

## Lesson Plan

### Description

In this activity, students play a card game to explore how two types of immune cells help to fight viral infections. This activity was created by Science Learning Hub – Pokapū Akoranga Pūtaiao University of Waikato Te Whare Wānanga o Waikato. Please go to their website to get copies of the cards that are needed to play the game.

### Learning Outcomes

- explain that different viruses infect different cells to cause disease
- explain the two main ways the immune system stops viruses from replicating
- explain the relationship between influenza and the lung, and rotavirus and the gut.

### Materials

- Playing cards – colour copy and laminate several sets of cards. If used as a class activity, more cards will be required in this order – rotavirus, B cell rotavirus, killer T cell rotavirus, gut cell, gut cell, influenza virus, B cell influenza virus, killer T cell influenza virus, lung cell, lung cell. Go to <https://www.sciencelearn.org.nz/resources/190-fighting-infection-card-game> to print the cards for the game.
- Paper clips – 2x the number of cell cards (gut and lung) used
- Adhesive dot labels – 2 colours, about 16–20 of each
- Copies of the card combinations, which gives instructions for necessary actions. These should also be printed when making the playing card. See above.

### Introduction/Explanation

Our immune system is made up of several levels. The first level is basically the physical barriers that prevent germs from entering our bodies. This includes our skin and our mucosal lining in the openings of our bodies (eyes, nose, mouth, stomach etc.). But sometimes germs can get inside our bodies through a cut, into our digestive tract or into our respiratory system.

Some germs are living organisms, like bacteria, but others are non-living, such as viruses.

Viruses need our cells to make copies of themselves. They have protein molecules on the outside that allow them to enter our cells. Viruses can be quite specific as to what kind of cells they infect. The influenza and coronaviruses attach to cells of the respiratory system (lungs, nose, and throat) whereas rotaviruses attach to cells in the digestive system.

### Sciencenorth.ca/schools

Science North is an agency of the Government of Ontario and a registered charity #10796 2979 RR0001

With funding from:



Agence de la santé  
publique du Canada

Public Health  
Agency of Canada

The views expressed herein do not necessarily represent the views of the Public Health Agency of Canada

The next levels of the immune system need to act quickly to minimize damage caused by a viral infection. Level 2 of our immune system consists of cells (phagocytes) that will eat germs, but they often get overwhelmed quickly. They will recruit our third level of protection with dendritic cells. Dendritic cells act as a bridge between the **innate** immune system (same response to any germ) and the **adaptive** immune system (specific response to a specific germ).

Level 3 of our immune system, the adaptive immune system, consists of lymphocytes (T cells and B cells). Helper T cells will reactivate our phagocytes, call on Killer (cytotoxic) T cells to kill virus-infected cells and activate B cells to make antibodies. B cells will make antibodies against a specific germ. They will neutralize the germs and essentially tag them for destruction by the phagocytes.

Once we have been infected by a germ once, our body usually “remembers” that germ and can fight it faster the next time it infects us.

Vaccines take advantage of this aspect of our immune system by introducing a mimic of the germ. Our immune system will make antibodies against the mimic, but we won’t be infected by the germ. When we are infected, our bodies will react much faster and make many more antibodies and we probably won’t get that sick from being infected by the real germ.

### Action

1. Prepare the playing cards by printing out the pages of sheets and cutting up the cards. Also prepare the macrophage dumpster card.
2. To play the card game in a group or individually:
  - a. Divide one set of cards into two piles or into two small bags/bowls so they can be taken one at a time without looking. The two piles are the non-moving cells (sessile) i.e., gut and lung cells and the remainder (viruses, B cells and killer T cells).
  - b. The first person takes one card from each pile and examines them. Together, the group looks at the card combinations and discusses what action is necessary.
  - c. After taking the necessary action, place the two cards in separate discard piles. (The cards will be used again in repeated rounds.)
  - d. The next person takes a card from each group and examines them. Continue as above.
  - e. Once the two piles of cards are finished, mix the cards up in their piles (or return to bag) and begin again.
  - f. After going through the cards five times, turn up the cards and look to see how successful the viruses were in this infection.
  - g. If a card must be removed from play, it is placed on the macrophage dumpster pile.

3. To play the card game as a class activity:
  - a. Give each student a card. Those students holding virus cards are given adhesive dots (8–10 each, with different colours for different viruses). Those students holding B cell cards are also given six paper clips.
  - b. Those who represent sessile cells are to remain in one place (around the edge of the room). All other cardholders are to move around to interact randomly with these cells.
  - c. The moving group each go to a sessile cell, and they show each other their cards.
  - d. With as little volume as possible, they decide on a course of action using the card combinations, complete it and the moving person sets off to find a new cell.
  - e. If the action requires a card to be removed from play, the person sits down.
  - f. Continue to allow approximately five interactions per person.
4. Consider what would happen if there were
  - a. more virus cards
  - b. more B cell cards
  - c. more killer T cell cards.
5. It may be possible to add extra cards and see what happens in a repeat game.

#### **Additional Resources**

This activity comes from Science Learning Hub Pokapū Akoranga Pūtaiao:

<https://www.sciencelearn.org.nz/resources/190-fighting-infection-card-game>

