|  |
| --- |
| **TEXAS CTE LESSON PLAN**[www.txcte.org](http://www.txcte.org) |
| **Lesson Identification and TEKS Addressed** |
| **Career Cluster** | Health Sciences |
| **Course Name** | World Health Research |
| **Lesson/Unit Title** | Immunity and Diseases |
| **TEKS Student Expectations** | **130.226. (c) Knowledge and skills**(4) The student describes the engineering technologies developed to address clinical needs. The student is expected to:1. describe technologies that support the prevention and treatment of infectious diseases; and
2. explain the implication of vaccines on the immune system.
 |
| **Basic Direct Teach Lesson**(Includes Special Education Modifications/Accommodations and one English Language Proficiency Standards (ELPS) Strategy) |
| **Instructional Objectives** | The student will be able to:* Define immunity as it applies to the human body.
* Explain ways in which people acquire immunity.
* Identify the organs of the immune system.
* Analyze the body’s three lines of defense.
* Distinguish between the function of different types of white blood cells.
* Summarize how hormones affect the immune system.
* Define “tumor necrosis factor.”
* Analyze immunity and vaccinations.
 |
| **Rationale** | Understanding the immune system is vital for comprehending how our bodies respond to diseases and injuries. |
| **Duration of Lesson** | 4 – 5 hours |
| **Word Wall/Key Vocabulary***(ELPS c1a,c,f; c2b; c3a,b,d; c4c; c5b) PDAS II(5)* | The key vocabulary for this lesson plan is in a separate document in the lesson plan attachments section.  |
| **Materials/Specialized Equipment Needed** | * Immunity and Disease Terms handout
* Instructional PowerPoint: Immunity and Disease
* CheckPoint Test Key
* Teacher Instructions for Investigation Activity
* Student Instructions for Investigation handout
* Group Investigation Cards
* Evaluation Rubric
* Student computers
 |
| **Anticipatory Set**(May include pre-assessment for prior knowledge) | Discuss the following:Zoologist Ilya Metchnikoff first suggested the idea of cells being directly involved in the defense of the body in 1884. His famous experiment involved pushing the thorn from a rose stem into a starfish larva and observing how phagocytic cells rapidly migrated and clustered around the thorn. |
| **Direct Instruction \*** | I. Immunity literally means “free from burden”A. In medicine, when we speak of immunity, we are referring to the body’s ability to recognize and defend itself against foreign agentsII. How we acquire immunityA. Natural passive immunity (maternal)1. Occurs when antibodies travel across the placenta from the maternal blood to the fetal blood (the symbol for antibodies is “Y”)2. Antibodies are also found in the colostrum (the liquid produced in the breasts for a baby’s first meal)3. Antibodies received through passive immunity only last several weeksB. Active Immunity1. Natural active immunity – occurs when a person is exposed to harmful microbes (infectious diseases)2. Artificial active immunitya. Active immunity is artificially triggeredb. Occurs when a person is intentionally given a small quantity of an infectious disease (a vaccine)III. The immune system is our body’s defense against foreign agents such as bacteria and virusesIV. The organs of the immune system are positioned throughout the body. (these organs are also called lymphoid organs because they are home to lymphocytes—types of white blood cells)A. Primary organs (where lymphocytes develop)1. Thymusa. Located in the chest between the sternum and heartb. The thymus is large during infancy, but atrophies as a child growsc. This is where the immune system’s T-cells mature2. Bone marrowa. New blood cells form in marrow then enter the bloodstreamb. Some white blood cells mature elsewhere in the bodyc. Bone marrow produces all blood cells from stem cellsi. Called “stem cells” because they branch off and can become many different types of cellsii. Stem cells change into actual, specific types of white blood cellsB. Secondary organs (where immune responses occur—our body’s call to action during infections)1. Spleena. Located under the left side of the diaphragm (tucked under and protected by the ribs)b. Filters out foreign organisms that infect the bloodstreamc. Also filters out old red blood cells from the bloodstream and recycles themd. Serves as a blood reservoir2. Lymph nodesa. Small, bean-shaped structures strung along a series of vessels (lymphatic vessels which carry lymph fluid)b. Lymph nodes store cells that fight infection and diseasesc. They act as filters, collecting and killing pathogens and/or cancer cells that travel through the lymphatic systemd. They are clustered in the neck, armpits, abdomen, and groinC. Lymph nodes (where lymphocytes and macrophages are packed)1. Lymphocytesa. T-cells – white blood cells that mature in the thymus, and then migrate to other tissuesi. T-cells respond directly to antigens (foreign agents such as pathogens or toxins)ii. Their response involves the destruction of target cells (e.g., virus-infected cells or cancer cells)iii. 80% of blood cells are T-cellsb. B-cells – named for the bone marrow where they are producedi. B-cells produce antibodies that incapacitate antigens2. Macrophagesa. White blood cells (WBC) known as “big eaters”b. Eat foreign material in the bodyc. Some macrophages are stationed at areas of the body where foreign material commonly entersd. Other macrophages patrol the body3. All lymphocytes exit the lymph nodes through outgoing lymph vessels4. Once in the bloodstream, lymphocytes are transported to tissues throughout the body – they patrol body for foreign antigens then return to the lymphatic system to begin the cycle all over again5. Lymphocyte and fluid exchange occurs between blood and lymph vessels6. Enables the lymphatic system to monitor the body for invading microbes7. The lymphatic system is sometimes considered part of the circulatory system because it transports lymph through the vessels and empties it into the venous bloodV. How the body protects itself when exposed to foreign agentsA. Markers of “self”1. The body has the ability to distinguish between “self” and “non-self”2. Every cell in the body carries distinctive surface proteins that distinguish it as self3. Foreign cells (bacteria, viruses, etc.) are recognized by the body as non-self and fall under attack by the immune system4. Normally your immune cells don’t attack your own body tissues because they carry the same pattern of self-markers, and therefore, coexist peaceably with any cells they recognize as selfB. The body has built-in defense mechanisms which fight off non-self cells or tissues1. Nonspecific defense mechanismsa. Act against all harmful agents and provide nonspecific resistances (skin barrier, body’s inflammatory response)b. Do not distinguish one infectious microbe from another2. Specific defense mechanismsa. Only act against certain agentsb. The backup defense system that has the ability to recognize and target organisms which don’t belong in the body (viruses, bacteria, etc.)VI. The body’s three lines of defenseA. The first line of defense (nonspecific defense mechanisms) – the physical and chemical barriers that keep foreign agents at bay1. Skin (keratin resists the digestive enzymes of invading bacteria; sweat and body oil lower the pH of skin to between 3 and 5, which is a hostile environment for most pathogens; sweat and sebum contain antiseptic molecules, primarily lysozyme which breaks down bacterial cell walls)2. Ciliated mucous membranes and mucus (trap invading pathogens and foreign debris that can then be swept away by cilia)3. Nasal passages and sinuses (make nitrous oxide that are toxic to a wide range of infectious microbes)4. Tears and saliva (contain lysozyme, an antiseptic enzyme that attacks and breaks down cell the walls of bacteria)5. The stomach’s hydrochloric acid and good gut bacteria (helps crowd out bad bacteria)B. The second line of defense (also nonspecific defense mechanisms that do not react to specific intruders) – cells that initiate the inflammatory response (redness, fever, swelling) spring into action if foreign agents succeed in passing the first line of defense and enter body1. Phagocytes – ingest and destroy foreign particlesa. Neutrophils – the “foot soldiers” of white blood cellsi. Make up about 60 – 70% of all WBCsii. Tend to self-destruct as they destroy invadersiii. A person makes about 100 billion every dayb. Monocytes – develop into macrophages (the largest phagocyte)i. Only about 5% of the WBCsii. Voracious eaters at infection sites, readily engulfing invading organisms and cellular debrisiii. Macrophages can also become involved in "intelligence gathering," collecting various bits and pieces of an enemy and displaying remains like macabre trophies of warc. Eosinophils – have limited phagocytic activityi. Make up only 1.5% of WBCsii. Can destroy larger parasites such as worm larvae (latch onto the surface of a parasite and release destructive enzymes)d. Basophils – release histamines, which are part of the inflammatory responsei. Histamine increases the permeability of capillaries to white blood cells so they can fight foreign invaders in the infected tissuese. Natural Killer (NK) cells – move throughout blood and lymphi. Attack the body’s own cells, either those infected by viruses or cancerous cellsii. Attack the membranes of target cells causing them to lyse (break open)f. Complement system – a group of antimicrobial proteins found in plasma that work with (complement) antibodiesi. Activate when they come into contact with foreign agentsii. Insert themselves into the membranes of pathogens, causing the pathogens to swell and lyseC. The third line of defense (specific defense mechanisms) – the immune response1. Comes into action when nonspecific lines of defense don’t stop foreign agents and an infection becomes widespread2. Millions of Y-shaped proteins called antibodies are produced by white blood cells in response to foreign invaders (antigens)a. Antibodies are also referred to as immunoglobulins and/or gamma globulinsb. Each antibody responds to a specific antigen (bacteria, virus, etc.)3. The structure of antibodiesa. The structures are very similar, but the small regions at the tip of the protein are variableb. Each variant tip can bind to a different antigen targetVII. AntigensA. Anything that antagonizes or stimulates the immune system to produce an immune response, including1. Pathogens2. Foreign substances or agents (a splinter, etc.)3. Tissues or cells from another person (except an identical twin)4. Explains why transplanted organs and tissues are sometimes “rejected”B. Antigens carry marker molecules that identify them as foreignVIII. HormonesA. Several hormones are generated by the components of the immune systemB. These hormones are known as lymphokines, which enhance the function of leukocytesC. Certain hormones, such as steroids and corticosteroids, suppress the immune systemIX. Tumor Necrosis Factor (TNF)A. An immune cell protein produced by macrophagesB. Kills cells that appear abnormalC. Inhibits the growth of tumor cells but causes inflammationD. Promotes the creation of new blood vessels (important to healing)X. InterferonA. Proteins produced by the immune system in response to an attack by a virusB. Helps to protect other healthy cells from the attack. When the immune system mistakes “self” for “non-self”XI. Sometimes the immune system launches chronic attacks against the body’s own cells or tissuesA. These attacks are called autoimmune diseasesB. Examples of autoimmune diseases1. Rheumatoid arthritis2. Systemic lupus erythematous3. Myasthenia gravis4. Diabetes IXII. AllergensA. In some cases the immune system responds to harmless foreign agents1. Dust, ragweed, and certain foodsB. The result is an allergic reaction1. The antigens that cause it are called allergens |
| **Guided Practice \*** | Student groups will investigate an immunity-related topic, then create and present a PowerPoint presentation over their research. |
| **Independent Practice/Laboratory Experience/Differentiated Activities \*** | None |
| **Lesson Closure** | None |
| **Summative/End of Lesson Assessment \***  | * Successful completion of CheckPoint test
* Evaluation Rubric

**Accommodations for Learning Differences**For reinforcement, the student will develop flash cards for the key terms.  |
| **References/Resources/****Teacher Preparation** |  |
| **Additional Required Components** |
| **English Language Proficiency Standards (ELPS) Strategies** |  |
| **College and Career Readiness Connection[[1]](#footnote-1)** | **Science Standards**III. Foundation Skills: Scientific Applications of CommunicationB. Scientific Reading1. Read technical and scientific articles to gain understanding of interpretations, apparatuses, techniques or procedures, and data.3. Recognize scientific and technical vocabulary in the field of study and use this vocabulary to enhance clarity of communication.VI. BiologyF. Systems and Homeostasis1. Know that organisms possess various structures and processes (feedback loops) that maintain steady internal conditions.**Cross-Disciplinary Standards**I. Key Cognitive SkillsA. Intellectual curiosity1. Engage in scholarly inquiry and dialogue.I. Key Cognitive SkillsB. Reasoning 4. Support or modify claims based on the results of an inquiry.I. Key Cognitive SkillsC. Problem Solving3. Collect evidence and data systematically and directly relate to solving a problem.I. Key Cognitive SkillsE. Work Habits2. Work collaboratively.II. Foundational SkillsC. Research across the curriculum2. Explore a research topic.4. Evaluate the validity and reliability of sources.5. Synthesize and organize information effectively. 6. Design and present an effective product.7. Integrate source material II. C. 8. Present final product.II. Foundational SkillsE. Technology1. Use technology to gather information.2. Use technology to organize, manage, and analyze information.3. Use technology to communicate and display findings in a clear and coherent manner. |
| **Recommended Strategies** |
| **Reading Strategies** |  |
| **Quotes** |  |
| **Multimedia/Visual Strategy****Presentation Slides + One Additional Technology Connection** |  |
| **Graphic Organizers/Handout** |  |
| **Writing Strategies****Journal Entries + 1 Additional Writing Strategy** |  |
| **Communication****90 Second Speech Topics** |  |
| **Other Essential Lesson Components** |
| **Enrichment Activity**(e.g., homework assignment) | Student will view the following online videos and develop a multimedia presentation:* Disease Defense: The Immune System (4 min.)
* Disease Defense: Immunity and Vaccination (3 min.)
* Autoimmune Inflammatory Disease (23 min.)
 |
| **Family/Community Connection** |  |
| **CTSO connection(s)** | SkillsUSAHOSA |
| **Service Learning Projects** |  |
| **Lesson Notes** |  |

1. Visit the Texas College and Career Readiness Standards at <http://www.thecb.state.tx.us/collegereadiness/CRS.pdf>, Texas Higher Education Coordinating Board (THECB), 2009. [↑](#footnote-ref-1)