

## Comparing Virus to Other Types of Cells

### Science Grade-Level Expectations

The exercises in this instructional task address content related to the following science grade-level expectation:

LS-H-C7 Compare the structures, functions, and cycles of viruses to those of cells (GLE 21)

	Objectives
<b>Task</b>	<ul style="list-style-type: none"> <li>– Compare viruses and bacterial cells</li> <li>– Determine if viruses are living organisms</li> <li>– Compare replication and reproduction</li> </ul>
<a href="#">Sample Student Exemplar Response</a>	

### Implementation Tips:

- This task is intended to be integrated into a larger unit that contains hands-on science opportunities, student-led investigations, non-fiction reading, and a variety of other instructional strategies.
- Teachers may choose to use or modify the task as part of an instructional lesson or as a formative or summative assessment.
- Strategic instructional decisions will need to be determined prior to implementation such as:
  - Should the provided text be read aloud to students or read independently by students?
  - Will students work collaboratively or individually to complete the task?
  - What content knowledge and skills will students need to have prior to attempting the task?
  - Does the task need to be modified based on the needs of the students at the time of implementation?

- Read [MERS-CoV Outbreak Largest Outside Kingdom of Saudi Arabi](#), an article by the World Health Organization (WHO).
- Read [Get to Zero, Stay at Zero](#) by Aruna Dutt of the United Nations.

**Task Part 1:** Why is a deadly viral outbreak of Mers-CoV and Ebola more difficult to control and eliminate than a deadly bacterial infection?

**Task Part 2:** Compare how virus and bacterial cells are formed. In your explanation, include:

- Why is viral replication not considered to be reproduction?
- How does a virus obtain energy and DNA or RNA bases for its replication process?

## Sample Student Exemplar Response

### Part 1

Bacterial infections can be treated with antibiotics. Antibiotics vary in their mode of action. In some cases, components (chemical compounds) in the antibiotics bind to the bacteria's protein-building factory—the ribosome—and cause it to assemble proteins incorrectly. Other antibiotics work by inhibiting ribosomes in the cell. Some break down the cell wall of bacteria; the bacteria break open and, therefore, are destroyed. Many antibiotics prevent the production of a cell wall or membrane. Some antibiotics damage or break DNA strands, which prevents reproduction and metabolic life functions. Though many antibiotics destroy bacteria, in some cases it triggers bacteria to evolve to be antibiotic resistant. In these cases, the bacterial cells are mutated and survive the antibiotics to reproduce.

Although antibiotics will kill or prevent the reproduction of bacterial cells, they have no effect on viruses. Viruses do not have the cell organelles that a bacterial cell contains. Viruses are made up of nucleic acids, proteins, and a capsid only. There are no ribosomes or cell walls in the virus for the antibiotic to act upon; therefore rendering the antibiotic ineffective. Viruses are like kidnappers. They invade living, normal cells and use those cells to multiply and produce other viruses like themselves. This eventually kills the cells, which can make you sick. Viral infections are hard to treat because viruses live inside your body's cells. They are safe from medicines which usually move through your bloodstream. Also, the viruses have an external covering (viral coat) that is almost identical to the host cell's membrane which makes the viruses difficult to target.

### Part 2

The purpose of virus replication is to allow production and survival of its kind. However, replication can only occur through using a host cell. When a virus infects a cell, it uses the cell's ATP cycle to gain energy and uses much of the cell's machinery (ribosomes, enzymes, and other proteins) to replicate. During this process, abundant copies of the genome are created and packaged into copies of the virus thereby enabling the virus to invade other cells. Replication between viruses varies and is dependent upon the type of genes involved in them.