

SARS-CoV-2: the virus that causes COVID-19

GREETINGS HOMESCHOOLING PARENTS,

Students in my homeschool science classes have had lots of questions about COVID-19, as your children may have. I've created this infographic to help students understand what viruses are, the diseases they cause, and the details of the virus, SARS-CoV-2, and the disease it causes, COVID-19. I hope it's helpful to your family and please feel free to share it with other families.

—*Greg Landry*
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WHAT IS A VIRUS?

- A virus is genetic material (RNA or DNA) that is surrounded by a protein coat or envelope.
- A virus does not meet our typical criteria for a living organism, so we call it a particle.
- It reproduces only inside the cells of living organisms.
- It is a microscopic (100 nm) pathogen (can cause disease).
- Discovered in 1800's, but so small (smaller than the smallest cells) that they could not be seen with a light (standard) microscope.
- First seen in the 1930's.
- Antibiotics kill bacteria but don't affect viruses because they're not living – making them more difficult to treat.
- They can often adapt to immune system responses.
- "Virus" means "poison" in Latin.
- Viruses hijack the cell and direct it to replicate the viruses RNA or DNA (genetic material).
- Can infect only certain types of cells – SARS-CoV-2 (causes COVID-19) and influenza ("flu") viruses primarily infect cells of the respiratory system (lungs and upper airways).
- Some viruses are beneficial to humans - bacteriophage viruses (often called "phages") in the mucus of our airways and in our intestines kill bacteria so that they don't harm us.

nm = nanometers

- = one billionth of a meter
- = 0.000000001 meters
- = 25,400,000 nm in 1 inch

Virus size (average):

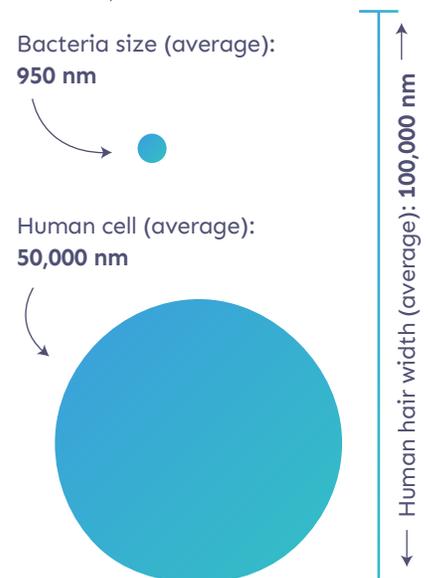
100 nm

Bacteria size (average):

950 nm

Human cell (average):

50,000 nm



DISEASES CAUSED BY VIRUSES

Mononucleosis (Epstein-Barr Virus): No vaccine.

Common Cold (Rhinoviruses): more than 100 types. No vaccine.

"Flu" (Influenza Viruses): three types of mutating (changing) viruses: types A, B, & C. Type A is the most common and vaccines are altered annually based upon predictions of the most likely variation of type A for the upcoming "flu season" (primarily November - April in the U.S.)

Pneumonia (RSV - Respiratory Syncytial Virus): serious in children. No effective vaccine.

Measles (Measles Virus - Rubeola): Vaccine is given to infants.

German Measles (Rubella Virus): Vaccine is given to infants.

Mumps (Mumps Virus): Vaccine is given to infants.

Rabies (Rabies Virus): Vaccine is available.

SARS: SARS (Severe Acute Respiratory Syndrome) Virus: A type of coronavirus that causes pneumonia with 10% fatality rate. The source is a type of bat in China in which the virus lives. Rarely seen in humans since 2004. Vaccines in development.

COVID-19: SARS-CoV-2 (severe acute respiratory syndrome coronavirus 2) Virus: type of coronavirus that causes pneumonia and other respiratory problems. The source is a type of bat in China in which the virus lives. First seen in humans in 2019. Vaccines in development.

HOW A VACCINE WORKS

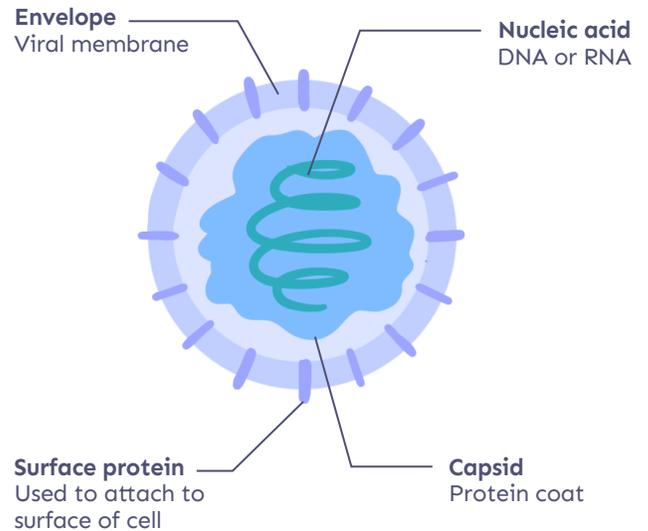
Parts of a pathogen, such as a bacteria or virus, are injected into a person to stimulate the production of **t-lymphocytes** (a type of white blood cell) that "remembers" the pathogen. If the immune system detects the same pathogen again, the t-lymphocytes produce antibodies to attack them. Some people believe that the large number of vaccines given to infants may be, in some cases, too much for a young immune system to handle and that vaccines may have other negative effects on children.

COVID-19 (disease) and SARS-CoV-2 (virus)

- Although the virus is typically called "COVID-19", technically, the virus is SARS-CoV-2 (severe acute respiratory syndrome coronavirus 2) and the disease it causes is COVID-19.
- SARS-CoV-2 is a part of the virus family (similar structures) known as coronaviruses.
- SARS-CoV-2 is an RNA virus.
- Several types of coronaviruses are known and they affect the respiratory system in humans.
- They are believed to live in a specific type of bat in China but can "jump species" to humans.
- Some of the coronaviruses cause common colds, but one type caused the SARs epidemic in 2002-2003. SARS (Severe Acute Respiratory Syndrome) Virus has rarely been seen in humans since 2004.
- SARS-CoV-2 is a new type of virus in the coronavirus family, first seen in humans in December 2019. The "19" in the name of the disease it causes, COVID-19, is a reference to 2019.
- It's sometimes called "novel" coronavirus because it's a new coronavirus.
- Because it's such a new virus, scientists don't know a lot about the disease it causes, but believe it is very contagious and tends to be most serious in older people and people with health conditions rather than younger, healthy people. Although, there have been exceptions to that assumption.
- The CDC (Centers for Disease Control and Prevention) in the U.S. suggests the following to help protect yourself from contracting COVID-19:

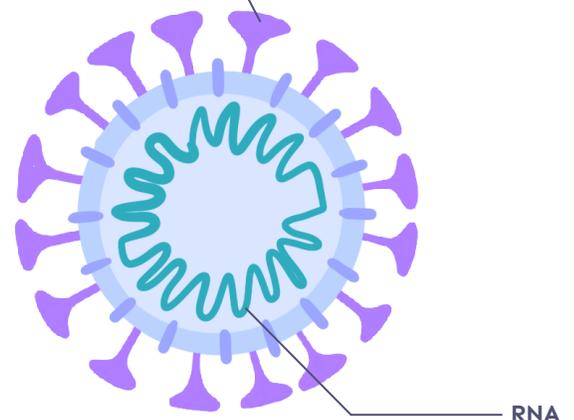
- ! Wash your hands with soap often for at least 20 seconds
- ! If you're unable to wash your hands, use a hand sanitizer that contains at least 60% alcohol
- ! It's best to put distance between yourself and others, especially if the virus is spreading in your community.
- ! Avoid touching your face with unwashed hands
- ! Avoid close contact with people who are sick

VIRUS



CORONAVIRUS (includes virus SARS-CoV-2)

Spike protein
these "crowns" are the origin of the virus family name: coronavirus

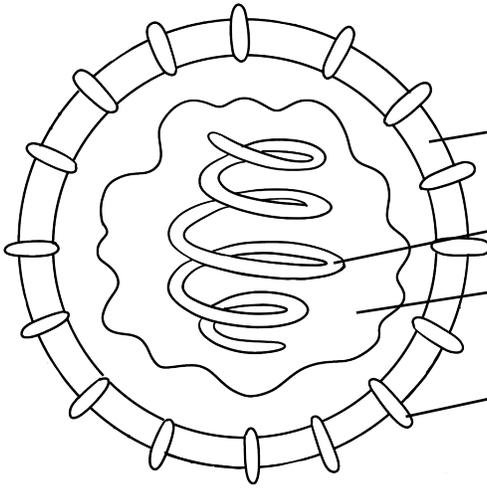


2 TIMOTHY 1:7

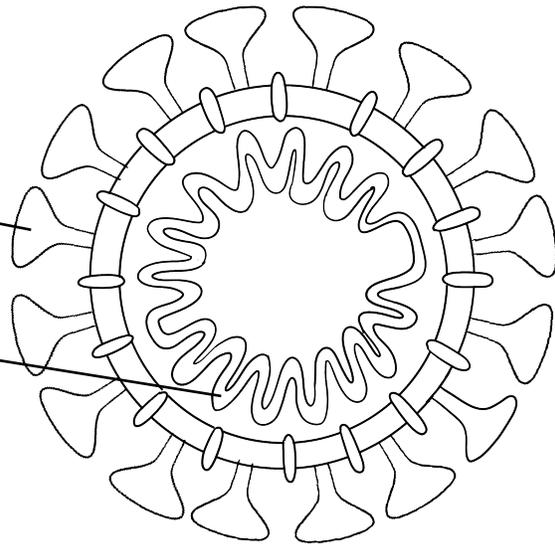
"For God has not given us a spirit of fear and timidity, but of power, love, and self-discipline."

Student worksheet on viruses

Virus



CORONAVIRUS
(includes virus SARS-CoV-2)



True or False

1. **T F** "COVID-19" is the name of a virus.
2. **T F** SARS is a type of coronavirus.
3. **T F** SARS-CoV-2 is a type of coronavirus.
4. **T F** The virus that causes the disease COVID-19 is a part of the virus family (similar structures) known as coronaviruses.
5. **T F** The "19" in "COVID-19" indicates the average number of days of sickness for a person with this disease.
6. **T F** Viruses are living organisms.
7. **T F** Viruses are not affected by antibiotics.
8. **T F** Viruses contain either DNA or RNA.
9. **T F** Viruses are larger than bacteria.
10. **T F** One nanometer (nm) is 0.001 meters.