

Unit 1: Lesson 2 – The Innate Immune System

Vocabulary: The Components of the Innate Immune System

Using resources suggested by your teacher, find definitions for the terms below.

Commensal bacteria	
Complement system	
Cytokines	
Edema	
Inflammatory response	
Macrophages	
Natural Killer (NK) cells	
Neutrophils	
Pathogen-associated molecular patterns (PAMPs)	
Phagocytosis	

Refer to the online glossary and compare your definitions with those in the glossary. Make any necessary corrections to your definitions above.

Activity 1

Castle of the Body

Like this castle, the body has different defense mechanisms to keep out invaders. The walls and moat protect the castle. Think of skin as the walls of your body, while the moat is like the mucous membranes that line your respiratory, digestive, and reproductive tracts. In this activity, you will simulate the many attacks by outside microbes made on the human body and simulate how the body defends against them. You may work individually, but the activity is better carried out working in a small group.



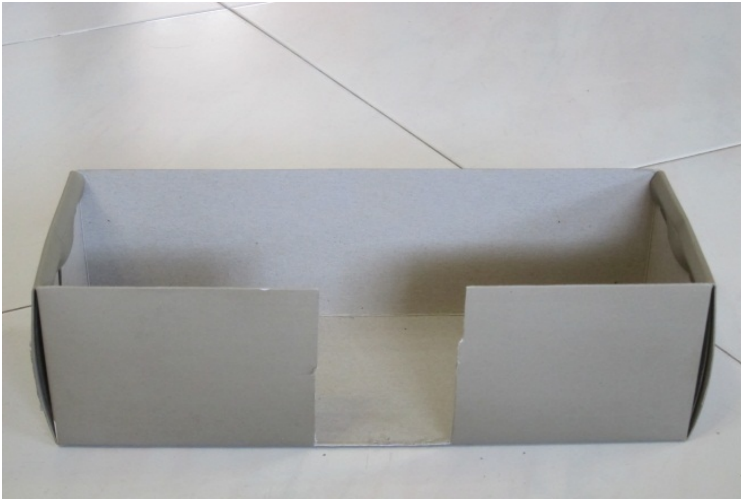
Figure 1. Herstmonceux Castle, near Wartling, East Sussex, Great Britain. (Courtesy of Geograph.org)

Materials:

- shoebox without lid
- craft knife or scissors
- 10 ping pong balls
- 10 marbles
- 10 1½" foam balls
- masking tape

Procedure:

1. Cut a hole in one side of the box, about two ping pong balls in width and height (see diagram). This will be your “castle.”



2. Place masking tape sticky side up in front of the castle opening. Use two smaller pieces at each end of the tape to keep it flat.
3. From a distance of one foot, gently roll the ping pong balls and tally the results in the worksheet data table. If a ball is stuck on the tape, tally a mark in the “Moat” column. If the ball hits the wall of the box, tally in the “Walls” column. If the ball makes it into the shoebox, tally in the “Castle” column.
4. After rolling ten balls, total the results for Trial #1.
5. Clear away the ping pong balls and repeat Step 3, using the foam balls. Try to roll the balls the same speed that you used for the ping pong balls.
6. After ten rolls, total the results for Trial #2.
7. Clear away the foam balls and repeat Step 3, using the marbles. Again, roll the marble from the same distance and at the same speed you used for the other two trials.
8. After ten rolls, total the results for Trial #3.
9. Complete the table for the percentages of balls in each trial.
10. Answer the questions below.

Data table

	Trapped in Moat	Hit Walls	Inside Castle
Trial #1 (ping pong balls)			
Trial #2 (foam balls)			
Trial #3 (marbles)			
Total number of items			
Average			

Percentages

Calculate the percentages and averages of balls in each trial.

	% moat	% walls	% castle	Total %
Trial #1 (ping pong balls)				
Trial #2 (foam balls)				
Trial #3 (marbles)				
Total percentage				
Average				

4. Working in a small group, create a list of ways to get more of the balls or marbles into the box. Then create a list of ways to stop more of the balls or marbles getting into the box. If time allows, repeat the activity using different materials to represent various kinds of pathogens. Record your data and calculate percentages as before. Record the effectiveness of the technique and summarize your results and conclusions.

Discussion

Within your group, discuss how your activity represents the immune system's interaction with pathogens to protect the body. Create a multimedia resource to illustrate how your activity and the moat and castle analogy are models of the interactions of pathogens and the immune system.

Evaluation

Create a multimedia resource about the innate immune system

Here are summary points about the innate immune system

- The innate immune response is non-specific.
- The innate immune response is our first line of defense.
- The innate immune response is successful in averting most infections.

In the activity, consider how the moat and castle analogy models the interactions between pathogens and the immune system. Choose one of the assignment options below to educate others about these innate immune system attributes. Feel free to develop your own ideas.

Example assignments include:

- Make a 30 second television commercial
- Design an ad for a magazine
- Write a newspaper article
- Create a web page (blog, wiki, etc.)
- Perform a skit
- Create a slide presentation

Optional Activity

How does the innate immune system work?

Use the scenarios below to consider symptoms that indicate the innate immune system is functioning. Working in small groups, select one of the scenarios below and list the symptoms that might occur. Discuss and record possible innate immune system responses. Use the discussion questions when considering your chosen scenario. Record your thoughts on the table.

Scenarios

- You are out skateboarding and want to impress your friends by jumping an old park bench. The jump doesn't go so well and you fall. Later that evening, your finger is sore. When you look, you discover that you have a splinter.
- You and a group of friends go out to eat after a baseball game where your team won. To celebrate you buy a shake and a Double Blammo Burger from Greaseball's Diner. A couple of hours later, you aren't feeling so good.

- You are getting ready for class portraits. When you look in the mirror, you are horrified to see a giant pimple right on your forehead.
- You're sitting in class and the kid next to you coughs in your direction without using an arm or hand to cover his mouth. A day later, your throat is sore.

Discussion questions:

1. What symptoms indicate that your body is fighting a potential infection?
2. For each symptom, describe what part of the innate immune system contributes to the symptom.
3. What are the effects or results of each innate immune response?

Scenario	Q1. Symptoms	Q2. Innate system contributing to symptom	Q3. Effect of innate immune responses