# Immune system components and response

## *How does the immune system operate to recognize proteins?*

The immune system protects the body from harmful invaders like bacteria and viruses. It has two major parts: the **innate immune system,** which responds quickly and broadly, and the **adaptive immune system,** which takes longer but targets specific invaders and builds memory for future protection. Both systems work together in a step-by-step process to recognize, respond to, and eliminate threats.

## Ohio standards

- 6.LS.3: Cells carry on specific functions that sustain life

**Human Anatomy and Physiology**

- AP.T.3: Lymphatic and Immune Systems

## Student prior knowledge

Students should know that the immune system is a major system in the body, and that proteins are found in all organisms from viruses to bacteria, fungi, and other pathogens.

## Suggested timeline

Two 40- to 50-minute class periods

## Materials

- Cards of immune system parts
- Blank poster board or craft paper
- Colored pencils or markers

## Teacher preparation

1. Determine how you want to group students to complete the activity, individually or in small groups.
2. Copy enough card sets for each student or group.
3. Organize materials for each group.

## Procedure

### Part 1

1. Pass out cards to each student or group.
2. Have students use the cards to create an infographic of the immune system.
3. The cards can be organized in several different ways. Have students draw arrows or lines to connect the parts that:
    - develop from other cells.
    - signal a part of the immune system to reproduce or attack.
    - collaborate to keep out or destroy antigens.
4. Conduct a gallery walk or ask groups of students to share their infographics to describe the interconnectedness of these immune system parts.

### Part 2

5. Simulate an immune system response. Assign students a specific part of the immune system. Make sure they hold the card or identity of their component so it is visible to others. There should be more macrophages, platelets, neutrophils, plasma cells, dendritic cells than other cell types.
    - Introduce an injury to skin (a cut or scrape). Ask students to act out the role of their immune system component.
    - Introduce a pathogen and ask students to act out their immune system component following the guide given.

### Suggested wrap-up

Review the innate immune system and the adaptive immune system parts. Talk with students about the importance of proteins and their receptors in recognition of antigens and pathogens.

## Differentiation

Select parts of the immune system for specific students.

## Extensions

- Have students take photos of their immune system infographics and post.
- Ask students to create their own models of a component of the immune system.

## Support information

- Cytokines and chemokines
  ***bio.libretexts.org/Bookshelves/Microbiology/Microbiology_(Boundless)/11%3A_Immunology/11.10%3A_Immunity_and_Molecular_Signals/11.10B%3A_Cytokines_and_Chemokines***
- Components of the immune system
    - ***https://www.healio.com/hematology-oncology/learn-immuno-oncology/the-immune-system/components-of-the-immune-system***
    - ***ucir.org/immunology-101***
- The immune system and primary immunodeficiency
  ***primaryimmune.org/understanding-primary-immunodeficiency/what-is-pi/immune-system-and-pi***

## Career connections

- **Immunologist:** Immunologists are research scientists or practicing specialists who study, analyze, and/or treat disease processes that involve the immune system.
- **Protein engineer:** Protein engineers analyze amino acid interactions and predict how proteins will fold, then use that information to design new proteins..
- **Epidemiologist:** Epidemiologists analyze the causes, patterns, spread, and symptoms of various diseases.
- **Pathologist:** A pathologist is a healthcare provider who examines bodies and body tissues and completes lab tests to help other providers reach diagnoses.