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Matric number: 17/mhs03/006

Level: 300

COLLEGE: MHS

DEPARTMENT: Nursing

Course: medical surgical nursing

**Introduction**

**Immunology is the study of the immune system and is a very important branch of the medical and biological sciences. The immune system protects us from infection through various lines of defence. If the immune system is not functioning as it should, it can result in disease, such as autoimmunity, allergy and cancer.**

**1. Role of the immune system.**

**The major function of the immune system is to protect the host from environmental agents such as microbes or chemicals, thereby preserving the integrity of the body. Specific immunity is further divided into humoral immunity, the one involved with antibody, and cellular immunity, which is orchestrated by T cells.**

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

**When a foreign matter enters the human body, our defense system recognizes this as foreign through the immune system. How the human body recognize foreign against itself employs a complex "I.D." system. Each cell in the human body carries on it's 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's cells have, but each one has unique features or antigens where the immune system attaches identifiers called antibodies. This is the basis for the specific defense mechanisms. Once you have built the antibodies for a specific antigen, the immune system will respond faster than if the had been no previous exposure to the antigen (i.e. you are immune to the pathogen, but only that specific pathogen, because your immune system responds faster.) The non-specific part of the immune system is mostly composed of phagocytes (eating-cells) which engulf and digest foreign substances like bacteria and viruses, which do not bear the body's specifc idenifers.**

**2. There are two main types of immunity:**

**a. innate, also called natural or inherited**

**b. adaptive.**

**Innate Immunity**

**Plants and animals have what is called innate immunity. Innate immunity is the first line of defense against pathogens. It involves several cell types, proteins, and even an organ. The organ involved is your skin. skin is part of the first line of defense. It protects you and prevents pathogens from getting inside your body.**

**Air, food, or a break in the skin are some ways a pathogen enters. A pathogen entering through food or air has mucus to go through. The mucosal surfaces prevent pathogens from attaching to cells and causing disease. A set of proteins called the complement system is also involved. The complement system attacks the pathogen and marks it for destruction.**

**A pathogen getting through skin and mucus will have to deal with several types of cells including phagocytes, eating cells, and natural killer (NK) cells before it can cause disease. Pathogens have warning flags on their surface.**

**Neutrophils, macrophages, and dendritic cells are all phagocytes. They recognize the warning flag, attack the pathogen, and eat it - a process known as phagocytosis. If a pathogen is too big for one cell alone, several cells attack at once.**

**NK cells on the other hand, identify infected cells (host cells) and activate the host cell's death receptor pathway or give the cell a lethal injection (injecting enzymes that degrade proteins). Host cells even try to fight back by turning off machinery that would help the pathogen and sending out distress signals.**

**If pathogens make it through all this, it's time for adaptive immunity to step in, and they do this with the help of dendritic cells.**

**Adaptive Immunity**

**Adaptive immunity works slower than innate, and is more specific. There are two types: passive and active.**

**Passive immunity occurs when antibodies are passed from one person to another, as through transfusion for example.**

**The active immunity involves two types of white blood cells - T-cells and B-cells. Dendritic cells, after they have eaten and digested the pathogen, present the pathogen pieces to T-cells, which activates (turns on) the T-cells.**

**3. The different types of antibodies .**

**Antibodies are specialized proteins made by the immune system. They help the body fight against infections and disease by "recognizing" viruses, bacteria, and infected cells. Each antibody binds to a specific antigen associated with a danger signal in the body. This antigen is also known as the antibody's target**

**Human antibodies are classified into five isotypes (IgM, IgD, IgG, IgA, and IgE) according to their H chains, which provide each isotype with distinct characteristics and roles. IgG is the most abundant antibody isotype in the blood (plasma), accounting for 70-75% of human immunoglobulins (antibodies).**

**All classes are named using the convention Ig\*, where Ig stands for immunoglobulin and \* is the designation for the specific isotype.**

**There are five different antibody isotypes seen in humans: IgG, IgA, IgM, IgE, and IgD.2﻿**

**1. IgG is the antibody isotype that most people think of when they're 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.﻿**

**2. IgA is the antibody isotype 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 targets is associated with certain autoimmune diseases, such as celiac disease.**

**3. 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've previously gotten rid of.**

**4. 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's the histamine reaction that causes the symptoms of an allergy attack. This single subunit antibody also helps to protect the body from parasitic worms.**

**5. IgD is 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**

**Roles of the antibodies**

**a. IgG provides long term protection because it persists for months and years after the prescence of the antigen that has triggered their production.**

**b. IgG protect against bacteris, viruses, neutralise bacterial toxins, trigger compliment protein systems and bind antigens to enhance the effectiveness of phagocytosis.**

**c. Main function of IgA is to bind antigens on microbes before they invade tissues. It aggregates the antigens and keeps them in the secretions so when the secretion is expelled, so is the antigen.**

**d. IgA are also first defense for mucosal surfaces such as the intestines, nose, and lungs.**

**e. IgM is involved in the ABO blood group antigens on the surface of RBCs.**

**f. IgM enhance ingestions of cells by phagocytosis.**

**g. IgE bind to mast cells and basophils wich participate in the immune response.**

**h. Some scientists think that IgE’s purpose is to stop parasites.**

**I. IgD is present on the surface of B cells and plays a role in the induction of antibody production.**