cell.

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Immune Response (4 Steps)

The response of your immune system to disease-causing organisms can be divided into four steps: recognition, mobilization, disposal, and immunity.

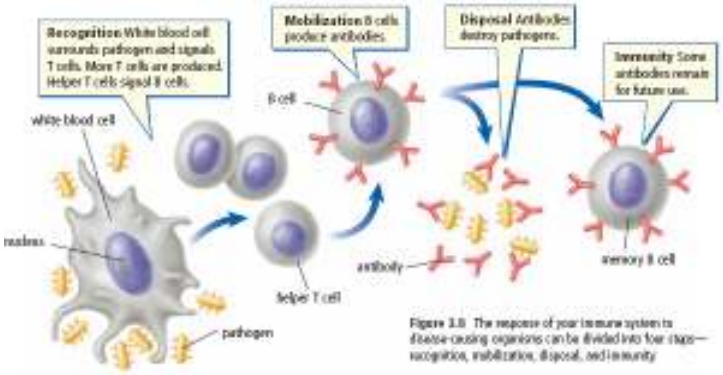

Figure 3.8 The response of your immune system to disease-causing organisms can be divided into four steps—recognition, mobilization, disposal, and immunity

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Take the Section 3.1 Quiz

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