Jonathan Quang 12/10/14

Biology- Ms.Prabhu

Homework #13

Part I:  
1.skin, digestive, respiratory, urogenital  
2.phagocytic, natural killer, inflammatory response, fever  
3.anigens, antibodies, T-cell receptors,  
4.light, heavy, variable, constant, variable  
5.Humoral, plasma cells, cell-mediated, cytotoxic, Helper, memory  
6.vaccine  
7.allergy, immune deficiency, autoimmune disease

Part II:  
3.Humoral immunity involves the

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|  | Humoral Immunity | Cell-mediated immunity |
| Types of immune cells involved | B cells and the plasma and memory cells that are differentiated from the B cells | Cytotoxic T cells  Helper T cells Effector T cells Memory T cells |
| Location of antibodies and receptors that bind foreign antigens | In B cells, the antigens bond to an antibody that is on the surface of the B cell. Plasma cells have antibodies produced on its surface that can detach and bind to pathogens. Memory cells have antibodies on their surface. | The T-cell receptor is located on the surface of cytotoxic T cells, memory t cells, helper T cells, and effector T cells. |
| Mechanisms by which invading cells are destroyed. | There are many B cells in the body that each have their own unique antibody. When an antigen binds to an antibody, that B cell begins multiplying rapidly. Eventually, some of the clones differentiate into plasma cells and memory B cells. Plasma cells become enlarged and packed with rough ER, which synthesizes huge quantities of antibodies. These antibodies are released into the bloodstream to bind to the same antigen binding site that was found in the antibodies located on the surface of the original parent B cell. These large amount of antibodies may bind to a foreign molecule, virus, or cell and render it harmless, mark the surface of pathogens and invading molecules to make it easier for phagocytes to destroy them, and causing complement proteins to punch holes in the plasma membrane of a microbe or making it easier for phagocytes to ingest the invaders. | When a cell is infected by a virus, some pieces of viral proteins are brought to the surface of the infected cell and can be recognized by some cytotoxic T cells. Each cytotoxic T Cell has its own unique receptor that binds to a certain viral antigen. The cytotoxic T cell then begins to squirt proteins onto the surface of the infected cell, causing pores to form on the infected cell's plasma membrane. The T cell also secreted enzymes that pass through the pores, killing the infected cell. If the infected cell is killed before the virus is finished multiplying, then the virus cannot spread from that cell. Helper T-cells direct and activate cells that can kill pathogens. Phagocytes perform antigen presentation when they kill a pathogen. The helper t-cell will actually attach itself to a phagocyte that has presented its antigen. The helper t-cell communicates the location of infection to other immune cells. The helper T cell makes more copies of itself, and some copies become effector T cells that travel around, stimulating other lymphocytes to take action. Most copies become memory T cells. These T cells "remember" what the intruder was and protects the body from the intruder if it enters the body again. |

4.

The variable regions at the tips of the arms of an antibody are what binds to antigens. Each antibody binds only to a specific antigen because the bonding sites have a certain size, shape, and electrical charge, so only certain antigen molecules can fit in and bind to the antibody. These uniqueness of each sites makes it so that the antibody can only bond to a few similar molecules.

7. Memory cells are cells that have differentiated from B or T cells that bear the same antibodies or T-cell receptors as their original parent cells. Memory cells contribute to long lasting immunity to specific diseases by "remembering" the foreign molecule or organism that invaded the body. There are many more memory cells that respond to the second infection than B or T cells that respond to the first infection. In addition, memory cells respond to the invader faster than the original parent cells could. This response is so fast that the body can get rid of the invaders without experiencing any of the associated disease sympotms.

8. A vaccination is a substance containing weakened or dead microbes. This confers immunity to a disease because the body will generate many memory B or T cells that recognize that microbe. If the microbe were to invade the body, it would face a greater opposition of B and T cells than if the body were never exposed to it prior.

Part III:  
3. Cyclosporine prevents rejection of transplanted organs by reducing the amount of helper T cells. Under normal circumstances, the body would recognize at least some parts of the transplanted organs as a foreign invader because the transplanted organs would contain MHC proteins that do not belong to the recipient of the organ. The MHC functions as an antigen, so the body marks it as foreign. Eventually, B cells and/or cytotoxic T cells will mark the foreign cells for phagocytes to consume or try to destroy it. By reducing the amount of helper T cells, which cause more B and T cells to be produced, the amount of B cells and T cells will be reduced. By reducing B cells and T cells, the foreign cells will live.   
If patients receive successful transplants, then some of them will develop various kinds of cancers because of the medicine that is taken to ensure the transplants works. The medicine taken reduces the immune system's ability to destroy foreign cells in a manner described in the paragraph above. Cancer cells are also considered to be foreign by the body, so the immune system will try to destroy the cells. If the ability of the immune system is diminished, the cancer cell may be left alive. When cancer cells are left alive, they proliferate.

Part IV:

1. Clonal selection is the process by which B and T cells function and reproduce in the body. Each B and T cell has antibodies that bind to a specific antigen. The ones that do bind to that antigen are the ones the multiply into genetically identical cells. This eventually produces B and T cells that combat that specific disease.

Part V:  
1. The three main jobs of the immune system is identifying foreign invaders, eliminate them, and make sure that if they do come back, the immune system can easily deal with it.  
2.A pathogen is a virus or organism that can harm the body.  
3. The two main ways to fight infection or innate (non-specific) immunity and acquired (adaptive) immunity. The innate immunity treats all pathogens the same and does so very quickly. The acquired immunity takes more time to go into effect and must learn how to combat the pathogen.   
4. The acquired immunity system gives humans the advantage because only vertebrates have an acquired immune system.  
5. The bodies' first line of defense are the skin and mucous membranes.  
6. Mucus is a viscous fluid that is produced wherever the body's interior is exposed. Its function is to trap and sweep microbes away.  
7.The second line of defense is the inflammatory response.  
8.Mast cells constantly search for unknown proteins and release signaling molecules when they find them.  
9.Histamine is one of the signaling molecules mast cells release when they find an unknown protein. This helps the body fight infection because it causes the blood vessels to be more permeable. This allows more fluid to flow into the affected area. Some of the fluid will carry white blood cells and other infection fighting cells that will fight the infection. The sheer amount of fluid that ends up at the site of infection contributes to inflammation.  
10. An allergic reaction occurs when a generally harmless substance enter the body and causes an inflammatory response despite the fact that the substance is not dangerous at all. They occur because mast cells will produce histamine in response to the harmless substance. This produces inflammation in the process mentioned in part five, question nine.  
11.An antihistamine works by suppressing the histamine triggers. Less histamine means less inflammation.  
 12.Leuokyocytes are white blood cells, the cells that carry most of the immune system's functions.  
13. The central nervous system is the one place where leukocytes cannot go. This includes the brain and spinal cord.  
14. Phagocytes help the body fight infection by chasing, grabbing, and consuming microbes that may cause harm.  
15. Pus is composed of the dead bodies of neutrophils after they have killed a microbe and died in the process.  
16. Macrophages are special because they can detect cells that have gone rogue (such as cancer cells) and kill them, can eat up to a hundred bacterium before they die, and do not move much as they guard certain places of the body.  
17. The only type of phagocyte that destroys other human cells are natural killer cells. Any cell that does not have matching MCH proteins is killed.  
18.MCH is a protein that is found on the surface of a cell. It stands for major histocompatibility complex. This is important because abnormal cells, such as cancer cells or infected cells, will not produce the proper MCH protein or produce none at all. Any cell that does not have the MCH protein is killed.  
19.Dendritic cells are found wherever the surface of the body is exposed to the environment, such as the nose and stomach. The two major functions of dendritic cells are to eat pathogens and pass information about the pathogen to the spleen and lymphatic system where the information is passed onto the acquired immune system.  
20. An antigen is anything that causes the immune system to identify a pathogen and then create an antibody against it.  
21.Antibodies are highly specialized proteins that recognize and slow/pacify intruders. They contribute to immunity by identifying a specific pathogen and alerting phagocytes to the pathogen's position.  
22. The two major types of lymphocytes are B cells that originate and mature from bone marrow and T cells that originate from bone marrow and originate from the thymus gland right behind the breastbone.  
23. The two types of acquired immunity are the cell-mediated response and the humoral response.  
24.In cell-mediated response, helper T-cells direct and activate cells that can kill pathogens. Phagocytes perform antigen presentation when they choose to present the shredded up proteins of the pathogen they had consumed as antigens. The helper t-cell will actually attach itself to a phagocyte that has presented its antigen. The antigen producing cell produces interleukin I which informs the helper T cell that a pathogen has been found and eliminated. The helper T cell produces interleukin II, which informs lymphocytes that there is a problem in that location. The helper T cell makes more copies of itself, and some copies become effector T cells that travel around, stimulating other lymphocytes to take action. Most copies become memory T cells. These T cells "remember" what the intruder was and protects the body from the intruder if it enters the body again.  
25.Cytotoxic T cells kill cells that produce an antigen if the cell presenting the antigen was infected.  
26. The humoral response differs from cell mediated response because the humoral response deals with pathogens that have yet to cause harm in the body's fluids while the cell mediated response deals with cells that are already infected.  
27. In the humoral response, B cells are patrolling the body. They are surrounded by many antibodies. Upon getting a signal from a helper T-cell, the B cells will attempt to use their antibodies to recognize the pathogen. If the B cell recognizes the pathogen, it will begin to produce more clones of itself with that antibody. Some copies differentiate into plasma cells, which release up to 200 antibodies per second. These antibodies bind to many pathogens, marking them for phagocytes to engulf. Most copies differentiate into memory cells that "remembers" the antigen of the pathogen and sticks around the body to prevent another major infection by the same pathogen.