

## 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, and specify their locations and functions.
- **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
- 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 work of 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.)

## Resources for Lesson 1: The Human Immune System

- NIH: Overview of the immune system, with sections on immune system function and location

<http://www.niaid.nih.gov/topics/immunesystem/Pages/overview.aspx>

- Immune Deficiency Foundation: extensive descriptions of the immune system components

<http://primaryimmune.org/about-primary-immunodeficiencies/relevant-info/theimmune-system>

## 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* (<https://vimeo.com/227174435>) and *How do Viruses Reproduce?* (<https://vimeo.com/227177718>)

2. Students read the Reading Passage, *Eternal Vigilance: The Human Immune System*.
3. Students identify any unfamiliar terms from video or the passage in the interactive glossary.
4. Students research online to find diagrams and resources that show the organs and tissues of the immune system.
5. In their notes, students create a T-chart listing organs and tissues of the immune system along with their associated function and location.
6. Students research online to find diagrams and resources that show the organs and tissues of the lymphatic system.
7. Refer students to Figure 1 in their worksheets.

## EXPLAIN

1. Students label the figure in their worksheets with organs and tissues of the immune system (a through j) or use the drag and drop interactive to correctly label the online diagram.
2. Students circle five lymph nodes in different regions of the model using a marker or colored pencil.
3. Students indicate what area of the body each lymph node would best protect from infection.
4. 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.
5. Students work in small groups to create a concept that map that shows the relationship between the lymphatic system and the immune system.

**ELABORATE**

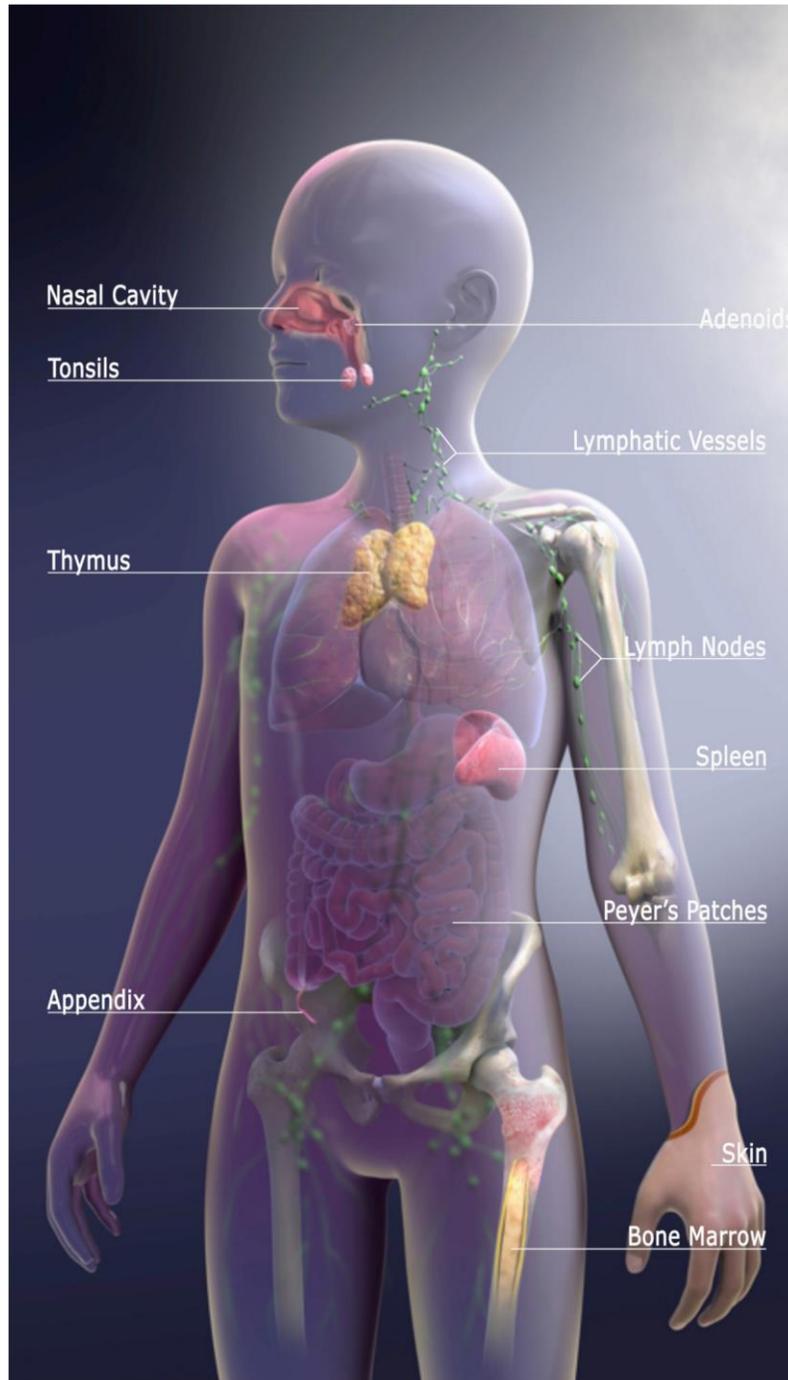
1. Students work in small groups to choose a particular condition (illness, injury, etc.).
2. Each group investigates which organs and tissues of the immune system are involved in defenses against that condition.
3. Groups present their findings to the class in a creative format such as an educational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

**EVALUATE**

1. Students use the drag and drop interactive to self-evaluate their ability to identify parts of the body associated with the immune system.
2. Students answer the evaluation questions in their worksheets.

**Rubric for evaluation questions in Student Worksheet 1**

Question 1. Correctly labeled diagram showing locations of organs and tissues of the immune system.



Question 2. Functions of organs and tissues of the immune system:

a. Nasal cavity	Trapping and filtering of potential pathogens from the air.
b. Tonsils	Trap potential pathogens entering the body through the nose and mouth.
c. Adenoids	Trap potential pathogens entering the body through the nose and mouth.
d. Lymph nodes	Storage of B and T cells, and other immune system cells. Lymph nodes filter lymph, removing pathogens that are then destroyed by immune system cells.
e. Thymus	Location for maturation of T cells (hence T cells)
f. Spleen	The spleen destroys defective red blood cells, detects and responds to potential pathogens and acts as a blood reservoir.
g. Peyer's patches	Peyer's patches contain B and T cells as well as macrophages and dendritic cells; they monitor the intestine to identify potential pathogens.
h. Appendix	Like the Peyer's patches the appendix monitors potential pathogens in the intestine.
i. Bone marrow	Production of B and T cells. Location for maturation of B cells (hence B cells). T cells migrate to and mature in the thymus.
j. Lymphatic vessels	Located throughout the body, these vessels collect and filter lymph which primarily consists of immune cells. Once filtered by going through lymph nodes, the lymph is reintroduced into the blood.
k. Skin	The skin serves as a major protective barrier from potential pathogens in the environment.

Question 3. Two other systems that have networks throughout the body:

- Circulatory and nervous systems.

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.