

## 5E Lesson Plan

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**Date/Time Lesson to be taught:** Thursday, October 6, 2011 @ 10:52 am

**Course Description:** Biology Unit 4 Topic 2

**Name:** Animal Defense Systems – Lesson 4

**Grade Level:** 9<sup>th</sup> Grade

**Honors or Regular:** Regular

**Lesson Source:** Ms. John; RISD Curriculum Script

**Concepts:** Students should know that viruses and bacteria are types of pathogens that can cause illness and disease. The immune system is the method that the body uses to defend itself against infection. Students need to know the differences between viruses and bacteria because there are different to treat them. They need to understand the relationship between body systems and the components of the immune system because the condition of one affects the other.

**Objectives:** The student will be able to:

1. Explain differences between viruses and bacteria.
2. Summarize the components of the immune system that are involved in defense from injury and illness.

**Texas Essential Knowledge and Skills:**

**B.4C** compare the structures of viruses to cells, describe viral reproduction, and describe the role of viruses in causing diseases such as human immunodeficiency virus (HIV) and influenza

**B.5B** examine specialized cells; and animal cells such as blood, muscle, and epithelium

**B.10A** interactions that occur among systems that perform the functions of regulation, nutrient absorption, reproduction, and defense from injury or illness in animals.

**B.11C** summarize the role of microorganisms in disrupting the health of both organisms.

**English Language Proficiency Standards (learning strategies, listening, speaking, reading or writing)**

74.5 (B) The student is expected to:

Write using newly acquired basic vocabulary in content-based grade-level vocabulary.

**Materials List and Advanced Preparations:**

- PP- Unit 4 Warm Up
- PP-Systems of Defense
- 28 copies of WS- Virus Life Cycle (pre-cut, quarter page per student)
- Interactive Notebook
- Interactive Notebook Supplies one (1) per student
- 28 copies of Pre and Post test.

- Purple and green post – it notes
- Giant sticky board paper prewritten with: Skin is the \_\_\_\_ line of \_\_\_\_\_. Pathogens such as \_\_\_\_\_ make us \_\_\_\_\_. Our body recognizes \_\_\_\_\_ because infected \_\_\_\_\_ displays \_\_\_\_\_. Blood cells are produced in \_\_\_\_\_, which help fight off \_\_\_\_\_. Viruses are not living because \_\_\_\_\_. Viruses follow two modes of replication: \_\_\_\_\_ and \_\_\_\_\_. Bacteria are classified by their \_\_\_\_\_ and the \_\_\_\_\_. Bacteria cause disease by using \_\_\_\_\_ in the host, or by releasing \_\_\_\_\_. Antibiotics treat \_\_\_\_\_.

**Safety:**

In case of emergency please follow emergency procedures according to RISD emergency guidelines. There are no chemicals or equipment being used besides paper, so there are no further safety issues.

**Accommodations for Learners with Special Needs (ELL, Special Ed, 504, GT, etc.):**

They have interactive notebooks that they can draw and write in, power point slides for visual prompts and content, and stem sentences for comprehension.

<b>ENGAGEMENT</b>		<b>Time: 5 Minutes</b>
<p>Hand out pre-test as students walk into class.</p> <p>Display the Project PP-Unit 4 Warm-Up Slide 4 (see attachment).</p> <p>From lesson 3 lab, students should have written down the function of bone marrow. Review by asking about the function of bone marrow again.</p> <p>Explain that bone marrow transplants are done to treat patients suffering from leukemia. In leukemia, the bone marrow produces cancer cells, rather than healthy cells. (Since this unit is about animal systems, I would try to tie in another animal besides human as well by explaining that other animals have bone marrow, and there are diseases that can affect bone marrow. Feline leukemia, for example, is a virus that infects cats, causes cancer, and my lead to a state of immune deficiency).</p>	<p>What is the function of bone marrow?</p> <p>What types of cells does it produce?</p> <p>Why would a person need to get a bone marrow transplant? Why would it help that person?</p> <p>What do you think Feline leukemia does to cats?</p>	<p>["Marrow produces blood cells that help with immune system." "The bone produces blood cells]</p> <p>[Bones are hard, why would they contain blood cells?</p> <p>The person's marrow is sick. The person's bones are sick. The sick bone marrow would be replaced with healthy bone marrow.]</p> <p>[The cat will also get sick because its immune system is now bad]</p>
<b>Evaluation/Decision Point Assessment</b>	<b>Assessment</b>	<b>Student Outcomes</b>
<p>When the students make the connection between bone marrow and overall immune system, then you can move on to exploration.</p>	<p>How would leukemia affect your immune system?</p>	<p>The students need to understand the function of bone marrow is to produce blood cells that help fight off infections. When bone marrow is compromised, the immune system is also affected.</p>

EXPLORATION		Time: 20 Minutes
What the Teacher Will Do	Probing/Eliciting Questions	Student Responses and Misconceptions
<p>Display Project PP-Systems of Defense (See attachment). Use slides 2-3 to review the function of bone and skin from yesterday. Make sure students have their IN (interactive notebooks) open to the page with the skin picture. (Instead of having a PowerPoint slide, I would use skin models if they were available. Or, I would also have a real microscopic slide of skin placed next to the picture for comparison).</p> <p>Make sure the students understand the skin plays an important role in the immune system as well. It's role in the immune system is that it "keeps stuff out." <b>It is the first line of defense in animals.</b></p> <p>Direct students to their IN diagram of the bone from yesterday. Use slides 4-5 to review the function of the skeletal system.</p> <p>Have the students turn to the next page of their IN. Distribute the WS-Virus Life Cycle (1/4 page/student, see attachment). Have the students glue the diagram into their IN on the center of the</p>	<p>What are the three layers found in skin?</p> <p>Why do you need skin? (Hint: If I cut myself with a knife that has billions of bacteria on it, will I get sick?)</p> <p>Why do we need bones? (Better more scientific question: What is the function of the skeletal system?)</p> <p>If it makes blood cells what is another function of the skeletal system besides support? (Hint, remember what leukemia is. What does the disease do?)</p> <p>We're mentioning the word "disease" a lot. What causes diseases?</p>	<p>[Epidermis/Dermis/Subcutaneous Layer. Top/middle/bottom. Top part/section with nerves and other stuff/stuff with the fat.]</p> <p>[Need skin to hold everything together. [Need skin because then everything on the inside would be exposed. Yes, if you cut yourself, you could get sick, or that part of the skin would get really infected]</p> <p>[Supports us. Allows us to move. Makes blood cells.]</p> <p>[Plays a role in the immune system. It makes stuff to fight off disease]</p> <p>[Viruses and bacteria. Getting cuts. Getting sick.]</p>

<p>page. Use slides 7-19 to guide the lecture.</p> <p>Slide 7: Pathogens, such as viruses, bacteria, fungi, protists and even allergens, make us sick.</p> <p>Slide 8: Recognizing pathogens. Our body recognizes pathogens because an infected cell displays an antigen on its surface.</p> <p>(Pass out the purple post –its to the majority of the class, then pass out green post –its to the rest of the class (give yourself a green post it as well). The purple post-it students are cells that belong to the body. The green post-it students and the teacher are viruses. The body cells have specific purple post-its, or markers, that identify the cells as belonging to you. Virus cells have different post-its, or markers, and your body recognizes that as being a pathogen.</p> <p>Walk over to one of the students who has a purple post-it and “infect” them by sticking your post-it to theirs. Hold this purple/green combo post-it up for the whole class to see. The new marker is called an antigen.)</p> <p>Antigens trigger an immune response.</p> <p>Slides 10-14: have students focus on their WS-Virus Life Cycle cut outs. Make sure they write the notes from the ppt slides into their IN.</p> <p>Review Viruses. Viruses are not living because they need a host to replicate, they cannot maintain homeostasis on their own, they do not grow, or metabolize. These are the factors that establish what is living. Things like heartbeat, blood, etc, does not define an organism as living. Make sure</p>	<p>So what are pathogens?</p> <p>How does the body know when you are infected with a pathogen?</p> <p>What is the difference between the student body cells, and me and the other green post-it viruses?</p> <p>When a virus infects a host cell, is a new marker (post-it) made?</p> <p>Are viruses living? Why or why not?</p> <p>What defines an organism as living again?</p>	<p>[Things that make you sick. Viruses, bacteria, protists, fungi, and allergens.]</p> <p>[The post-it]</p> <p>[Yes. What does the post-it mean again? There are post-its on our cells?]</p> <p>[They don’t have a heartbeat. They can’t replicate on their own. They don’t grow. They don’t have blood.]</p> <p>[Reproduce and grow on it own.]</p>
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<p>students realize this. A virus only function is to replicate.</p> <p>Slide 11: Virus replication. As you are explaining virus replication, walk around the class and ensure that students are writing in their IN. There are two pathways a virus can take to replicate once it is inside the host cell: lytic and lysogenic. Slide 12: In the lytic cycle, the host cell bursts open and dies. Slide 13: The lysogenic pathway is where the DNA “passively remains within the host cell’s DNA, and as the host cell replicates, so does the viral DNA. (Have the roots displayed next to the words. Greek: <i>lyein</i> [LYOO ayn], "to loosen"; loosening, dissolving, dissolution. So Lyso-dissolving/loosening – genic – beginning. The viral DNA loosens the host DNA in the beginning of infection. A good example of lysogenic pathway is the HIV virus. It’s important to at least show why scientists name things the way they do).</p> <p>Bacteria. Slides 15-17. Review bacteria. They are living organisms. They are prokaryotes. They are autotrophs (make their own food), or heterotrophs (need to obtain nutrition somewhere else, like on a petri dish). They can be helpful, but they can also cause diseases. They are classified by their shape (Cocci (round), Bacilli (oval), and spirochetes (spiral)), and cell wall type.</p> <p>Slide 18: Treating viruses and bacteria. Only bacteria can be</p>	<p>What does this virus in the picture look like its doing to the host cell? What is the blue line?</p> <p>What happens to the host cell in the lytic pathway?</p> <p>What happens to the host cell in the lysogenic pathway?</p> <p>What is the main characteristic that defines a prokaryote?</p> <p>How do non-beneficial bacteria cause disease? (Hint: They are living inside us, so do you think they would compete with our other cells for food and space?)</p> <p>Recently there has been an outbreak of Tuberculosis in Ennis. One lady on the news called it a virus. Why was she wrong in her statement?</p>	<p>[Putting that blue squiggly in it. It’s infecting the host cell with its DNA]</p> <p>[It blows up. All these little baby viruses come out of it.]</p> <p>[It doesn’t do anything. It looks like its staying in the host cells DNA.]</p> <p>[No nucleus. There is no characteristic. Why is it living?]</p> <p>[Competes for your body’s resources. They make you sick.]</p> <p>[Tuberculosis is a bacteria]</p>
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<p>treated with antibiotics. Viruses, only with rest and our own defense system. However, we can prevent getting a virus with vaccines. Once you have a virus, you will almost never have it again, because your body has the information to fight it off again because of ANTIGENS.</p>	<p style="text-align: center;">If this is a true statement, how can you have more than one flu infection?</p>	<p style="text-align: center;">[You lied. It's a different type of flu.]</p>
<p><b>Evaluation/Decision Point Assessment</b></p>	<p><b>Assessment</b></p>	<p><b>Student Outcomes</b></p>
<p>Review the whole explore section by using the giant sticky post it white board thing.</p>	<p>Skin is the ____ line of _____. Pathogens such as _____ make us _____. Our body recognizes _____ because infected _____ displays _____. Blood cells are produced in _____, which help fight off _____. Viruses are not living because _____. Viruses follow two modes of replication: _____ and _____. Bacteria are classified by their _____ and the _____. Bacteria cause disease by using _____ in the host, or by releasing _____. Antibiotics treat _____.</p>	<p>Students need to be familiar with the terms with regards to the immune system, but they also must realize that our skin defends. Once we get an infection, we have other defense mechanisms to fight off pathogens such as viruses and bacteria.</p>

<b>EXPLANATION</b>		<b>Time: 5 Minutes</b>
<b>What the Teacher Will Do</b>	<b>Probing/Eliciting Questions</b>	<b>Student Responses and Misconceptions</b>
Slide 20: Direct students to go to the next right page of their IN, use slide 20 as a guide. Have the students draw a T-chart.	What are the differences between viruses and bacteria?	[Viruses are not living. Bacteria are living. Bacteria are treated with antibiotics. Viruses can be treated with vaccines/rest/own body. There is good and bad bacteria. Viruses are only pathogenic.]
<b>Evaluation/Decision Point Assessment</b>	<b>Assessment</b>	<b>Student Outcomes</b>
Walk around the class, look at the student IN's.	Make sure they have a few differences between viruses and bacteria.	You want the students to realize that viruses and bacteria are two different types of pathogens that are treated in different ways.

<b>ELABORATION</b>		<b>Time: 10 Minutes</b>
<b>What the Teacher Will Do</b>	<b>Probing/Eliciting Questions</b>	<b>Student Responses and Misconceptions</b>
<p>Slide 21-28. Slide 21: Direct the students to draw a 4 square diagram in their IN on the right hand side. Slide 22: The first response is the inflammatory response: local blood vessels dilate, increased blood flow to the area brings more white blood cells causing swelling.</p> <p>Slide 23: Temperature Response.</p> <p>Slide 24: Complement system. Made of about 20 different proteins that travel through the bloodstream punching holes in the cell membranes of pathogens. A protein called an interferon, released by virus infected cells, prevents viruses from making proteins and RNA.</p> <p>Slide 25: White blood cells. The destroyers of pathogens. There are several types of white blood cells. Describe each type from the ppt.</p> <p>Slide 26: All of these responses represent the 2<sup>nd</sup> line of defense. Give the students a few minutes to jot down any notes they missed.</p> <p>Slide 27 and 28: 3<sup>rd</sup> line of defense is more specific. It involves T-helper cells and macrophages.</p>	<p>What happens if a pathogen gets past the first line of defense (the skin)? (Hint: What happens when a bee stings you, or you cut yourself, or you burn yourself? What do you see?)</p> <p>Why do we get fevers?</p> <p>What does complement mean?</p> <p>What does interfere mean? So interferon is _____ that _____ cells from replicating.</p> <p>What do our white blood cells do?</p> <p>How does the T-helper cell help in destroying pathogens?</p>	<p>[Our skin turns red. A bump appears. It hurts]</p> <p>[Fever fight off infections. Fevers raise our body temperatures to kill stuff]</p> <p>[Work together. Share.]</p> <p>[Stops a cycle. Interrupts. Disturb. Interferon is a protein that stops infected cells from replicating]</p> <p>[They kill pathogens]</p> <p>[Recognizes the antigens on the macrophage]</p>
<b>Evaluation/Decision Point Assessment</b>	<b>Assessment</b>	<b>Student Outcomes</b>
Ask the students what the first line	First line of defense is	Make sure the students

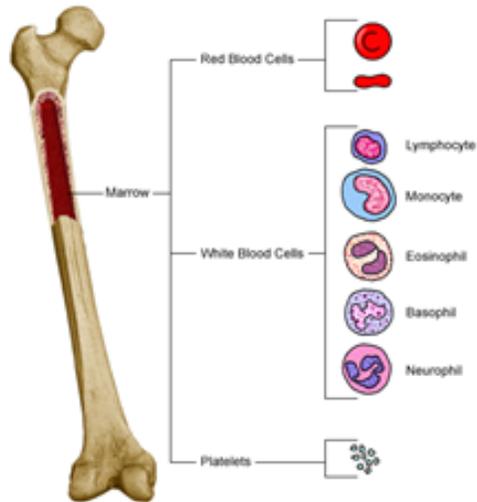
<p>of defense is. What makes up the second line of defense. 3<sup>rd</sup> line of defense is more specific.</p>	<p>_____. Second line of defense is _____ response, _____ response, _____ system, and _____ blood cells. Specific immune response is the _____ line of _____.</p>	<p>understand the order to how the immune system responds. Your first line of defense is the skin, and the most general, 2<sup>nd</sup> is all the responses. Specific is the final defense, and is most specific</p>
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<b>EVALUATION</b>		<b>Time: 5 Minutes</b>
<b>What the Teacher Will Do</b>	<b>Probing/Eliciting Questions</b>	<b>Student Responses and Misconceptions</b>
Hand out the post test.	Let us see what we have learned today.	

## Warm-Up Day 4

A bone marrow transplant is a procedure in which normal bone marrow cells are infused into a person.

Why would a person need to get a bone marrow transplant?



Name: \_\_\_\_\_

Date: October 6, 2011

**POST-TEST**

1. Explain at least two differences between viruses and bacteria.

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2. Joe was slicing an apple when the knife slipped and sliced his thumb. Using box below explain how the immune system responds to the injury.

White blood cells	Skin 	Bone marrow 	Bones
Interferons/complementary system 	Pathogens	Viruses	Bacteria
DNA 	Somatic Cells	T-helper cells	Antigens 
Temperature response 	Inflammatory response 		

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**PRE-TEST**

Name: \_\_\_\_\_

Date: October 6, 2011

1. Explain at least two differences between viruses and bacteria.

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2. Joe was slicing an apple when the knife slipped and sliced his thumb. Please put the following statements in the correct order:

- A. The skin around the cut becomes inflamed.
- B. Pathogen first enters body through cut in the skin.
- C. Various proteins try to stop replication of pathogen.
- D. White blood cells destroy pathogens.
- E. The injured site feels warm to the touch.

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**POST-TEST**

Name: \_\_\_\_\_

Date: October 6, 2011

1. Explain at least two differences between viruses and bacteria.

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2. Joe was slicing an apple when the knife slipped and sliced his thumb. Please put the following statements in the correct order:

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