Unit 6.2
"The RAD Disease":
Investigating and Modeling Body Systems

Unit Overview

Unit Summary

In this unit, students address the problem of emerging diseases by learning of a fictitious outbreak within their school. As students progress through the unit, they identify the illness, construct explanations about how it affects organ systems and their subsystems, and design an informational campaign to prevent a future outbreak.

To help students determine the pathogen, students learn about different types of living and nonliving things that can cause illness. They also learn that living things contain cells, and can be unicellular or multicellular (MS-LS1-1). They learn about the organization of the body and its interacting systems and subsystems at the organ system, organ, tissue, and cellular levels (MS-LS1-3). They then apply these concepts to the structure and function of a cell and its components, while understanding that these components work together in a system (MS-LS1-2).

At the end of the unit, students combine parts of multiple solutions to draft a public health solution to the outbreak in their school. Students share their presentations with the class, discuss the strengths of the proposed solutions, and consider how their solutions may apply to other common diseases like a cold, flu, and COVID-19.

Unit Challenge Questions

- How do germs make us sick?
- How do we keep sicknesses from spreading?

Unit Big Ideas

- Viruses are a type of germ that infects our cells, affecting their function. This makes us sick.
- Living things are made of cells, which are in turn made up of smaller parts that work together as a system to function.
- Multicellular organisms, like humans, have interacting levels of systems and subsystems that work together to keep the organism alive.

Connection to 21st Century Issues

Emerging pathogens, particularly viruses, are a constant concern for the public. The threat of a catastrophic pandemic is especially increased as technological advances enable rapid global travel. Epidemiology and its practices are constantly being tested as epidemics, such as COVID-19, Zika, Ebola, and measles, occur. The need for scientific communication with the public has rarely been more necessary. Succinct and accurate communication of scientific findings is paramount to the acceptance of scientific knowledge and trust in the scientific community.

Unit Challenge

Unit Challenge Summary

The adults in the school have contracted a mysterious illness from a virus on the coffee pot in the school, and it is impacting the nervous system. The virus is hijacking nerve cells in the brain and causing the adults to unexpectedly break into song and dance. The virus enters through the cell membrane of the nerve cells and tricks the cell into making copies of the virus.

The students need to figure out where the illness is coming from, what it is, and explain why it is causing teachers to act strange. Students then develop resources to help stop the spread of any future outbreaks of the illness.

Unit Challenge Scenario

Some of the adults in your school are acting strange! They have been randomly waving their hands, scratching their heads, and doing the funky chicken (random acts of dance, singing), but it doesn't happen all the time, and not all the adults at your school are affected. No one knows what the source is.

Officials from the health department believe that something in the school is causing this strange disease. They are calling this illness RAD disease, which stands for Random Acts of Dance. They asked the school to limit school visitors and keep track of EVERYONE who enters the school. This is a hassle!

There have been a few similar outbreaks in the past, but very little is known for sure. What we do know is:

- that the main symptom is breaking out into song and dance, the disease does not seem to progress to anything worse or more dangerous.
- RAD affects adults, there has never been a case observed in someone less than 20 years old.
- Infected adults eventually get better, but it takes a very long time.

Officials want to take this opportunity to learn more about this mystery illness. The officials are confident the sick adults can be treated if the cause of the illness can be identified. This would be great since the sick people want to get better as soon as possible.

During an outbreak, having a clear and understandable communicator between public health officials and the affected communities is vital. Since you are in the affected schools, you can be a great resource to help explain what is going on in your school to the general public.

Lesson Sequencing Table

Lesson #	Lesson Questions	What students do...	# days
1 (opener)	● How do germs make us sick? ● How do we keep sicknesses from spreading?	Students share their experiences with colds and model how this illness can quickly spread through a population. Students are introduced to the Unit Challenge and create the Unit Bubble Map.	2
2	● How do we figure out what is causing an illness? ● How do we conduct a good investigation	Students explore the qualities of good investigations through the lens of the 1854 cholera outbreak in London, England. Students apply these concepts to determine the likely source of the school outbreak.	4
3	● How do we know if something is living? ● Are there living things too small to see?	Students investigate the characteristics of living things and determine that the mystery illness is caused by a nonliving virus because it is not composed of cells.	4
4	● How does a healthy cell work?	Students identify the different parts of a cell and how they work together to function. Students use this information as a standard for comparison for infected cells, and use a model to compare how the cell parts work together in healthy and infected cells.	3
5	● How does a healthy body work?	Students build on what they have learned about how cells function to investigate how the body is made up of interacting systems at multiple scales from the whole body down to the individual cell. Students use what they have learned to predict how the RAD virus affects various functions in the teachers' bodies.	4-5
6	● How can we design better solutions to new problems? ● How do we figure out if a source of information is trustworthy?	Students consider how combining parts of multiple similar solutions can be used to address a novel problem. Students also investigate how to identify whether or not a source of information is trustworthy. They use what they have learned to develop a public health campaign to prevent a future RAD outbreak.	4
7 (closer)	● How do germs make us sick? ● How do we keep sicknesses from spreading?	Unit Challenge teams share their public health campaigns with the class and discuss the strengths of the proposed solutions. Students then make connections between the fictional RAD virus and real viruses found in schools.	3-4

