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MEDICAL SURGICAL ASSIGNMENT

1. **ROLE OF THE IMMUNE SYSTEM**

The role of the immune system is to protect our body from any foreign matters that might cause any damage or homeostatic 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 specific identifiers.

1. **The two types of immunity**

**Types of Immunity:**

There are two major types of immunity: innate or natural or nonspecific and acquired or adaptive.

**(A) Innate or Natural or Nonspecific Immunity:**

Innate immunity is inherited by the organism from the parents and protects it from birth throughout life. For example humans have innate immunity against distemper, a fatal disease of dogs.

As its name nonspecific suggests that it lacks specific responses to specific invaders. Innate immunity or nonspecific immunity is well done by providing different barriers to the entry of the foreign agents into our body. Innate immunity consists of four types of barriers— physical, physiological, cellular and cytokine barriers.

**1. Physical Barriers:**

They are mechanical barriers to many microbial pathogens. These are of two types. Skin and mucous membrane.

**(a) Skin:**

The skin is physical barrier of body. Its outer tough layer, the stratum corneum prevents the entry of bacteria and viruses.

**(b) Mucous Membranes:**

Mucus secreted by mucous membrane traps the microor­ganisms and immobilises them. Microorganisms and dust particles can enter the respiratory tract with air during breathing which are trapped in the mucus. The cilia sweep the mucus loaded with microorganisms and dust particles into the pharynx (throat). From the pharynx it is thrown out or swallowed for elimination with the faeces.

**2. Physiological Barriers:**

The skin and mucous membranes secrete certain chemicals which dispose off the pathogens from the body. Body temperature, pH of the body fluids and various body secretions prevent growth of many disease causing microorganisms. Some of the important examples of physiological barriers are as follows:

1. Acid of the stomach kills most ingested microorganisms
2. Bile does not allow growth of microorganisms,
3. Cerumen (ear wax) traps dust particles, kills bacteria and repels insects,
4. Lysozyme is present in tissue fluids and in almost all secretions except in cerebrospinal fluid, sweat and urine. Lysozyme is in good quantity in tears from eyes. Lysozyme attacks bacteria and dissolves their cell walls. Lysoenzyme is also found in saliva,
5. Nasal Hair. They filter out microbes and dust in nose,
6. Urine. It washes microbes from urethra,
7. Vaginal Secretions. It is slightly acidic which discourages bacterial growth and flush microbes out of vagina,
8. Sebum (sweat). It forms a protective acid film over the skin surface that inhibits growth of many microbes.

**3. Cellular Barriers:**

These are certain white blood corpuscles (leucocytes), macroph­ages, natural killer cells, complement system, inflammation, fever, antimicrobial substances, etc.

**(B) Acquired Immunity (= Adaptive or Specific Immunity):**

The immunity that an individual acquires after the birth is called acquired or adaptive or specific immunity. It is specific and mediated by antibodies or lymphocytes or both which make the antigen harmless.

It not only relieves the victim of the infectious disease but also prevents its further attack in future. The memory cells formed by В cells and T cells are the basis of acquired immunity. Thus acquired immunity consists of specialized В and T lymphocytes and Antibodies.

**Characteristics of Acquired Immunity:**

**(i) Specificity:**

It is the ability to differentiate between various foreign molecules (for­eign antigens).

**(ii) Diversity:**

It can recognise a vast variety of foreign molecules (foreign antigens).

**(iii) Discrimination between Self and Non-self:**

It can recognise and respond to foreign molecules (non-self) and can avoid response to those molecules that are present within the body (self) of the animal.

**(iv) Memory:**

When the immune system encounters a specific foreign agent, (e.g., a microbe) for the first time, it generates immune response and eliminates the invader. This is called first encounter. The immune system retains the memory of the first encounter. As a result, a second encounter occurs more quickly and abundantly than the first encounter.

The cells of the immune system are derived from the pluripotent stem cells in the bone marrow. Pluripotent means a cell that can differentiate into many different types of tissue cells. The pluripotent stem cells can form either myeloid stem cells or lymphoid stem cells.

Myeloid stem cells give rise to monocytes, macrophages and granulocytes (neutrophils eosinophil’s, and basophils). RBCs and blood platelets (lymphoid stem cells) form В lym­phocytes (B cells), T lymphocytes (T-cells) and natural killer (NK) cells.

### Components of Acquired Immunity:

Acquired immunity has two components: humeral immunity or Antibody mediated immune system (AMIS) and cellular immunity or cell mediated immune system (CMIS).

#### I. Antibody Mediated Immune System (AMIS) or Humoral Immunity:

It consists of antibodies (specialised proteins produced in the body in response to antigen) that circulate in the body fluids like blood plasma and lymph. The word ‘humor’ pertains to fluid. В lymphocytes (B cells) produce antibodies that regulate humoral immunity. The T-lymphocytes themselves do not secrete anti-bodies but help В lymphocytes produce them.

#### II. Cell-Mediated Immune System (CMIS) or Т-Cell Immunity:

A healthy person has about a trillion lymphocytes. Lymphocytes are of two types: T lymphocytes or T cells and В lymphocytes or В cells. As we know both types of lymphocytes and other cells of the immune system are produced in the bone marrow. The process of production of cells of immune system in the bone marrow is called haematopoiesis.

1. **The different types of antibodies and their roles**
2. **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.
3. **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.
4. **IgM:** is one of the first types of antibody to be produced after a [**pathogen**](https://www.verywellhealth.com/what-is-a-pathogen-1958836) 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.
5. **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](https://www.verywellhealth.com/what-is-histamine-200964) 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.
6. **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.

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