**Part 1: Learning outcomes plan**

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| **Main idea:*** The immune system in our bodies fights infection to keep us healthy.
 | **Science strand:*** Living World: Life processes common to all living things – particularly focusing on a key structural feature (the immune system) and its function.
* Also describes the organisation of life at the cellular level.
 | **Level:** 3 4 5**Year:** 5–8**Teacher:** Barbara Ryan |
| **Overarching learning outcomes:** In building understandings about the immune system, students will integrate:* understanding that the immune system works to fight infection in our bodies (scientific knowledge)
* an investigation into the immune system and how it functions to fight specific diseases (scientific practice)
* understanding that scientific knowledge can be used to help people (nature of science).
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| **Conceptual learning outcomes**  | **Procedural learning outcomes**  | **Nature of science outcomes**  | **Technical learning outcomes**  |
| Students will understand that:* infection is the invasion of pathogens into the body
* cells are the basic building blocks of the body
* microorganisms are microscopically small organisms, and there are trillions of them within the human body
* bacteria (microorganisms) are mostly harmless, but there are a few pathogenic bacteria that are harmful to us
* viruses are extremely tiny genetic material, and some can be very dangerous (pathogenic)
* the immune system is cells, tissues and organs that work together to protect the body against pathogens
* there are special immune cells that are part of the immune system that have specific functions
* the immune cells respond differently for different pathogens.
 | Students will be able to:* research for information from the Fighting infection resources in the Science Learning Hub
* identify and classify microorganisms
* identify questions about the immune system suitable for investigating through the interactives or other immune system activities
* identify immune cells using identification cards, PowerPoint presentations and information from the Fighting infection resources
* follow a sequence of steps to learn a card game that explores how different viruses affect different cells in the body
* model immune response through drama
* draw a mind map depicting their understanding of the immune system
* follow a sequence of steps to conduct an experiment (spreading diseases)
* debate or role-play an ethical issue.
 | Students will understand and appreciate that:* scientists make categories so they can understand what they see (such as classifying microorganisms)
* scientists use models to explain things that are difficult to observe (such as the immune system that is within the body and has many parts that are microscopic)
* scientific research can help people in the future (such as research into infectious diseases)
* scientists face ethical dilemmas (such as keeping David Vetter alive).
 | Students will be able to:* use a microscope to observe cells
* use interactives from the Science Learning Hub to explore the immune system
* use a camera to take videos clips of the immune response drama.
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| **Management/materials:*** Resources: various articles on the Science Learning Hub, starting with [www.sciencelearn.org.nz/resources/165-fighting-infection-introduction](http://www.sciencelearn.org.nz/resources/165-fighting-infection-introduction), microscopes
* Equipment for the student activity [Spreading diseases](https://www.sciencelearn.org.nz/resources/192-spreading-diseases) (optional)
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| **Assessment:*** Imagine you are an immune cell, bacterium or virus. Write a short story about what happens to you in the body to show your understanding of the immune system.
* Alternatively, the mind map could be an assessment activity.
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**Part 2: Lesson plan**

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| **Main idea:** The immune system in our bodies fights infection to keep us healthy. |
| **Subtasks** | **Resources/focal artefacts** | **Planned interactions** | **Key student outcomes** |
| **Meso tasks** | **Micro tasks** |
| **Day 1**Introduce the concept of infection.  | 1.1 Introduce some previously made ‘snot’. | * ‘Snot’. To make, see Student activity > [Making snot](https://www.sciencelearn.org.nz/resources/196-making-snot)
 | * Class discussion: What is this? Brainstorm ideas about what snot is.
 | * Students will understand that snot is formed by the body to protect the body against invading particles and ‘germs’ that may cause an infection.
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| 1.2 Read and discuss the Science ideas and concepts article Infection. | * Article > [Infection](http://www.sciencelearn.org.nz/resources/179-infection)
 | * In small groups or as a class, read the article Infection. Discuss terms such as ‘microorganisms’, ‘pathogenic’, ‘vaccination’. This could be done as a class using an IWB – scientific words could be highlighted and discussed.
 | * Students will know that infection is the invasion of pathogens into the body.
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| 1.3 Students make snot themselves (optional). | * Student activity > [Making snot](https://www.sciencelearn.org.nz/resources/196-making-snot)
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| **Day 2**Exploring cells and microorganisms. | 2.1 What is a cell?  | * Student activity > [Introduction to cells](https://www.sciencelearn.org.nz/resources/186-introduction-to-cells)

**Teacher reference:*** Science ideas and concepts article > [Cells](https://www.sciencelearn.org.nz/resources/175-cells)
 | * Follow through with activities and questions 1–7 in the student activity. Have 2–4 microscopes set up with onion cells already on them for students to observe. If you have an IWB or data projector, get some cells (like banana cells suggested in the activity) off the internet and show on board.
 | * Student will understand that a cell is the smallest basic unit a body is are made up of.
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| 2.2 What is a microorganism? | * Science ideas and concepts article > [Microorganisms – friend or foe?](https://www.sciencelearn.org.nz/resources/176-microorganisms-friend-or-foe)
 | * In small groups or as a class, read the article Microorganisms – friend or foe? Ask students for terms they don’t understand and discuss.
* With an IWB or data projector (or on individual computers) explore the scale interactive under Useful links to appreciate the size of microorganisms (<http://learn.genetics.utah.edu/content/cells/scale/>).
 | * Students will understand that a microorganism is a tiny living organism. They will appreciate differences between bacteria cells, viruses and parasites.
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| **Day 3**Exploring the immune system. | 3.1 What is the immune system?  | * Student activity > [The wars within](https://www.sciencelearn.org.nz/resources/189-the-wars-within)

**Teacher reference:*** Science ideas and concepts article > [The body’s first line of defence](https://www.sciencelearn.org.nz/resources/177-the-body-s-first-line-of-defence)
* Science ideas and concepts article > [The body’s second line of defence](https://www.sciencelearn.org.nz/resources/178-the-body-s-second-line-of-defence)
 | (Before the session, the teacher should read the science ideas and concepts article articles and view the Cells of the immune system PowerPoint presentation from the student activity The wars within to become familiar with the immune system and cell names.)* As a class, go through the PowerPoint presentation slowly discussing each slide and practising saying the names of the immune cells presented.
 | * Students will have an appreciation of what the immune system is and will become familiar with immune system cell names.
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| 3.2 Exploring the immune system through two interactives. | * Interactives > [The immune system](https://www.sciencelearn.org.nz/image_maps/68-the-immune-system)> [The immune system in action](https://www.sciencelearn.org.nz/image_maps/69-the-immune-system-in-action)
 | * In pairs students, explore the interactives The immune system and The immune system in action. See what happens when a rotavirus and skin bacteria get into the body. Note that the body responds differently for different bacteria, viruses or invading pathogens.
 | * Students will see how the body responds to a specific bacterium and virus in the body.
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| 3.3 Play a card game to identify how different viruses affect different cells in the body. | * Student activity > [Fighting infection card game](https://www.sciencelearn.org.nz/resources/190-fighting-infection-card-game)
 | (Before the session, the teacher should colour copy, laminate and cut out the cards for the Fighting infection card game and go through the game to become familiar with the rules before teaching to the students.) * Play the game individually, in groups or as a class.
 | * Students will become more familiar with how the immune system works and how different pathogens cause different responses.
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| **Day 4**Further investigation into how the immune system fights infection.  | 4.1 Recap the names of immune cells and their main function.  | * Student activity > [Drama with microbes](https://www.sciencelearn.org.nz/resources/191-drama-with-microbes)
 | * As a class, identify the cells on each card and discuss their function.
* Display the cell cards. Tell students these cards are just a depiction of the cells and that the actual cells are not these colours – the dentritic cell though, does have arm-like projections, while the other cells are more round in shape.
 | * Students become more familiar with cells and pathogens and their function
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| 4.2 Identify the cells you know in the interactives. | * Interactives > [The immune system](https://www.sciencelearn.org.nz/image_maps/68-the-immune-system)> [The immune system in action](https://www.sciencelearn.org.nz/image_maps/69-the-immune-system-in-action)
 | * As a class (with an IWB/data projector) or in pairs/groups, go through the interactives again and see if you can name the cells you see.
 | * Students can identify the main cells in the immune system.
* Students will understand how immune cells interact together to destroy a pathogen.
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| 4.3 Model immune system response to bacteria and viruses. | * Student activity > [Drama with microbes](https://www.sciencelearn.org.nz/resources/191-drama-with-microbes)
 | * Discuss the idea of acting out immune response. Watch the movie clips of year 5/6 students and their immune response drama (IWB/data projector/computer).
* Follow instructions 5–9 in the student activity.
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| **Day 5–6**Consolidating ideas about the immune system. | 5–6.1 Depict ideas about the immune system in a mind map. | * Student activity > [Literacy in immunology](https://www.sciencelearn.org.nz/resources/194-literacy-in-immunology)
 | * In pairs or small groups, students draw mind maps depicting their knowledge of the immune system (see examples in the student activity).
 | * Students will have a simple understanding of the immune system and the function of some of the cells.
* Students will use scientific terms and phrases.
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| 5–6.2 Write poems that describe functions of immune cells or the working of the immune system. | * Student activity > [Literacy in immunology](https://www.sciencelearn.org.nz/resources/194-literacy-in-immunology)
 | * Read examples of student poems in the student activity.
* Students write their own poems.
 | * Students will have a simple understanding of the immune system and the function of some of the cells.
* Students will use scientific terms and phrases.
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| 5–6.3 **Assessment activity:**Write short stories on the immune system. | * Student activity > [Literacy in immunology](https://www.sciencelearn.org.nz/resources/194-literacy-in-immunology)
 | * Read examples of student stories in the student activity.
* Imagine you are an immune cell, bacterium or virus. Write a short story about what happens to you in the body.
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| **Optional extras**Understand how disease spreads in a group. | O.1 Participate in an experiment that shows how disease spreads among a group of people. | * Student activity > [Spreading diseases](https://www.sciencelearn.org.nz/resources/192-spreading-diseases)
 | * Follow the instructions in the student activity.
 | * Students will explain how a virus spreads and will be aware of how the spread can be limited.
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| Explore some current medical research. | O.2 Read about some current New Zealand research and use the Futures thinking tool to think about medical care in the future. | * Student activity > [Exploring medical research](https://www.sciencelearn.org.nz/resources/193-exploring-medical-research)
 | * Follow the instructions in the student activity using the topics TB, rotavirus, RSV or hookworm and allergies.
 | * Students will be aware of New Zealand research and that such scientific research helps people in the future.
* Students will become familiar with David Vetter’s case, appreciate the importance of the immune system and be introduced to ethics discussions.
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| Debate or role-play an ethical dilemma. | O.3 Debate or role-play the issues involved in keeping David Vetter (born without an adequate immune system) alive. | * Student activity > [Ethical dilemmas in fighting infection](https://www.sciencelearn.org.nz/resources/195-ethical-dilemmas-in-fighting-infection) (David Vetter section)

**Teacher reference:*** Article > [Managing classroom discussion](https://www.sciencelearn.org.nz/resources/198-managing-classroom-discussions)
 | * Follow the instructions in the student activity to learn about David Vetter and the issues involved.
* Conclude with either the debate or role-play to engage in ethical discussion.
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