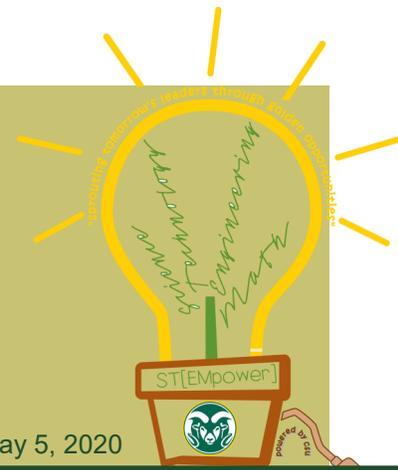


# ST[EMpower]

## VIRAL-CYCLES: CELL vs. VIRION

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### Compare Models of Animal Cell and Virion

#### THIS ISSUE

- Making Models page 2
- Model of Animal Cell Page 4
- Model a Virion page 5

#### POWER WORDS

- **chronic:** persisting for a long time or constantly recurring
- **novel virus:** a virus not seen before
- **virion:** the complete, infective form of a virus outside a host cell, with a core of RNA or DNA and a capsid
- **virus:** an infective agent that typically consists of a nucleic acid molecule in a protein coat, is too small to be seen by light microscopy, and is able to multiply only within the living cells of a host

What a crazy year! Suddenly, all the news is about the **novel** coronavirus and the disease it causes, COVID-19. It can be scary, because you can't go to school or play with your friends right now.

After we start opening back up, things are going to be different. You and your friends might wear cloth face masks, or sit further apart in your classroom. Depending on if we get an uptick in infections, we may need to stay at home again. This will last until enough people are immune to COVID-19, either by being infected and recovering, or getting a vaccine that still needs to be developed.

Some people infected by this **virus** show no symptoms. Some people have minor symptoms. Other people have very severe symptoms, and they need to go to the hospital to help them stay alive. Anyone who is infected can spread this disease.

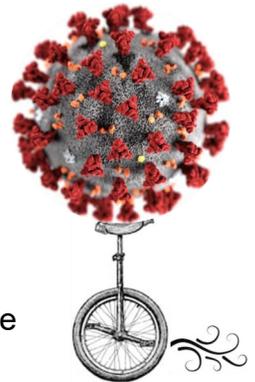
What about children? Generally

children do not get really sick. Phew! The concern with this disease is if someone has an underlying condition. That means, the person has another **chronic** illness, like diabetes. If they are infected with coronavirus, they can have severe symptoms. It also is harder for older people.

Scientists are working very hard to understand how this disease attacks the human body. Why do some people have no symptoms, but are infected, and others need to go to the hospital to help them stay alive?

Scientists are working very hard to find treatments, or medicine that helps reduce the symptoms of the disease, or a vaccine to help people get immunity to COVID-19 without having the disease.

We are in this together, and we will be okay.



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ENGINEERING, AND MATH  
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EXTENSION

COLORADO STATE UNIVERSITY EXTENSION  
4-H PROGRAMS ARE AVAILABLE TO ALL WITHOUT DISCRIMINATION

In this activity, you will build a model of a typical animal cell. This model will have the major **organelles**, but not all the particles and molecules that comprise a cell. Our cells are packed with fibers, centrioles, nucleotides (make up DNA and RNA), amino acids, etc. You will then build a model of the coronavirus. This model will have all of the **components** of a **virion**.

**Virion** is pronounced like this:

- vi (the “i” sounds the same as in “hit”)
- ri (ree, sounds the same as in “free” without the “f”)
- on (like the preposition “on”)

*Animal Cell Model:*

- Page 4 has the components to build your cell. Don’t have lunch yet! Wait until you make the **virion** and compare the two for similarities and differences before enjoying your models.
- Gather all your materials, and then build your ~~sandwich~~ - I mean - model of the cell. Examine the model of the cell, and arrange the ingredients like that image.
  - Start with the bread.
  - Add spread (the mayonnaise or cream cheese).
  - Add 1 sliced egg.
  - Add olives (sliced or whole).
  - Add shredded lettuce.
  - Add dried cranberries.
  - Add green or red bell pepper slices.
- Compare your sandwich model to the image. As you go through each of the ingredients, read what they represent with the

description in the left column of page 4.

*Virion Model:*

- Page 5 has the components to build your virion. Don’t have your snack yet! Wait until you compare your typical animal cell model to this virion model.
- Gather all your materials and then build your ~~snack~~ - I mean model of the virion.
- Examine the model of the virion, and arrange the ingredients like that image.
  - Start with the cracker.
  - Add 1 sliced egg yolk (remove the white).
  - Add deli meat slice (cut into slivers and pieces).
  - Add the slice of bread, and wrap it around your cracker/yolk/deli meat.
- Compare your snack model to the image. As you go through each of the ingredients, read what they represent with the description in the left column of page 5.

*Compare your two models:*

- List the similarities and differences between your two

**POWER WORDS**

- **component:** a part or element of a larger whole
- **organelle:** any of a number of organized or specialized structures within a living cell

- models.
- Do you have any conclusions? Write them down.

**MATERIALS**

- butter knife
- plate
- 2 slices of bread
- spread like cream cheese or mayonnaise
- hard boiled egg, peeled and sliced round sections
- olives, sliced
- shredded lettuce
- dried cranberries or raisins
- minced onion or green onion
- sliced red or green bell pepper
- round cracker
- deli meat (like ham or turkey)
- print pages XX-XX
- color pencils or markers

**FASCINATING FACTS**

- Animal cells, in general, are eukaryotic, which means they have a nucleus. However, not all animal cells have a nucleus. For example, red blood cells do not have a nucleus because they do not multiply by meiosis or mitosis. The lack of a nucleus allows them to carry more hemoglobin in the cell.
- During the daily activity, the cell can face some malfunction in the RNA and DNA strands amongst other things. The cell has the functionality to correct these malfunctions on their own immediately.

**FASCINATING FACTS**

- The genetic information of viruses can be DNA or RNA; single or double stranded; one molecule or in pieces.
- The name virus was coined from the Latin word meaning slimy liquid or poison.
- Viruses are not alive – they are inanimate complex organic matter. They lack any form of energy, carbon metabolism, and cannot replicate or evolve. Viruses are reproduced and evolve only within cells.
- Walter Reed discovered the first human virus, yellow fever virus, in 1901.

## Cell Components:

## DON'T EAT THE CELL MODEL!!!

### Cell Membrane: slice of bread

Acts like our skin, protects and contains the cell. It is made from 2 layers of proteins and fats. It controls the entry of needed supplies (e.g. nutrients) exit of waste products.

### Cytoplasm (Cytosol): spread (mayo/cream cheese)

Fills the cell with a jelly-like material which contains all the cell organelles, enclosed within the cell membrane.

### Nucleus: hard boil egg slice

DNA is the brain of the cell (yolk) is surrounded by a membrane (white). It contains genetic materials (DNA and RNA) and macromolecules to produce RNA and DNA during replication.

### Lysosome: olives

Acts like a stomach, they are small round organelles surrounded by a membrane comprising of digestive enzymes to recycle used molecules and organelles.

### Golgi Body (Apparatus): shredded lettuce

It acts like a big rig truck, transporting cell products to where they need to go. It is a flat, smooth, sac-like organelle located near the nucleus.

### Mitochondrion: dried cranberries

The powerhouse, they are rod-shaped organelles with a double membrane. They make small packets of energy called ATP.

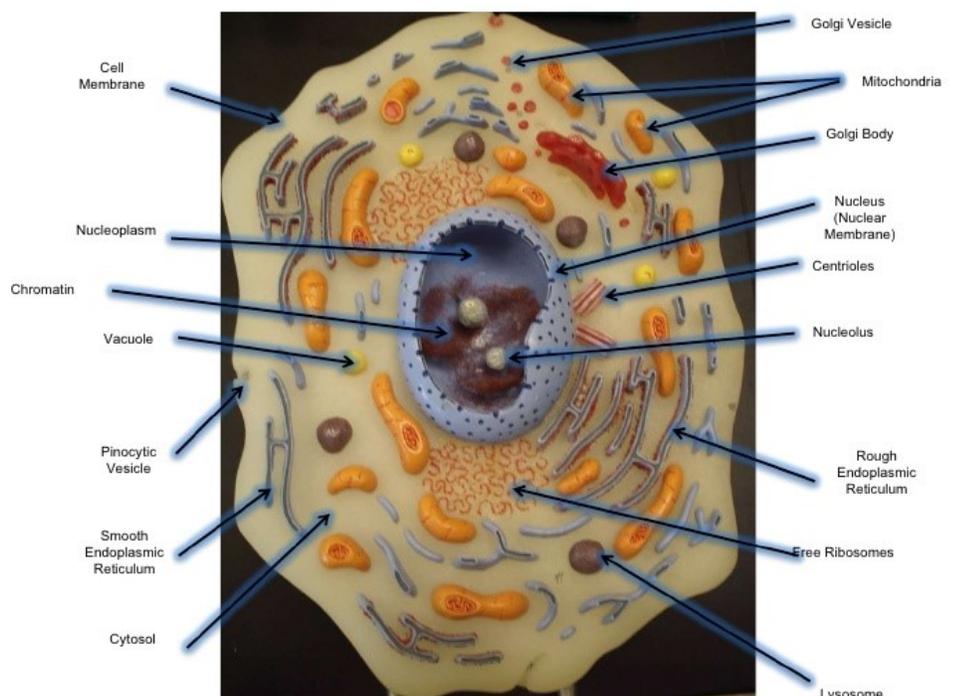
### Ribosome: finely chopped green onion

Small organelles read RNA (copies of the DNA blueprint) to make new proteins for the cell to function.

### Endoplasmic Reticulum: thin sliced green pepper

This is the protein manufacturing center, folding, modifying, and transporting proteins. It is a thin, winding network of sacs originating from the nucleus.

## Sketch your model here:



## Virion Components:

## Sketch your model here:

### Capsid: round cracker

The capsid is a protein layer between the envelope and the genome to protect the viral genome. The grey surface on the bottom image is the capsid.

### Genetic Material: hard boiled egg slice, remove the white and use only the yolk

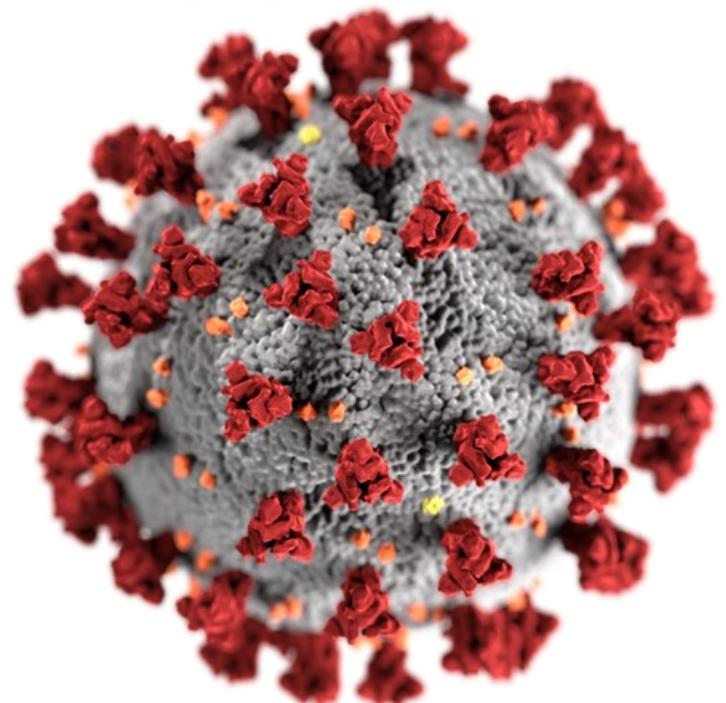
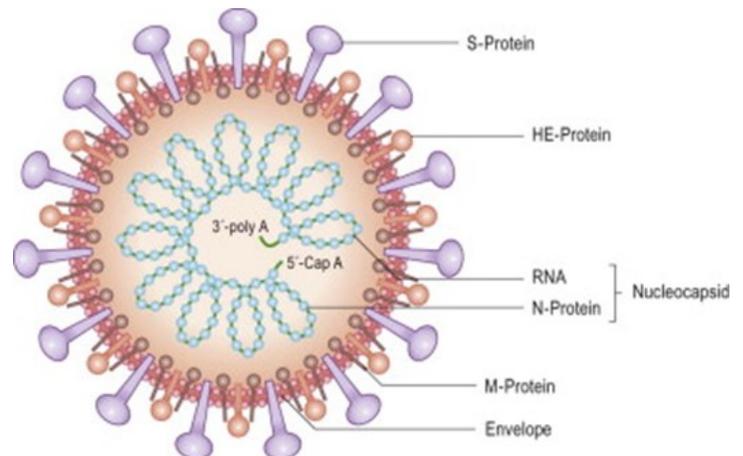
Viruses have bits of DNA or RNA. They have no DNA Polymerase (the molecule that replicates (copies) DNA), or RNA Polymerase (the molecule that transcribes (copies) RNA). To replicate new virions, they must hijack a cell (bacteria, fungi, protist, plant or animal cell), and use the molecules in the cell to copy their DNA or RNA.

### Glycoproteins: pieces of deli meat cut into small strips (like ham slice)

In the image on the right, S-Protein, M-Protein, N-Protein, and HE Protein are glycoproteins. The virus inserts viral proteins called glycoproteins in the envelop. Glycoproteins on the surface of the envelope help identify and bind to the host's membrane.

### Envelope: slice of bread

Coronavirus has an envelope as its outer layer when outside a host cell. The envelope is captured portions of the host cell membranes. The viral envelope will fuse with the host's membrane, allowing the capsid and viral genome to enter and infect the host.



**DON'T EAT THE VIRION MODEL!!!**

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