

➤ Introduction

Immunity is a state of specific resistance to infection. Specific resistance is directed against a particular type of microorganism and is the single most important characteristic of immunity. (The immune system enables the body to recognize a foreign agent as nonself, which is something other than a person's own substances (self). The immune system takes a specific action for neutralizing, killing, and eliminating that agent. The action involves nonspecific resistance as well. On occasion, the immune system activity may lead to tissue damage as seen in allergic disorders and other states of hypersensitivity. The immune system's activity is based on its ability to distinguish characteristic proteins or protein-linked components associated with foreign substances. Once this distinction has been made, certain lymphocytes are provoked to produce antibodies directed against the foreign matter, while other lymphocytes are sensitized to the invading agent and react with it directly. Thus, there are two major branches of the immune system: antibody-mediated immunity (also known as humoral immunity) and cell-mediated immunity.

Immunity: The resistance of body against infectious organism is called immunity or the ability of an organism to resist a particular infection or toxin by the action of specific antibodies or sensitized white blood cells.

Immune: Resistant to a particular infection or toxin by the action of specific antibodies or sensitized white blood cells.

Immune response: The coordinate reaction of cells of immune system to infectious organism is called immune response.

Infection: Any symptomatic or asymptomatic invasion and multiplication of microorganisms such as bacteria, viruses, and parasites that are not normally present within the body is called infection.

Immunology: A branch of biology which deals with the study of immune system and its response to invading organism is called immunology"

➤ Antigen

Any foreign substance which activate the immune response is known as antigens or immunogens. The uptake and processing of antigens by macrophages in the tissue is an initial, critical step in most immune responses. The simple act of taking foreign substances into the body does not necessarily stimulate an immune response because the substances may be broken down before they are ingested by macrophages.

Antigenic determinants: The group of molecules on the antigen that determine their immunogenicity are called antigenic determinants, also known as epitopes. Antigenic determinants may consist of several amino acids of a protein molecule or several monosaccharide units of a polysaccharide. Each species of living thing is chemically and antigenically unique because of differences in its proteins, carbohydrates, and other organic substances.

Types of antigens: There are two types of antigens.

Auto or self-antigens: Are a person's own or self-antigens e.g. dead or aberrant cells.

Non self-antigens: Are antigens outside the body which are further divided into;

Alloantigens: Antigens found in different members of the same species (the red blood cell antigens A and B are examples).

Heterophile antigens: Identical antigens found in the cells of different species. A single organism such as a bacterium may contain a variety of proteins, carbohydrates, and other materials that provoke immune responses.

Somatic antigens: Antigens found on the body cell are called somatic antigens.

Capsular antigens: Antigens in the bacterial capsule are capsular antigens.

Flagellar antigens: Antigens of an organism's flagella are known as flagellar antigens.

Exotoxins: Protein substances such as exotoxins are also antigenic.

The Major Histocompatibility Complex and its functions

The major histocompatibility complex (MHC) (also called human leukocyte antigens, HLAs) is the mechanism by which the immune system is able to differentiate between self and nonself cells. The MHC is a collection of glycoproteins (proteins with a carbohydrate) that exist on the plasma membranes of nearly all body cells. The proteins of a single individual are unique, thus, it is extremely unlikely that two people, except for identical twins, will possess cells with the same set of MHC molecules the immune system is able to identify nonself cells by aberrations in the MHC displayed on the plasma membrane. There are two groups of MHC molecules, and each group generates different markings on the plasma membrane:

- i. MHC-I glycoproteins are produced by all body cells (except red blood cells). When a cell becomes cancerous or is invaded by a virus, unfamiliar proteins are synthesized in the cell. These proteins are endogenous antigens that is, antigens produced inside the cell. Portions of these antigens are combined with MHC-I glycoproteins and, when displayed on the plasma membrane, indicate a nonself cell.
- ii. MHC-II glycoproteins are produced only by antigen-presenting cells (APCs) mostly macrophages and B cells. APCs actively ingest exogenous antigens that originate outside the cell. Exogenous antigens include bacteria, toxins or pollen that are circulating in the blood, lymph, or body fluids. APCs break down the antigens and incorporate pieces of them with MHC-II glycoproteins. This aberrant display of MHC markers is recognized as nonself.