Name: Adams Sefinat Oyindamola

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1. Explain roles 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 homeostasis 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 defence 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 defence 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.

2. Describe the two types of immunity.

The two types of immunity are

   A. Innate Immunity

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

So, what are some ways a pathogen gets inside? 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 that say: 'I don't belong here'.

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.

B. 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. Explain the different types of antibodies and their roles.

The 5 types of antibodies

A. IgG

B. IgM

C. IgA

D. IgD

E. IgE

They are classified according to the type of heavy chain constant region, and are distributed and function differently in the body.

Functions of Antibody

1. IgG provides long term protection because it persists for months and years after the presence of the antigen that has triggered their production.
2. IgG protect against bacteria, viruses, neutralise bacterial toxins, trigger compliment protein systems and bind antigens to enhance the effectiveness of phagocytosis.
3. 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.
4. IgA are also first defence for mucosal surfaces such as the intestines, nose, and lungs.
5. IgM is involved in the ABO blood group antigens on the surface of RBCs.
6. IgM enhance ingestions of cells by phagocytosis.
7. IgE bind to mast cells and basophils which participate in the immune response.
8. Some scientists think that IgE's purpose is to stop parasites.
9. IgD is present on the surface of B cells and plays a role in the induction of antibody production.