

Agents of the Immune System: Pathogen Lesson	Grades 9-12
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<h2 style="margin: 0;">Lesson Plan</h2>	
<p>Description</p> <p>In this lesson, students will understand the role the immune system plays. They will learn about the different types of pathogens, how they infect our bodies and the stages of infection.</p> <p>In the Agents of the Immune System GooseChase experience, students will work independently or as part of a team to complete the missions, learn about the immune system and collect points. Students' submissions in the GooseChase app will remain hidden from other students who participate in the Agents of the Immune System experience.</p>	<p>Materials</p> <p>A smartphone, tablet, or Chromebook for at least one student in each group with the free GooseChase app downloaded.</p>
<p>Big Ideas</p> <ul style="list-style-type: none"> • The immune system is a collection of cells that works together to identify foreign invaders and protect the body from infection. • Immune cells travel around the body through the lymphatic system • Pathogens are disease-causing agents • Viruses are a type of non-living pathogen that is dependent on its host cell to replicate itself and spread. • Bacteria are single-celled organisms that may or may not cause disease. Pathogenic bacteria release toxins that make us feel ill. 	<p>Specific Expectations</p> <p><u>Grade 10</u></p> <p>B2.1 Use appropriate terminology related to cells, tissues, organs, and systems of living things, including, but not limited to: absorption, anaphase, capillaries, concentration, differentiation, diffusion, meristematic, mesophyll, phloem, prophase, red blood cells, regeneration, stomate, and xylem [C]</p> <p>B3.4 Explain the primary functions of a variety of systems in animals (e.g., the circulatory system transports materials through the organism; the respiratory system supplies oxygen to and removes carbon dioxide from the body)</p> <p><u>Other Grades:</u></p>

- There are four stages of infection a pathogen must follow to cause disease; exposure, adhesion, invasion and infection.

There are no specific curriculum links to this program, but it is an easy way to introduce students to the basics of the immune system and pathogens in a fun and engaging way as part of a team.

Introduction

The immune system is a collection of cells and organs throughout the body that work together to protect us against pathogens—disease-causing agents. This includes the skin, spleen, lymph nodes, lymphatic vessels and more. The immune system must be able to differentiate between things that belong in the body, and those that do not.

Our immune cells are controlled and grow at specific places within our bodies, typically found within the lymphatic system. Lymphatic vessels run throughout the body, similar to the circulatory system, and act like a road for immune cells to travel. A colourless fluid called lymph carries things throughout the lymphatic system. The lymph travels to lymph nodes, where it is filtered.

Viruses, fungi, bacteria and parasites are all different types of pathogens. Viruses are non-living pathogens that are made up of genetic material—DNA or RNA that act as instructions, and a protein coat that protects the genetic material. Some viruses have another layer called an envelope. The spike proteins on a virus' surface are what allow it to enter our cells. Viruses are not considered to be alive because they don't eat, grow, or reproduce on their own. They must hijack the cellular machinery in a host cell they infect to replicate.

Bacteria are single-celled organisms that are extremely diverse in their structure as well as metabolic functions. Not all bacteria are pathogenic; many are helpful to humans. Billions of bacteria are living on you right now! Pathogenic bacteria make us feel ill by releasing toxins that are meant to help them establish infections.

For a pathogen to cause disease, there are a few stages to that process. First, the body needs to come in contact with the pathogen. This stage is called exposure. Next, the pathogen needs to be able to stick to the body's cells and tissues. We call this stage adhesion. Invasion happens after the pathogen has stuck to the body, when it travels to the part of the body that it infects.



Finally, we have the infection stage. This is when the pathogen needs to beat the immune defences and cause disease. In this stage, the pathogen can make copies of itself.

Action

1. Ensure students can access a device with the free GooseChase [iOS](#) or [Android](#) app downloaded. Mobile devices or tablets with a camera are best for this lesson. Only one student from each group needs a device.
 - 1.1. If you plan to use Chromebooks instructions for downloading the GooseChase app can be found at this web address <https://support.goosechase.com/en/articles/4437551-can-i-participate-in-a-goosechase-experience-on-a-chromebook>
2. Divide the class into groups of 2-4 and have them Log in, or if they are New to Goosechase, sign up for an account or participate as a guest. Please encourage students to use a pseudonym.
3. Have students search for this Experience by code **5WGQ15** or name **Agents of the Immune System: Pathogen Lesson**. If multiple students in each group have a device, they may create a team in the app. The French version of the experience can be found by code **LK53V5** or name **Agents du système immunitaire: leçon sur les pathogènes**.
4. Give each group a printed copy of the accompanying workbook for them to record their written submissions. Explain that students should complete the experience missions in numerical order. Once they get to the bonus questions, they may do them in any order, although they should complete the first bonus mission listed in their workbook.
5. Allot one class period to have students work through all of the missions and as many Bonus Missions as they are able to. Many of the questions do not have a single correct answer, but are up to interpretation. Encourage students to think creatively and remind them they are being marked on the effort they put into their answers.

<p>Consolidation/Extension</p> <p>If you wish to go further, you may have groups compare their answers for the first bonus mission highlighting what they have learned. Students may also wish to share their team's score with the class. It may also be beneficial for students to discuss as a class some of the key concepts/takeaways of the lesson and what they have learned.</p>	
<p>Accommodations/Modifications</p> <p>You can have students take a screenshot of their answers to questions not included in the workbook for grading purposes.</p>	<p>Assessment</p> <p>Students can be assessed on the detail and effort they put into their written answers in their workbook. You can encourage them to vary their responses, including using words, pictures, comics, charts, etc.</p>
<p>Additional Resources</p> <p>Parts of the immune system https://www.chop.edu/centers-programs/vaccine-education-center/human-immune-system/parts-immune-system</p>	