

Immunology Worksheet

- What is the general organization of the lymphatic and immune systems?
- What are the functions of the immune system?
- What are the two primary lymphoid organs and what is their structure and function?
- What are the secondary lymphoid organs and what is their structure and function?
- Where do immune cells arise and how?
- What are the immune cells and what is the general function of each?
- What is a pathogen and what are the general classifications of normal pathogens?
- Assuming that you had a vial of *E. coli* (or other pathogen) in your hand, without trauma, what are the ways that it COULD enter your blood?
- What First Line of Defense mechanisms prevent the entry of the bacterium into your blood?
- How could the First Line of Defense be circumnavigated either by the bacteria or other sources?
- If the First Lines of Defense are breached, what happens then?
- What is meant by the Second Line of Defense and what allows for the existence of the Second Line?
- Alright, the pathogen has entered your body. What is the generalized structure of each of the types of pathogens specifically in regards to their surfaces and size?
- What is an antigen? What is it generally made of? What are the purposes of antigens?
- What is an epitope (some books refer to it as an antigenic determinant)? Why is an epitope special?
- What is a hapten? What would be needed for a hapten to cause an immune response?
- What is the target location in the body of a bacterium? A virus? Fungi? A protozoan? A worm?
- What is meant by intracellular and extracellular?
- When a pathogen enters the body, inflammation and fever usually occur. What are the hallmark signs of inflammation and what are the benefits of inflammation? What actually causes inflammation?
- What are cytokines? Prostaglandins? Leukotrienes?
- How is body temperature regulated? How do pathogens alter body temperature and why? Is there any benefit, immunologically, to us?
- Assuming the pathogen that entered you is an extracellular bacteria, compliment would be activated. What is compliment? How is compliment activated? What is the resulting structure of compliment activation? What happens to the bacterium as a result of compliment activation?
- Bacteria have entered the body and tissue has been traumatized, immune cells are “called” to the area. How?
- What immune cell shows up first on the scene and how does it “know” to be there? How does it get there?
- How does a neutrophil aid in immunity? What is the lifespan of a neutrophil?
- What is this process called phagocytosis (5 steps)?
- A monocyte is activated to become a macrophage and is called to the site. What is the job of the mighty macrophage?
- A dendritic cell does much the same job as a macrophage. Another word for them is an antigen-presenting cell (APC). How does an antigen-presenting cell differ from an ordinary phagocytic cell like a neutrophil?
- What line of defense would each of the following be classified as: neutrophil? Macrophage? Dendritic cell?
- What is a major histocompatibility complex (MHC)?
- What classes of MHC molecules exist? What cells would have each type of MHC molecules?
- How do MHC molecules aid in “presenting” antigen?
- How does a MHC get antigen to “present” and how does it display antigen?
- What types of antigen does each class of MHC present?
- Once an antigen-presenting cell has antigen to present, where does it go? How does it get there (vessel pathway)?
- What is the general organization of a lymph node?
- What does an antigen-presenting cell do inside the lymph node?
- Where does a B cell (lymphocyte) come from? How many different B cells are there?

- What is a B-cell receptor (BCR)? And what is its structure?
- Once made, there are enough B cells to literally fight anything, including our own cells, what happens to B cells that have B-cell receptors that can attack body tissues? Where does this occur?
- Where do B cells reside in the body?
- What line of defense would B cells be classified as? Why? Which arm?
- What happens when a B cell encounters an antigen-presenting macrophage or dendritic cell that has a MHC class II molecule with an epitope which can bind to the antigen-determining region of the B-cell receptor?
- What would happen if the B cell did not have a B-cell receptor that recognized the epitope?
- What is the role of a T helper 2 cell in B cell activation?
- What would happen if a T helper 2 cell did not activate the B cell?
- When might T helper 2-activation not be required for the B cell to become active?
- What two populations of cells are produced as a result of B-cell activation?
- What is a plasma or B effector cell? What does a plasma cell produce?
- What is the structure of an antibody (immunoglobulin)? How does it differ from the B-cell receptor of the initially activated B cell?
- What are the five classes of antibodies that can be produced from a B cell? What is the structure of each class?
- Does the plasma cell fight the antigen, or do the antibodies fight the antigen?
- What are the different ways antigen can be fought?
- How long does it take for a B cell response to be mounted against extracellular pathogens?
- What is the first antibody produced on initial infection of the pathogen?
- What happens to the antibody produced by the plasma cell at about 5 days into the B cell response?
- What is a B memory cell and how does it function in immunity?
- What might happen if T helper 2 cells declined in number?
- What are the characteristics of a worm that might make defending the body against it different than a bacterium?
- What cells are present in the body to aid in the fight against parasitic worms?
- How is this accomplished? Or is it?
- How might the body protect itself against either a fungal or protozoan pathogen?
- What is a virus? What is its structure? Where is it typically located in the body?
- What might be different about an intracellular bacterium?
- What is cancer and how might a cancer cell be detected by the body cells?
- What is a T cell (lymphocyte)? Where does a T cell come from?
- What is a T-cell receptor (TCR) and how many different types of T cells are there?
- How can you differentiate one class of T cell from another?
- What is the structure and role of the T-cell receptor?
- What is the structure and role of a CD4 or CD8 marker?
- What are the different types of T cells called? What does each type recognize?
- There are millions of different T cells initially produced that can bind to (or recognize) almost anything in the world including our own cells and tissues. How and where is a T cell educated to not attack body structures?
- A body cell has either a virus, an intracellular bacterium or is cancerous. A naïve T cell encounters this cell. What does the T-cell receptor bind to on the surface of that cell? What about the CD marker?
- Which type of T cell binds to the cell?
- What line of defense would a T cell be classified as? Why? Which arm?
- On the body cell, if the MHC class one marker is altered, that might mean, what?
- On the body cell, if the MHC class one marker is missing entirely, then what?
- Which T-cell biomolecule recognizes the Class I MHC marker?
- On the body cell, if the MHC class I marker is holding a self-antigen, then?

- On the body cell, if the MHC class I marker is holding a foreign antigen, then?
- What happens to the cytotoxic T cell if the CD8 marker recognizes the MHC class I molecule and the T-cell receptor recognizes the antigen (regardless of if it is self or foreign)?
- What is the role of T helper 1 cells in activating a cytotoxic T cell?
- What happens if a T helper 1 cell does not activate the cytotoxic T cell?
- What happens if the cytotoxic T cell is activated by a T helper 1 cell?
- What populations of cells are created as a result of cytotoxic T-cell activation?
- How do effector cytotoxic T cells differ from the cytotoxic T cell that was initially activated?
- What is the job of activated cytotoxic T cells? How do they perform this function?
- What is the ultimate result of cytotoxic T cell activation on infected or cancerous tissue?
- What is the role of cytotoxic T memory cells in subsequent infections by the SAME pathogen?
- How do natural killer cells differ from cytotoxic T cells? Are they specific to a specific type of epitope or are they general to all altered cellular MHC class I molecules and foreign cellular epitopes? Which line of defense are the natural killer cells?
- What might happen if T helper 1 cells declined in number?
- What is meant by naturally acquired or artificially acquired immunity?
- What is meant by active or passive immunity?
- What are the benefits and risks of naturally acquire active immunity, artificially acquired active immunity, naturally acquired passive immunity and artificially acquired passive immunity?
- For vaccine types, what is the difference between live, attenuated and killed? Which is more effective and what population of people could you give each type to?
- What might happen if something too small to cause an immune response, like a hapten, were to bind to a larger body molecule to cause an immediate allergic response? How does this happen? What type of immune disorder might this cause? What examples of immune disorders fall into this category?
- What if blood was transferred from one person to another? What COULD happen then? What type of immune disorder might this cause? What examples of immune disorders fall into this category?
- What might happen if antibody found and bonded with its specific antigen, but instead of being phagocytized, the complex was deposited in body tissues? What type of immune disorder might this cause? What examples of immune disorders fall into this category?
- What would happen if a hapten or other allergen was present in the body, but it took several hours to days for a response to occur? What type of immune disorder might this cause? What examples of immune disorders that fall into this category?
- What types of transplanted tissues exist in the world right now (4 basic types)?
- What is graft rejection and how does it occur? What would be the treatment?
- What is graft-versus-host rejection and how does it occur? What would be the treatment?
- What are the benefits and risks of immunosuppressive drugs?
- What is an autoimmune disease?
- Why and how do autoimmune diseases occur?
- How do autoimmune disease occur to produce: hemolytic disease, type I diabetes mellitus, Graves' Disease, Multiple sclerosis, Rheumatoid Arthritis, Glomerulonephritis, Systemic Lupus Erythromatosus.
- How do the following primary immunodeficiencies occur and what is affected: Chronic granulomatosis, Severe-combined Immunodeficiency Disease, Digeorge Syndrome and Bruton-type agammaglobulinemia.
- How is acquired immunodeficiency disease acquired? What are the target cells of the virus? How does it result in AIDS? What is the collections of diseases resulting from prolonged AIDS called and what makes up that collection? What is the number one leading cause of death of AIDS patients worldwide? How is it treated?