

# Directed Reading

## Section: Two Lines of Nonspecific Defenses

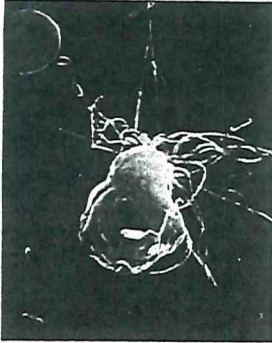
In the space provided, explain how the terms in each pair differ in meaning.

- inflammatory response, temperature response  
**Inflammatory Response** - series of events that suppress infection + speed recovery from the infection  
**Temp. Response** - is the ↑ in body temperature, called a fever, that slows the growth of many disease-causing bacteria
- complement system, interferon  
**Complement System** - consists of about 20 diff't proteins that circulate in the blood + become active when they encounter certain pathogens  
**Interferon** - protein released by cells infected by viruses. Causes nearby cells to produce an enzyme that prevents viruses from making proteins + RNA
- neutrophil, macrophage  
**Neutrophils** - WBCs that engulf + destroy pathogens by releasing chemicals that also destroy the neutrophil itself  
**Macrophage** - WBC that engulfs + kills pathogens, + they clear dead cells + other debris from the body

Read each question, and write your answer in the space provided.

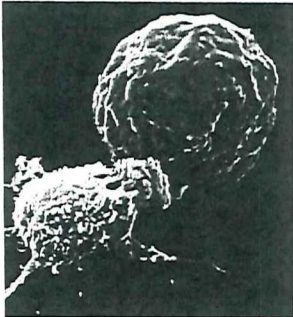
- What is a pathogen?  
**Disease-causing agent, such as bacteria, viruses, fungi or protists**
- How does skin help defend the body against infection?  
**Acts as a barrier to invading microorganisms. Oil + sweat make the skin acidic, inhibiting the growth of many pathogens**
- How do mucous membranes help defend the body against infection?  
**produce mucus, which traps pathogens, serve as a barrier to pathogens + produce chemical defenses**
- How does a natural killer cell defend the body against pathogens?  
**attacks pathogen-infected cells + destroys them by puncturing their cell membranes**

Magnification: 2,280×



**Figure 2 Macrophage.** Cytoplasmic extensions of this macrophage (yellow) are capturing bacteria (blue).

Magnification: 14,250×



**Figure 3 Natural killer cell.** This natural killer cell (yellow) is attacking a cancer cell (pink).

**Proteins** Various proteins also provide nonspecific defenses. One defense mechanism, called the **complement system**, consists of about 20 different proteins. Complement proteins circulate in the blood and become active when they encounter certain pathogens. Then some of these proteins form a membrane attack complex (MAC), a ring-shaped structure. The MAC punches a hole in the cell membrane, causing the cell to leak and die. Another nonspecific defense is **interferon** (*in tuhr FEER ahn*), a protein released by cells infected with viruses. Interferon causes nearby cells to produce an enzyme that prevents viruses from making proteins and RNA.

**White blood cells** The most important counterattacks in the second line of nonspecific defenses are carried out by three kinds of white blood cells: neutrophils, macrophages, and natural killer cells. These cells patrol the bloodstream, wait within the tissues for pathogens, and then attack the pathogens. Each kind of cell uses a different mechanism to kill pathogens.

- Neutrophils.** A **neutrophil** (*NOO truh fihl*) is a white blood cell that engulfs and destroys pathogens. The most abundant type of white blood cell, neutrophils engulf bacteria and then release chemicals that kill the bacteria—and themselves. Neutrophils can also squeeze between cells in the walls of capillaries to attack pathogens at the site of an infection.
- Macrophages.** White blood cells called **macrophages** (*MA kroh fay jez*), shown in **Figure 2**, ingest and kill pathogens they encounter. They also clear dead cells and other debris from the body. Most macrophages travel through the body in blood, lymph, and fluid between cells. Macrophages are concentrated in particular organs, especially the spleen and lungs.
- Natural killer cells.** A **natural killer cell** is a large white blood cell that attacks cells infected with pathogens. Natural killer cells destroy an infected cell by puncturing its cell membrane. Water then rushes into the infected cell, causing the cell to swell and burst. One of the body's best defenses against cancer, natural killer cells can detect and kill cancer cells, as shown in **Figure 3**, before a tumor can develop.

## Section 1 Review

- 1 Describe** how the inflammatory and temperature responses help defend against infection. ⚡ 10A 10B
- 2 Identify** the role of white blood cells in the second line of nonspecific defenses. ⚡ 10A 10B
- 3 Critical Thinking Relating Concepts** Explain why taking a drug that reduces fever might delay rather than speed up your recovery from an infection. ⚡ 10A 10B
- 4 ★ TAKS Test Prep** In the inflammatory response, local blood vessels dilate when infected or injured cells release ⚡ 10A  
A interferon.  
B histamine.  
C mucus.  
D complement proteins.