**FUNCTIONS OF IMMUNE SYSTEM**

**The basic function of the immune system is to remove foreign antigens such as viruses and bacteria to maintain homeostasis.**

1. **NATURAL IMMUNITY**

Natural Immunity which is a non-specific, provides a broad spectrum of defense against resistance of infection. It is considered the first line of host defense following antigen exposure because it protects the hosts without remembering prior contact with an infectious agent. Reponses to a foreign invader are very similar from one encounter to the next regardless of the times the invader is encountered. Natural Immunity co-ordinates the initial response to pathogens through the production of cytokines and other effector molecules, which either activate cells for control of the pathogen(by elimination) or promotes the development of acquired immune response. The cells involved in this response are monocytes, macrophages, dendritic cells, natural killer cells(NK) cells, basophils, eosinophils and granulocytes.

1. **WHITE BLOOD CELL ACTION**

The cellular response is the key to the effective initiation of cellular response. WBCs or leukocytes, participate in both the natural and the acquired immune responses. Granular leukocytes or granulocytes, fight invasion by foreign bodies or toxins by releasing cell mediators, such as histamine, bradykinins, and prostaglandins and by engulfing foreign bodies or toxins. Granulocytes include neutrophils, eosinophils, and basophils. Neutrophils(Polymorphonuclear leukocytes) are the first cells to arrive at th site where inflammation occurs. Eosinophils and basophils, other types of granulocytes increase in number during allergic reactions and stress responses. Non-granular leukocytes include monocytes and macrophages(reffered to as histocytes when they enter tissue spaces ) and lymphocytes. Monocytes are the first to arrive on the scene and function as phagotic cells, engulfing, ingesting, and destroying greater numbers and quantities of foreign bodies or toxins other than granulocytes.

1. **INFLAMMATORY RESPONSE**

The inflammatory response is a major function of the natural immune system that is elicited to response to tissue injury or invading organisms. Chemical mediators assist the response by minimizing blood loss, walling off the invading organism, activating phagocytes, and promoting formation of fibrous scar tissue and regeneration of injured tissue.

1. **PHYSICAL AND CHEMICAL BARRIERS**

Physical and chemical barriers is enhanced by the activation of the immune response. Physical surface barriers include intact skin, mucous membranes and cilia of the respiratory tract which prevents pathogens from gaining access to the body. The cilia of the respiratory tract , along with coughing and sneezing responses, filter and clear pathogens from the upper respiratory tract before they can invade the body further. Chemical barriers such as mucus, acidic gastric secretion, enzymes in tears and saliva, and substances in sebaceous and sweat secretions, act in non-specific way to destroy invading bacteria and fungi. Viruses are encountered by other means such as interferon.

1. **IMMUNE REGULATION**

The regulation of immune response involves balance and counterbalance. Dysfunction of the natural immune system can occur when the immune components are inactivated or when they remain active long after their effects are beneficial. A successful immune response eliminates the responsible antigen. If an immune response is critical to the prevention of disease it must be well controlled to curtail immunopathology. If immune response fails to develop and clear an antigen sufficiently, the host is considered immunocompromised or immunodeficient. Most microbial infections induce an inflammatory response mediated by T cells and cytokines, which in excess can cause tissue damage. Therefore, regulatory mechanisms must be able to suppress or halt immune response.

**TYPES OF IMMUNITY**

**Immunity is the body’s specific protective response for a foreign agent or organism. The immune system functions as the body’s defense mechanism against invasion and allows a rapid response to foreign substances in a specific manner.**

* **INNATE(non-specific) IMMUNITY**

Innate immunity refers to non-specific defense mechanisms that come into play immediately or within hours of an antigen’s appearance in the body. Host defense mechanisms that act from the start of an infection but do not adapt to a pathogen. The major functions of vertebrae innate immune system include:

* Recruiting immune cells to sites of infection through the production of chemical factors, including specified chemical mediators called cytokines.
* Identification and removal of foreign substances present in organs, tissues, blood and lymph by specialized white blood cells.

INNATE IMMUNITY also includes the external barriers of the body, like the skin and mucous membranes( like those that line **the nose,throat, and gastrointestinal tract)**, which are the first line of defense in preventing diseases from entering the body, if outer defensive wall is broken(through a wall), the skin attempts to heal the break quickly and immune cells on the skin attack invading germs.

**ACQUIRED(ADAPTIVE OR SPECIFIC)IMMUNITY**

Acquired Immunity develops after birth, it usually develops as a result of prior exposure to an antigen through an immunization(vaccination) or by contracting a disease, both of which generate a protective immune response. Weeks or months after exposure to the body produces an immune response that is sufficient to defend against the disease on re-exposure. In contrast to the rapid but non-specific natural immune response, this form of immunity relies on the recognition of specific foreign antigens immunity. The acquired immune response is broadly divided into two mechanisms:1) the cell mediated response involving T-cell activation and 2) Effector mechanisms, involving B-cell maturation and production of antibodies. There are two types of adaptive immune they are **PASSIVE AND ACTIVE** and they are interrelated. Active acquired immunity refers to the immunologic defenses developed by the person’s own body. This immunity lasts for many years or a lifetime. Passive acquired immunity is temporary immunity transmitted from one source outside the body that has developed immunity through previous disease or immunization. Examples include immunity resulting from the transfer of antibodies from the mother to an infant in utero or through breastfeeding or receiving injections of immune globulin.

**TYPES OF ANTIBODIES AND THEIR ROLES**

**Antibodies are large proteins called Immunoglobulins, that consist of two subunits, each containing a light and heavy peptide chain held together by a chemical link composed of disulfide bonds. Each subunit has one portion that serves as a binding site for a specific antigen and another portion that allows the antibody molecule to take part in the complement system.**

**Antibodies defend against foreign invaders in several ways abd type of defense used depends on the structure and composition of both antigen and the immunoglobulin.**

1. **IgG**

* **Structure:**  Monomer
* **Percentage serum antibodies:** 75%
* **Location:** Blood, lymph, intestine
* **Half-life in serum:** 23 days
* **Complement Fixation:** Yes
* **Placental Transfer:** Yes
* **Known Functions:** Enhances phagocytosis, neutralizes toxins and viruses, protects fetus and newborn.

1. **IgM**

* **Structure:** Pentamer
* **Percentage serum antibodies:** 10%
* **Location:** Blood, lymph, B cell surface (monomer)
* **Half-life in serum:** 5 days
* **Complement Fixation:** Yes
* **Placental Transfer:** No
* **Known Functions:** First antibodies produced during an infection. Effective against microbes and agglutinating antigens

**3.IgA**

* **Structure:** Dimer
* **Percentage serum antibodies:** 15%
* **Location:** Secretions (tears, saliva, intestine, milk), blood and lymph.
* **Half-life in serum:** 6 days
* **Complement Fixation:** No
* **Placental Transfer:** No
* **Known Functions:** Localized protection of *mucosal* surfaces. Provides immunity to infant digestive tract

**4.IgD**

* **Structure:**  Monomer
* **Percentage serum antibodies:** 0.2%
* **Location:** B-cell surface, blood, and lymph
* **Half-life in serum:** 3 days
* **Complement Fixation:** No
* **Placental Transfer:** No
* **Known Functions:** In serum function is unknown. On B cell surface, initiate immune response.

**5. IgE**

* **Structure:** Monomer
* **Percentage serum antibodies:** 0.004%
* **Location:** Bound to mast cells and basophils throughout body. Blood.
* **Half-life in serum:** 2 days
* **Complement Fixation:** No
* **Placental Transfer:** No
* **Known Functions:** Allergic reactions. Possibly lysis of worms.