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Role of innate immunity in human being

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Abstract

Innate immunity is the defense system with which we were born. It protects us against all antigens innate immune system defends the host from infections caused by bacteria, viruses. It is of four types physical, physiological, cellular and cytokine. This type of immunity is not as strong as acquired immunity. Innate immunity is inherited from the parents and it is not specific. It acts the same for all foreign bodies entering the body. Innate immunity's the main function is to stop the spread of infections until the adaptive immune system starts working. Examples of Innate immunity include cough reflexes, enzymes in tears and skin oils, mucus which traps bacteria and small particles. Innate immune system acts as physical and chemical barrier to infectious agents.

Keywords: Innate immunity, Antigens, Bacteria, Virus, infection, physical, Chemical Barrier

Introduction

In our everyday life we encounter harmful diseases caused by organism like bacteria or viruses. But most of the people does not affected by these and live life without being sick. That is because the human body has systems which fight against these harmful organisms. This system is known as immune system. There are two main classes of the immune system and first is innate immune system and the other is adaptive immune system or acquired immunity (Anon 2021). In this chapter we will discuss the innate immune system.

Innate immune system

The innate immune system is made up of defenses against infection which activates immediately as pathogens attacks.[2]innate immune system is made up of certain barriers that aim to keep away viruses, parasites, bacteria and other foreign particles out of our body or limit their ability to spread in our body. Innate immune system is the defense system with which we were born. It protects us against all foreign bodies. Immunity that is present at birth and lasts a person whole life is known as innate immunity. Innate immunity first responds to a harmful foreign substances .When harmful foreign substances like bacteria (Janeway *et al.* (2001). viruses enter the body certain cells present in the immune system quickly respond and try to destroy them. Certain barriers such as skin, mucus membrane, stomach acid, tears, help to keep away harmful substances from entering the body (Mayer 2018).

Type of innate immunity

Innate system has four types of barriers that protect the body from pathogens.

1. **Physical barriers:** The skin and mucus membranes of the respiratory and digestive tracts are physical barriers that help to prevent various infections (Abutarbush 2007). Secretions from these areas like saliva, tears, sweat, and mucous help and act as a barriers (Stvrtinovo *et al.* 1995).
2. **Physiological barriers:** These barriers include physiological secretions. Their function is to prevent growth of microorganism which are capable of passing the physical barrier. These include sweat, saliva and acid secreted in the stomach.
3. **Cellular barrier:** These barriers destroy and eliminate microbes entering the body. It is carried out by white blood cells such as leucocytes, monocytes natural killer cells and macrophage. They do by phagocytosis.
4. **Cytokine barriers:** The cells which have been infected by virus starts secreting interferon which prevents the spread of infection. They protect the

non infected cell from infections (Lotze & Tracey 2005).

Term related to innate immunity

Self: Self refers to protein particles and other molecules that are a part of or made by our body. They can be found circulating in our body (in blood or attached to different tissues). These self particles should not be targeted by immune system. This non reactivity of the immune system to self particles is called tolerance.

Non self: These particles are not made by human body and are recognized potentially harmful. These are also called foreign bodies. These foreign bodies can be bacteria, viruses, parasites, pollen grains, dust and toxic chemicals. The non self particles and foreign bodies that are infectious or pathogenic, like bacteria, viruses and parasites make proteins called antigens that allow the human body to know that they intend to cause damage.

Antigens causes an immune response. Antigens are a common term used for each pathogen that announce the pathogens presence in our immune system. Some pathogens are general whereas others are very specific. A general antigen is dangerous whereas specific antigen is a bacteria that will cause an infection in gastrointestinal tract or a influenza virus.

Cytokines: Cytokines are molecules that are used for cell signaling, or cell to cell communication. Cytokines are similar to chemokines wherein they can be used to communicate with neighboring or distant cells about initiating an immune response. Cytokines are also used to 40 trigger cell trafficking or movement to specific area of the body.

Chemokines: These are a special type of cytokines released by infected cells .Infected host cell release chemokines in order to initiate an immune response and to warn neighboring cells.

Cells of Innate Immune System

White blood cells or leucocytes present in the circulatory system work to defend and protect the human body. The following cells are leucocytes of the innate immune system.

Phagocytes or phagocytic cells: Phagocyte means eating cells which describes the role of phagocytes in immune response. Phagocytes act as security guards in the human body. Phagocytes circulate throughout the body. Looking for potential threats like bacteria and viruses to engulf and destroy.

Macrophages: Macrophages are efficient phagocytic cell that can leave the circulatory system by moving across the capillary vessels walls. By this ability of moving outside the cells walls allows macrophages to hunt pathogens with less limits. Macrophages can also release cytokines in order to signal and recruit. Other cells to an area with pathogens.

Mast cells: Mast cells are found in mucous membrane and connective tissues and are in important for wound healing and defense against pathogens via inflammatory response .Activated mast cells release cytokines and granules that contain chemical molecules to create an inflammatory cascade

Neutrophils are phagocytic cells that contains granules in their cytoplasm .That is why they are also known as granulocytes. These granules are very toxic to bacteria and fungi and cause them to stop proliferating or die on contact. The bone marrow of an average healthy adult makes approximately 100 billions new neutrophils per day (Janeway *et al*. 2005). Neutrophils are typically the first cells to arrive at the site of infection because they are present in the circulation at any given time

Eosinophils: Eosinophils make up 1-6% of white blood cells and are found in many locations like thymus, lower gastro intestinal tract, ovaries, uterus, spleen and lymphnodes. Eosinophils secrete highly toxic proteins and free radicals that kill bacteria and parasites.

Basophils: Basophils are also granulocytes that attack multi-cellular parasites. Basophils release histamine. The use of histamine plays a key role in mounting and an allergic response

Natural Killer Cells: Natural Killer cells (N K Cells) do not attack pathogens directly. N.K. cells destroy infected host cells in order to stop the spread of an infection. Infected host cells can signal N K cell

for destruction through the expression of specific receptors and antigen presentation

Dendritic Cells: Dendritic cells are antigen presenting cells that are located in tissues, and can contact external environment through the skin, the inner mucosal lining of the nose, stomach, lungs and intestine . Since dendritic cells are located in common points for initial infections, they can easily identify infection and acts as messengers for the rest of immune system Dendritic cells also act as bridge between the innate immune system and the adaptive immune system .

Complement System (Mechanism of innate immunity)

The compliment system is a mechanism that complements other aspects of the immune response. Complement system acts as a part of the immune system. It can also work with the adaptive immune system if necessary. The compliment system is made of a variety of proteins circulate in the blood in inactive state. When activated these proteins collectively initiate the compliment system, which starts the following steps-

1. **Opsonization:** Opsonization is a process in which foreign particles are marked for phagocytosis. Since all the pathways require an antigen to signal that there is a threat present. Opsonization detect infected cells and identifies circulating pathogens expressing the same antigens.
2. **Chemotaxis:** Chemotaxis is the attraction and movement of macrophages to a chemical signal. Chemotaxis uses cytokines and chemokines to attract macrophages and neutrophils to the infection site and destroy the area covered by pathogens.
3. **Cell Lysis:** Lysis is the breaking down or destruction of the membrane of a cell. The proteins of the compliment system puncture the membranes of foreign cells, destroying the integrity of the pathogen. By destroying the membrane of foreign cells this process weakens the ability to proliferate, and helps to stop the spread of infection.
4. **Agglutination:** Agglutination uses antibodies to cluster and bind pathogens together. By bringing many pathogens together, the cells of the immune system can mount an attack and weaken the infection. Other innate immune system cells continue to circulate throughout the body in order to track down any other pathogens that have not been clustered and bound for destruction.

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