Immunology

Is the science that concerned with the study of a host's reactions when foreign substances are introduced into the body.

A foreign substance that induces such an immune response is called an **antigen**.

Immunity

Is the physical state of the body that makes it resistant to a particular disease. **There are two major types of immunity:**

A. Innate (natural) immunity

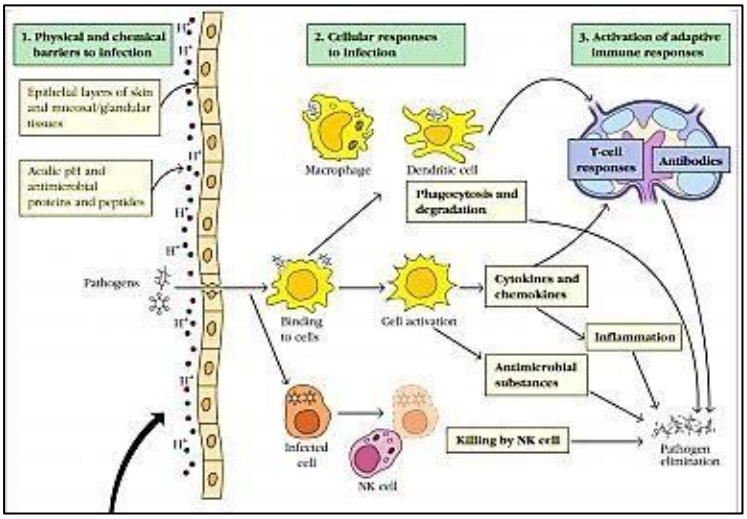
B. Adaptive (acquired) immunity

Innate immunity

Innate immunity: (also called natural or native immunity) is the individual's ability to resist infection by normal body functions. These are considered nonspecific and are the same for all pathogens or foreign substances to which one is exposed. No prior exposure is required and the response lacks memory and specificity.

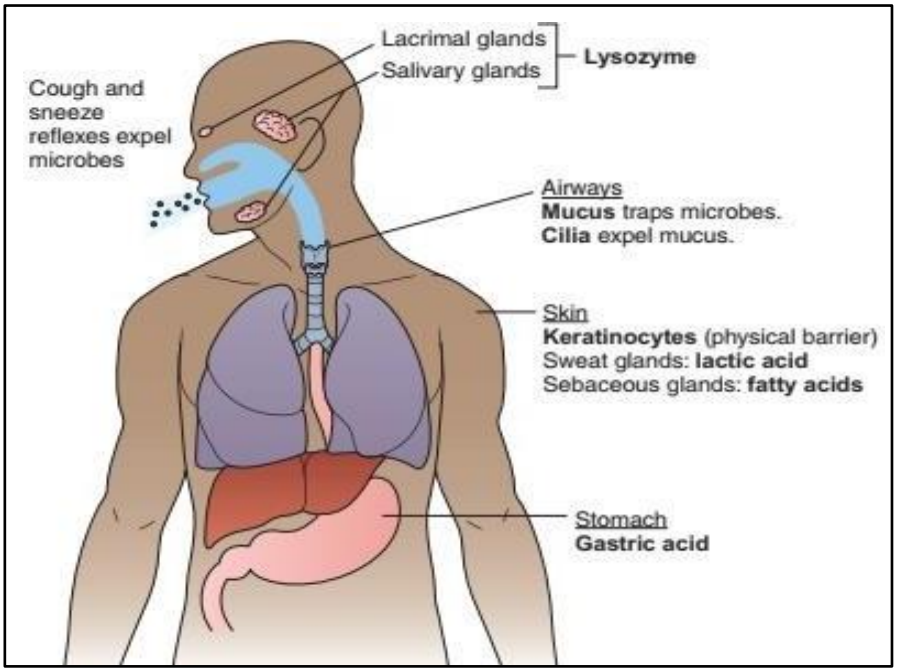
The innate immunity is composed of many defense barriers:

- ✓ The **first line** of defense includes some **physical and chemical barriers** such as epithelial cell layers of the skin, mucosal tissues (e.g., gastrointestinal, respiratory, and urogenital tracts), and glandular tissues (e.g., salivary, lacrimal, and mammary glands).
- ✓ If an infectious agent overcomes the physical and chemical barriers, **cellular immune responses** are rapidly **activated**, which constitute the **second line** of defense, are triggered by cell surface or intracellular receptors that recognize components of pathogens.
- ✓ Some white blood cell types are activated to rapidly engulf and destroy extracellular microbes through the process of phagocytosis.
- ✓ Also, many cells are activated through their receptors to produce a variety of antimicrobial substances that kill pathogens, as well as cytokine and chemokine proteins that recruit cells, molecules, and fluid to the site of infection, leading to swelling and other symptoms collectively known as inflammation.
- ✓ Also, contribute **dendritic cells** that carry and present pathogens to lymphocytes to the activation of **adaptive immune responses, the third line of defense.**



Some of the mechanisms of Innate Immunity

Example	Function
Skin and mucous membranes	Retards entry of microbes
Lactic acid	Keeps low growth of microorganisms
Cilia	Move pathogens out of respiratory tract
Stomach acid	Low pH keeps pathogens from growing
Urine	Flushes out pathogens from the body
Lysozyme	Attacks cell walls of pathogens
Normal flora	Compete with pathogens Produce antimicrobial peptides
Cells	Participate in phagocytosis (e.g., NK cells destroy target cells)
Pathogen recognition receptors (e.g., Toll-like receptors)	Help phagocytic cells recognize pathogens



Adaptive immunity

Adaptive immunity: (also called acquired immunity) is a specific system that protects the body from a wide range of microorganisms and abnormal body cells, this system is turned on by exposure to a foreign substance.

Important characteristics of the adaptive defense system:

It is specific: for each individual pathogen or microbial agent.

It is systemic: immunity is not restricted to the site of the initial infection.

It has memory: The ability to remember a prior exposure. An increased response to that pathogen upon repeated exposure.

Key elements of natural and acquired immune responses:

	Natural immunity	Adaptive immunity
Characteristic	Non-specific immunity	Specific immunity
Response time	Rapid response (minutes to hours)	Slow response (days to weeks)
Specificity	Low specific for recognize of molecules	Highly specific for recognized to microbial and non-microbial structure
Memory	No have memory	Have memory
Soluble components	Many antimicrobial peptides and proteins	Antibodies
Major cell types	Phagocyte, natural killer and dendritic cells.	T, B lymphocytes and antigen presenting cells (APCs)