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* **Explain the role of the immune system**
* **Describe the two types of immunity**
* **Explain the different types of antibodies and their roles**

**THE ROLE OF THE IMMUNE SYSTEM**

The role of the immune system is to protect the body from foreign matters that might cause any damage or homeostatic imbalance. When an organism is threatened by, microorganisms, viruses or cancer cells, the immune system acts to provide protection. The success of the immune system depends on its ability to discriminate between foreign and host cells. Normally the immune system does not mount a response against self. This lack of an immune response is called tolerance.

When a foreign material enters the body, our defense system recognizes this as foreign through the immune system. How the human body recognizes foreign material against itself employs a complex “I.D system. Each cell in the human body carries on its surface a mixture of proteins and sugars that serve to identify the cell to the immune system. Foreign objects lack the identifiers that all of the body cells have, but each one has a unique feature or antigen where the immune system attaches identifiers called antibodies. This is the basis for specific defense mechanisms. Once you have built the antibodies for a specific antigen, the immune system will respond faster than if there had been no previous exposure to the antigen. (I.e. you are immune to the pathogen, but only that specific antigen, because your immune system responds faster). The non-specific part of the immune system is mostly composed of phagocytes which engulf and digest foreign substances like bacteria and viruses which do not bear the body’s specific identifiers.

Immune system is commonly presented as defense machinery. However, host defense is the only manifestation of the immune system’s overall function in the maintenance of tissue homeostasis and system integrity. In fact, the immune system is an integral part of the fundamental physiological processes such as development, reproduction and wound healing and a close cross talk between the immune system and other body systems such as metabolism, the central nervous system and the cardiovascular system is evident.

**TYPES OF IMMUNITY**

The two major types of immunity include;

**The Active and Passive immunity**

**ACTIVE IMMUNITY**

Individuals rely on active immunity more so than the passive immunity. Active immunity is created by our own immune system when we are exposed to a potential disease causing agent. Most of the time, we are exposed to these potential pathogens naturally throughout the course of the day; in the air we breathe, the food we eat and the things we touch. Luckily, most of these exposures are to agents that will not result to disease, either because they are harmless or because our immune system works to neutralize them.

In addition to fighting off these pathogens active immunity is important because it lasts a long time in the form of immunologic memory. Immunologic memory consists of B and T cells that can recognize a particular pathogen. These cells circulate low levels in our bodies and if activated by recognizing a particular pathogen in their travels, they quickly start to multiply and signal other elements of the immune system to activate as well. Memory cells are crucial for two reasons. First, they allow our immune system to respond quickly. Second, they are specific for the pathogen, so the immune response is ready the moment the pathogen is encountered.

**NATURALLY ACQUIRED ACTIVE IMMUNITY**

Naturally acquired active immunity occurs when q person is exposed to a live pathogen and develops a primary immune response, which leads to immunological memory. This type of immunity is natural because deliberate exposure does not induce it. Many disorders of immune system function can affect the formation of active immunity such as immunodeficiency (both acquired and congenital forms) and immunosuppression.

**ARTIFICIALLY ACQUIRED ACTIVE IMMUNITY**

Artificially acquired active immunity can be induced in a vaccine, a substance that contains antigen. A vaccine stimulates a primary response against the antigen without causing symptoms of the disease. Immunologic memory develops, because vaccines are designed such that they do not cause illness, we gain the benefits of the exposure without the risks associated with fighting off a natural infection. In this way, vaccines offer our immune system a chance to train for a future encounter and provide us with a shortcut to protection.

**PASSIVE IMMUNITY**

Passive immunity is the transfer of active immunity, in the form of readymade antibodies, from one individual to another. Passive immunity can occur naturally, when maternal antibodies are transferred to the fetus through the placenta and can also be induced artificially, when high levels of human antibodies specific for a pathogen or toxin are transferred to non-immune individuals. Passive immunity is used when there is a high risk of infection and insufficient time for the body to develop its own immune response, or to reduce the symptoms of ongoing or immunosuppressive diseases. Passive immunity provides immediate protection, but the body does not develop memory, therefore the patient is at risk of being infected by the same pathogen.

Passive immunity, or immunity gained in a way other than one’s own immune system, can occur in a few ways and can be life-saving. However, passive immunity is short-lived because the antibodies are not continually replenished as they would be in an individual whose immune system is responding directly.

**NATURALLY ACQUIRED PASSIVE IMMUNITY:** Maternal passive immunity is a type of naturally acquired passive immunity, and refers to antibody-mediated immunity conveyed to a fetus by its mother during pregnancy. Maternal antibodies are passed through the placenta to the fetus by an FcRn receptor on placental cells. This occurs around the third month of gestation. IgG is the only antibody isotope that can pass through the placenta. Passive immunity is also provided through the transfer of IgA antibodies found in breast milk that are transferred to the gut of the infant, protecting against bacterial infections, until the newborn can synthesize its antibodies. Colostrum present in mother’s milk is an example of naturally acquired passive immunity.

**ARTIFICIALLY ACQUIRED PASSIVE IMMUNITY**: Artificially acquired passive immunity is a short-term immunity induced by the transfer of antibodies, which can be administered in several forms; as human or animal blood plasma, as pooled human immunoglobulin for intravenous or intramuscular use and in the form of monoclonal antibodies. Passive transfer is used prophylactically in the case of immunodeficiency diseases such as hypergammaglobulinemia. It is also used in the treatment of several types of acute infection and to treat poisoning

Passive or adoptive transfer of cell mediated immunity is conferred by the transfer of sensitized or activated T-cells from one individual ton another. It is rarely used in humans because it requires histocompatiblie donors which are often difficult to find.

**THE DIFFERENT TYPES OF ANTIBODIES AND THEIR DIFFERENT ROLES**

**Human antibodies are classified into five isotopes**;

* IgM
* IgD
* IgG
* IgA
* IgE

According to their H chains, which provide each isotope with distinct characteristics and roles.

**IgM**: is one of the first types of antibody to be produced after a pathogen has entered the body. Since it is made up of five Ig subunits bound together, it has very high avidity. In other words, it sticks very strongly to its target. IgM is very important in the early stages of an infection. IgM sometimes appears when an infection becomes reactivated, such as with a herpes outbreak. It can also appear when someone is reexposed to a disease they have previously gotten rid of. IgM is also involved in ABO blood group antigen on the surface of RBCs. IgM enhances ingestion of cells by phagocytosis.

**IgD:** is very important in the early stages of the immune response. Bound to B cells, it does not circulate; instead it signals those cells to become active. This can help to stimulate inflammation. IgD is the least understood type of antibody, and its functions are still being discovered. IgD is present on the surface of B cells and plays a role in the induction of antibody production.

**IgG:** is an antibody isotope that most people think of when they are talking about antibodies. It is the antibody that is built by immunization. It activates an immune cascade that can eliminate some forms of infection. IgG can also neutralize certain toxins. It gives a long term protection because it persists for months and years after the presence of the antigen that has triggered their production. It protects the body against bacteria, viruses, neutralizes bacterial toxins, trigger compliment protein systems and bind antigen to enhance the effectiveness of phagocytosis.

**IgA:**  It is an antibody isotope that is found in usually mucosal areas, such as the mouth and the vagina. It can also be found in saliva, tears, and breast milk. IgA is formed by two Ig subunits bound together. When IgA binds to a target, it can stimulate inflammation. In mucosal areas, IgA can also keep pathogens from sticking to epithelial cells. The production of IgA against inappropriate target is associated with certain autoimmune diseases, such as celiac disease. IgA bind antigens on microbes before they invade tissues. It aggregates the secretions so when the secretion is expelled, so is the antigen. IgA is the first defense for mucosal surfaces.

**IgE:** Is the antibody that is responsible for the allergic response. It is mostly found in the lungs, skin and mucous membranes. When IgE binds to an allergen, it starts the histamine reaction. It is the histamine reaction that causes the symptoms of an allergy attack. This single subunit antibody also helps to protect the body from parasitic worms. It binds to mast cells and basophils which participate in the immune response.