**NAME: RASAQ NASIRAT OMOLARA**

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**COURSE TITLE: MEDICAL SURGICAL NURSING II**

**COURSE CODE: NSC 306**

**ASSIGNMENT TITLE: BASIC IMMUNOLOGY**

**QUESTION:**

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

 **INTRODUCTION**

The immune system is a network of cells, tissues and organs that work together to defend the body against attacks by “foreign” invaders. It is a host defense system comprising many biological structures and processes within an organism that protects against disease.

1. **THE ROLE OF THE IMMUNE SYSTEM**

The role of the immune system is to protect the body from any foreign matters that might cause any damage or homeostasis imbalance. The success of the immune system depends on its ability to discriminate between foreign (non self) and host (self) cells. The immune system act to provide protection when an organism is threatened by microorganisms, viruses or cancer cells. Each cell in the human body carries on it’s surface a mixture of proteins and sugars that serves to identify the cell to the immune system. Foreign materials lack the identifier that all the body’s cells possess but each has unique feature or antigen. Antibodies is where the immune system attaches it’s identifier. This is the basic for the specific defense mechanisms. As soon as the antibodies is built for a specific antigen, the immune system will response faster than if there had been no previous exposure to the antigen. 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 possess specific identifiers.

1. **TYPES OF IMMUNITY**

There are two major types of immunity:

1. Innate immunity: Plant and animal possess what is called innate immunity. Innate immunity is also called native immunity, exists by virtue of an organisms constitution, that is, its genetic make-up, without an external stimulation or a previous infection. It is divided into two types:
2. Non-specific innate immunity; a degree of resistance to all infections in general.
3. Specific innate immunity; a resistance to a particular microorganism only.

 The innate response is usually triggered when microorganisms are identified by pattern recognition receptors, this system does not confer lasting immunity against pathogens. Innate immunity is the first line of defense against pathogens, it involves several cell types, proteins and organs.

1. Pattern recognition by cells: cells in the innate immune system use pattern recognition receptors to recognize molecules and structures that are produced by the pathogens. They are proteins expressed mainly by cells of the innate immune system such as dendritic cells, macrophages, monocytes, neutrophils and epithelial cells. Cytosolic receptors (detect infection or cell damage in the cytosol), toll-like receptors(detect extracellular or endosomal pathogen) and inflammasomes (generate active forms of the inflammatory cytokines)
2. Surface barriers: Several barriers protect organisms from infection, including mechanical, chemical and biological barriers. The waxy cuticle of most leaves, the exoskeleton of insects, the shells and membrane of externally deposited egg and skin are examples of mechanical barrier that are the first line of defense against infection. Chemical barrier also protect against infection. The skin and the respiratory tract secrete anti microbial peptides such as beta-defensins. Enzymes such as lysozyme and phospholipase A2 in saliva, tears and breast milk. Vaginal secretion serves as chemical barrier following menarch while semen contains defensin and zinc to kill pathogens, gastric acid in the stomach e.t.c
3. Phagocytosis: it is an important feature of innate immunity performed by cells called phagocytes that engulf or eat pathogensor particles.
4. Inflammation: inflammation is one of the first line responses of the immune system to infection. The symptoms of inflammation are redness, swelling, heat and pain which are caused by increased blood flow into tissue. Inflammation is produced by eicosanoids and cytokines which are into the injured or infected cells.
5. Adaptive immunity: it works slower than innate immunity and it is more specific. It involves two types of white blood cells; T-cell and B-cells. Adaptive immunity can be sub-divided into:
6. Passive immunity: it is acquired through transfer of antibodies or activated T-cell from an immune host, it short lived usually last a few months. It can also be divided into:
7. Natural immunity: this type of immunity is acquired by maternal transfer through placenta and breast feeding which is usually short lived.
8. Artificial immunity: this is the inoculation of specific antibodies, immune serum globulin containing antibodies e.g, Anti tetanus Serum.
9. Active immunity: this occurs when there an exposure to an antigenic stimulus. The host produces its own corresponding antibodies. It also divided into:
10. Natural immunity: the immunity is when an individual is infected by the disease causing agents
11. Artificial immunity: the immunity is acquired through inoculation of infectious agents in form of vaccines, dead, live or attenuated e.g typhoid, BCG e.t.c

Adaptive immunity can also be divided by the type of immune mediators involved; ***humoral immunity*** is the aspect of immunity that is mediated by secreted antibodies, whereas ***cell mediated immunity*** involves T-lymphocytes alone.

 **3. DIFFERENT TYPES OF ANTIBODIES AND THEIR ROLES**

Antibodies are proteins produced and secreted by B cells. They bind to foreign substances that invade the body such as pathogen. Antibodies activate the complement system to destroy bacterial cells called lysis and they also facilitate phagocytosis of foreign substances by phagocytic cells. Human antibodies are classified into five isotypes (IgM, IgD, IgA and IgE) according to their H chains, which provide each isotypes with distinct characteristics and roles:

1. IgG: this is the most abundant antibody isotype in the blood (plasma),accounting for 70-75% of human immunoglobulin(antibodies). IgG detoxifies harmful substances and is important in the recognition of antigen-antibody complexes by leukocytes and microphages. IgG is transferred to the fetus through the placenta and protects the infant until its own immune system is functional.
2. IgM: this usually circulates in the blood, accounting for about 10% of human immunoglobulins. IgM has a pentameric structure in which five basic Y-shape molecules are linked together. B cells produce IgM first in response to microbial infection/antigen invasion. Although IgM has a lower affinity for antigens than IgG, it has higher avidity for antigens because of its pentameric/hexameric structure. IgM, by binding to the cell surface receptor, also activates cell signaling pathways.
3. IgA: this is abundant in serum, nasal mucus, saliva ,breast milk and intestinal fluid, accounting for 10-15% of human immunoglobulins. IgA forms dimmers ( i.e two IgA monomers joined together). IgA in breast milk protects the gastrointestinal tract of neonates from pathogens.
4. IgE: this is present in minute amounts, accounting for no more than 0.001& of human immunoglobulins. Its original role is to protect against parasites. In regions where parasitic infection is rare, IgE is primarily involved in allergy.
5. IgD: IgD accounts for less than 1% of human immunoglobulins. IgD may be involved in the induction of antibody production in B cells, but its exact function remains unknown.