

Introduction to the Immune System

Introduction

During this concept, you will be introduced to the immune system. The topics covered include:

- An introduction to innate (non-specific) and adaptive (specific) immune responses.
- Compare and contrast innate (non-specific) with adaptive (specific) defenses.
- Define immunity and the immune system.
- Describe the roles of the various types of leukocytes in innate (non-specific) and adaptive (specific) immune responses.
- Explain the ways in which the innate (non-specific) and adaptive (specific) immune responses cooperate to enhance the overall resistance to disease.

An Introduction to the Immune System

The body's ability to maintain homeostasis is highly dependent on its ability to fight off pathologic agents. Immunity is our body's ability to ward off the pathogens that produce disease. The protective cells, chemicals, and physical barriers that keep us safe from invading pathogens form the immune system of our body. These are widely distributed with the highest numbers present in the lymphatic system – lymph nodes, spleen, and lymphatic vessels to name a few.

There are two major forms of immunity with three lines of defense:

1. Non-specific Resistance (Innate Immunity): Fast-acting defense mechanisms that provide general protection (non-specific) against invasion by a wide range of pathogens. Also called inborn/ native/ genetic immunity as it is present at birth.

Non-specific defense includes both first and second line of defense:

- First line of defense: Physical and chemical barriers like skin, mucus membranes, and sebum that block the invasion through exposed epithelia.
 - Second line of defense: Internalized system of protective cells and processes that work to prevent pathogens entering the body. Leukocytes like neutrophils, eosinophils can destroy pathogens in both phagocytic and non-phagocytic killing, while macrophages perform phagocytic killing only. A differential count of leukocytes can help in identifying infectious agents (bacterial, viral. or parasites). Some processes that form the second line of defense are:
 - Inflammation and fever are non-specific responses activated to enhance the activity of leukocytes.
 - Interferons are chemical messengers released by cells attacked by viruses to activate defense mechanisms in healthy in nearby healthy cells.
 - Complement system is a set of proteins activated via three different pathways that target and destroy the cell wall of pathogens.
1. Specific Immunity (Adaptive Immunity): Directed slow responses by specialized lymphocytes that recognize specific foreign substances (antigens) and develops memory of those antigens. A slow, uniquely tailored response to a specific pathogen based on antigen identification hence the name adaptive or acquired immunity.
- Adaptive immunity forms the third line of defense, which includes cell-mediated and antibody-mediated responses that provide long-term specific immunity.