

Unit 1: Lesson 1 – Organs and Tissues of the Immune System

LESSON QUESTIONS

- What parts of the body are associated with the immune system?
- What are the locations and functions of organs and tissues associated with the immune system?

LESSON OBJECTIVES

- Identify the organs and tissues of the body associated with the immune system.
- Specify the locations and functions of the organs and tissues associated with the immune system.

OVERVIEW

Students explore resources related to organs and tissues of the immune system, including associated glossary terms. They create a T-chart of locations and functions of organs and tissues of the immune system and label a diagram of the human body.

LENGTH

Up to two 45-minute sessions

GLOSSARY TERMS

adenoids, appendix, bone marrow, lymph nodes, lymphatic vessels, nasal cavity, pathogen, Peyer’s patches, skin, spleen, thymus, tonsils

STANDARDS

- **Next Generation Science Standards**
 - HS-LS1-2 Develop and use a model to illustrate the hierarchical organization of interacting systems that provide specific functions within multicellular organisms.
 - HS-LS1-2.2.1 Develop and use a model based on evidence to illustrate the relationships between systems or between components of a system.

- HS-LS1-2.4.1 Models (e.g., physical, mathematical, computer models) can be used to simulate systems and interactions— including energy, matter, and information flows—within and between systems at different scales.
- HS-LS1-2.LS1.A.1 Multicellular organisms have a hierarchical structural organization, in which any one system is made up of numerous parts and is itself a component of the next level.
- **Common Core State Standards**
 - RST.11-12.4 Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context.
 - RST.11-12.7 Integrate and evaluate multiple sources of information presented in diverse formats and media (e.g., quantitative data, video, multimedia) to address a question or solve a problem.
 - WHST.9-12.2 Write informative/explanatory texts, including the narration of historical events, scientific procedures/ experiments, or technical processes.
 - WHST.9-12.9 Draw evidence from informational texts to support analysis, reflection, and research.
 - WHST.9-12.5 Develop and strengthen writing as needed by planning, revising, editing, rewriting, or trying a new approach, focusing on addressing what is most significant for a specific purpose and audience.

MATERIALS

- Student worksheet:
https://vaccinemakers.org/sites/default/files/lessons/HS.student%20worksheet_unit1_lesson1.FINAL_.pdf
- Computer with internet access

BACKGROUND FOR TEACHER

The immune system is the body's defense system. Without a properly functioning immune system, the body quickly succumbs to infection. Students will know that the immune system helps the body to prevent or recover from illness. However, they are unlikely to know many details. They may also not understand how the immune system is the basis for vaccination. The immune system is a body system like other systems, and it interacts with those systems. This lesson provides the basis for understanding how the immune system works. The activities and exercises familiarize students with the immune system's main structures. This knowledge provides students with the vocabulary and information needed to understand key concepts of immune system function.

TEACHER NOTES

Other body systems generally function in the same place all the time. The immune system must function at any possible location throughout the body depending upon where the infection is occurring. Students should understand that lymph nodes are located throughout the body to be protective regardless of where a potential infection is introduced. (Hence the figure does not show all lymph nodes.)

LESSON RESOURCES

- Lesson animations:
 - *A Virus Attacks a Cell* <https://vimeo.com/227174435>
 - *How do Viruses Reproduce?* <https://vimeo.com/227177718>
- Lesson glossary:
<https://vaccinemakers.org/sites/default/files/resources/HS.lesson%20glossary.unit1.lesson1.FINAL.pdf>
- Reading passage, *Eternal Vigilance: The Human Immune System*,
<https://vaccinemakers.org/sites/default/files/resources/HS.reading%20passage.unit1.lesson1.FINAL.pdf>
- Additional resources that may be helpful:
 - Trivia quizzes related to the lesson animations, *Kahoot!*,
www.vaccinemakers.org/trivia
 - Comprehensive human immune system overview, VEC,
<https://www.chop.edu/centers-programs/vaccine-education-center/human-immune-system>

- Immune system information, with sections on immune system function and location, NIH, <https://www.niaid.nih.gov/research/immune-system-overview>
- Basic information on immune system function, How Stuff Works.com, <http://science.howstuffworks.com/life/human-biology/immune-system2.htm>

ENGAGE

1. Ask students to write a sentence describing the most recent occasion when they were ill with a cold or the flu, or when they had an injury such as a cut or graze.
2. Students work with a partner to create a list of symptoms they remember from that occasion.
3. Ask students to write in their notes why they think they had those particular symptoms.
4. Explain that some of those symptoms, such as a fever or headaches, or redness around a cut are due to responses by the immune system.

EXPLORE

1. Students watch the animations, *A Virus Attacks a Cell* and *How do Viruses Reproduce?* If time allows, or to reinforce the concepts in the animations, students can complete the quizzes on *Kahoot!* related to these animations.
2. Students read the Reading Passage, *Eternal Vigilance: The Human Immune System*.
3. Students identify any unfamiliar terms from the videos or passage in the lesson glossary.
4. Students research online to find diagrams and resources that show the organs and tissues of the immune system and can record their findings in their notebooks.
5. In their notes, students create a T-chart listing organs and tissues of the immune system along with their associated functions and locations.
6. Students research online to find diagrams and resources that show the organs and tissues of the lymphatic system.

EXPLAIN

1. Refer students to the model of the human body and internal organs in their worksheets.
2. Students label the figure in their worksheets with organs and tissues of the immune system (*a* through *k*).
3. Students circle five lymph nodes in different regions of the model using a marker or colored pencil.
4. Students indicate what area of the body each lymph node would best protect from infection.
5. Students discuss within their group whether the diagram shows all of the lymph nodes in the body or not. Students record answers in their notebooks with a brief explanation of why they came to that conclusion.
6. Students work in small groups to create a concept map that shows the relationship between the lymphatic system and the immune system.

ELABORATE

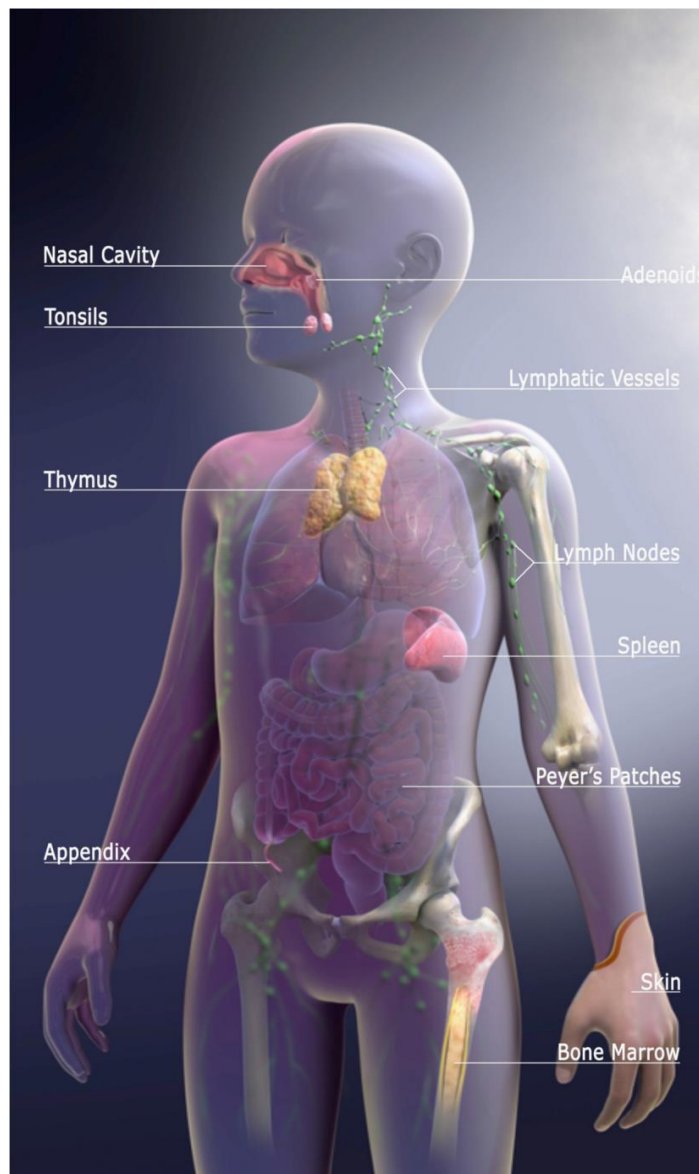
1. Students work in small groups to choose a particular condition (illness, injury, etc.).
2. Each group investigates which organs and tissues of the immune system are involved in defenses against that condition.
3. Groups present their findings to the class in a creative format such as an educational brochure, skit or video presentation.

EVALUATE

1. Students write a few sentences about whether they feel it is important that the lymph system is spread throughout the body and justify their answer with evidence.
2. Students identify 2 other systems that have a network of vessels throughout the body and write a short passage to explain how each might be related to the immune system.

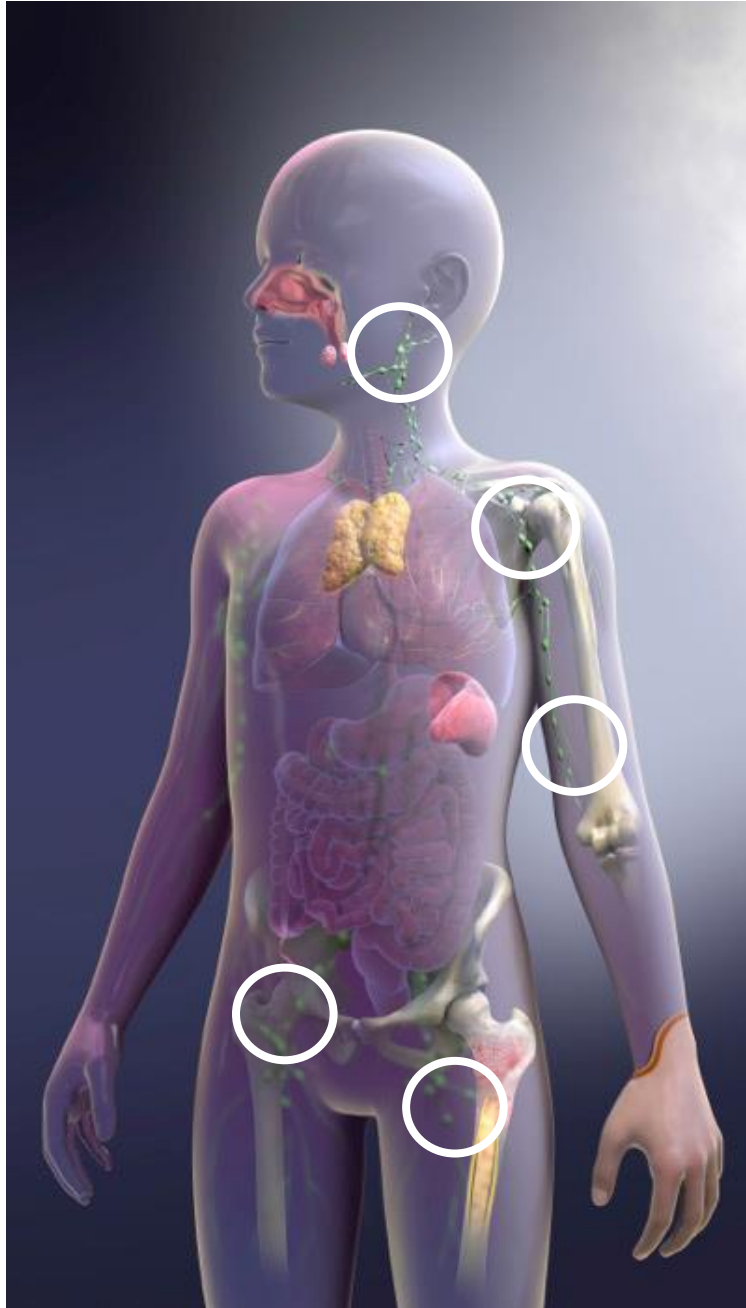
RUBRIC: STUDENT WORKSHEET

1. In one or two sentences briefly describe the functions of organs and tissues of the immune system.
 - Refer to the lesson glossary for descriptions of the organs and tissues and their related functions.
2. Describe what a pathogen is and how it functions.
 - A pathogen is a disease-causing agent, such as a bacterium or virus. Pathogens try to circumvent the immune system, so they can invade our bodies.
4. a. Correctly labeled diagram of organs and tissues of the immune system.



4. b. Diagram showing five lymph nodes in different regions of the model.

- Answers will vary, but students should have circled areas showing the green patches to indicate they understand where lymph nodes are located. Sample circles shown for illustrative purposes on diagram.



4. c. Students indicate what area of the body each lymph node would best protect from infection.
- Student answers should indicate the understanding that the lymph nodes protect the area of the body in which they are located (e.g., lymph nodes under arm protect the chest, breast, and upper arm areas).
5. Write a few sentences about whether you feel it is important that the lymph system is spread throughout the body and why.
- Responses should note that having the lymph system throughout the body allows for protection regardless of where a potential infection is introduced.
6. a. Identify 2 other systems that have a network of vessels throughout the body.
- Circulatory and nervous systems
6. b. Write a short passage to explain how each might be related to the immune system.
- Circulatory system serves as the transportation system for much of the immune response. Whereas blood is pumped through the body by the beating of the heart, movement of lymph through lymphatic vessels is the result of movement of muscle cells in the walls of the lymphatic vessels.
 - Nervous system indicates pain at the site of an infection.