Power of 1 Wellness News

Newsletter 4 Δ *April 01, 2020*

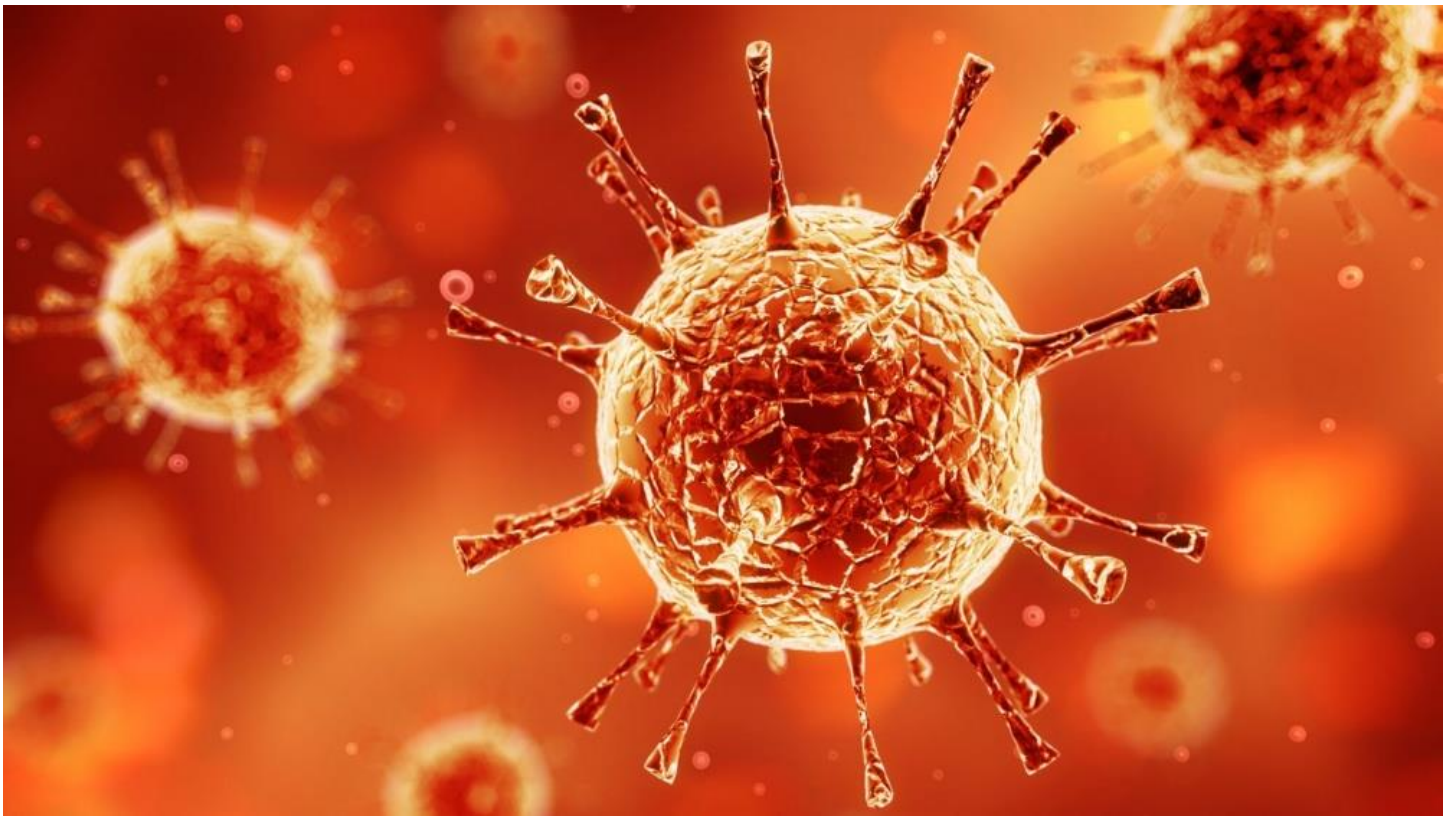
Wellness Word—Turning of the Times

Since last month's newsletter, a mere 30 days of chronological time, the conditions, pace, expectations and content of not only our American lifestyles but also those on a massive global scale have been thoroughly uprooted, undergone seismic shifts and a drastically new normal superimposed. Altogether this ongoing experience, rooted in a surreal (or dream-like) break from our familiar cultural realities, has produced universal feelings of disbelief, anxiety, defiance, frustration, depression, tragic loss, confusion, uncertainty, panic, fear, to name a few. Along with the sheer size and scope of change we are all commonly experiencing is the relative suddenness and dire necessities with which we are being confronted and forced to act upon like dominoes, in family after family, city after city, state after state, country after country, continent after continent.

Regardless of what continent we happen to live on, regardless of what sex/religion/race/government/political party we affiliate with, regardless of job or income and whether or not our preference is for more spacious country living or the quicker pace of an urban city, the corona virus is a mighty equalizer for those of us belonging to the species Homo sapiens. For the short-term, at least, we are beginning to get the idea that public health is significantly upheld, dependent upon and contributed to by every person; that our actions as individuals can be crucial to the survival of others even if we do not immediately realize or directly participate in the culmination of their future outcomes; and that we are all, each of us, connected in important ways that we may have taken for granted or not realized at all until recognized by the void of absence.

Whether we have fled to underground bunkers, secondary vacation homes or yachts; are confined to those spaces we must currently call home under shelter-in-place & stay-at-home directives; or are currently undergoing days-long journeys back to the villages of our birth, the immediacy of isolating ourselves through social distancing as a common collective is an objective that we ALL share or will be soon when overwhelming numbers of infections/deaths/closures force that eventuality.

Stripped of those things that typically define and ground us as individuals__ our usual schedules, work lives, activities, distractions__ we pause. Compelled to reprioritize, redirect, reconnect, we pivot__ finally facing what is easier to deny and in so doing we begin to navigate our way forward to accept, to adapt, to adjust. With time to consider, we wonder how, why, for how long, who will be next, what comes next? And, as we so often do in wrenching times of upheaval, we bear witness to those experiences that consume us, to those dear to us who have been lost, and, if we are lucky, to those things that we might together learn and change in the future to help mitigate the inevitability of another such occurrence.



What's New?

Δ NOTE: ALL WORKSHOPS/SEMINARS HAVE BEEN CANCELLED UNTIL FURTHER NOTICE.

Δ WELLNESS FOCUS: THE METABOLIC NETWORK. This spring we have been embarking on a series to define the WHY behind all the directives we hear about "watching our diets" and "losing the weight." The last segments of the monthly newsletters have been centered around the relationships and connections the organs in our bodies create that form a comprehensive systemic network. The final installation in this series will be presented NEXT MONTH in the May newsletter. The April edition will instead be focusing on the more immediate current events concerning our society today.

Δ WELLNESS FOCUS: GOING VIRAL. This month's focus is a 4-article topical compilation of corona information including 1) information on viruses in general; 2) corona-specific infections with details of symptoms/course in mild-moderate-severe cases; and 3) recent data from corona exacerbations/complications: corona-lung interactions, corona-heart interactions and corona-GI interactions. Although included information has been re-formatted to fit this newsletter, content has been preserved in the original 4 discrete articles, complete with authors and references. Unlike The Metabolic Network, this material is not dependent upon or intended to be foundational or interlinked with future posts so feel free to skip over information, areas or even entire articles.

Wellness Bites: DATES

Dates are the fruit of the date palm tree, which is grown in many tropical regions of the world. Native to the Middle East, dates have existed since prehistoric times and are believed to have been cultivated as early as 8000 years ago. There are over 100 different varieties of date palm trees. Although dates can appear to be dried, they're actually fresh fruits. Fresh whole dates contain just 30% moisture, making them one of nature's only naturally "dried" fruit.

Fiber, potassium, magnesium, 6 essential B vitamins, copper, manganese, iron, antioxidants/polyphenols/phytoestrogens (flavonoids, carotenoids, phenolic acid).

Improves digestion; aids in maintenance of healthy bones; assists in stabilization of blood sugar (low-glycemic index) and regulation of blood pressure; supports heart/vascular health; antioxidant & anti-inflammatory properties help protect against cellular damage associated with cancers, heart disease, diabetes, Alzheimer's; supports brain function; promotes process of natural labor when consumed during last weeks of pregnancy. Contain highest concentration of isoflavones (type of phytoestrogen that helps reduce unpleasant symptoms of menopause) of all fruits; currently being studied for their ability to provide natural relief from menopausal symptoms.

It's easiest to find dates in their dried form, though these are higher in calories than fresh fruit, so it is important to eat them in moderation.

Dates are incredibly versatile & make a delicious appetizer or snack. They are often paired with other foods, such as almonds, nut butter or soft cheese and can be served stuffed with meat or cheese. Dates provide moisture, all-natural sweetness and are useful as a binder in baked goods, such as breads, muffins, cookies, tarts and bars. You can also combine dates with nuts & seeds to make healthy snack bars or energy balls. Add chopped dates to yogurt, hot cereals/oatmeal, smoothies, slaws & salads. Try substituting them for raisins or apricots when conjuring up savory dishes, such as roasts or stews, or add them to marinades, salad dressings & glazes to add sweetness & balance other flavors.

INEXPENSIVE! NUTRIENT-DENSE! Dates are a healthy substitue for white sugar in recipes due to their sweet taste, nutrients, fiber & antioxidants and serve as a convenient portable snack that can be useful for low blood sugar episodes. Pitted dates can be purchased whole, chopped or extruded. Extruded dates are coated with oat flour, rice flour or dextrose for use in baking. Date juice is also available & can be used in making baked goods or smoothies.

GOING VIRAL

Key points:

- A **virus** is an infectious particle that reproduces by "commandeering" a host cell and using its machinery to make more viruses.
- A virus is made up of a DNA or RNA genome inside a protein shell called a **capsid**. Some viruses have an external membrane **envelope**.
- Viruses are very diverse. They come in different shapes and structures, have different kinds of genomes, and infect different hosts.
- Viruses reproduce by **infecting** their host cells and reprogramming them to become virus-making "factories."

Introduction

Scientists estimate that there are roughly 10^{31} viruses at any given moment. That's a one with 31 zeroes after it! If you were somehow able to wrangle up all 10^{31} of these viruses and line them end-to-end, your virus column would extend nearly 200 light years into space. To put it another way, there are over 10 million times *more* viruses on Earth than there are stars in the entire universe.

Does that mean there are 10^{31} viruses just waiting to infect us? Actually, most of these viruses are found in oceans, where they attack bacteria and other microbes. It may seem odd that bacteria can get a virus, but scientists think that *every* kind of living organism is probably host to at least one virus!

What is a virus?

A **virus** is a tiny, infectious particle that can reproduce only by infecting a host cell. Viruses "commandeer" the host cell and use its resources to make more viruses, basically reprogramming it to become a virus factory. Because they can't reproduce by themselves (without a host), viruses are not considered living. Nor do viruses have cells: they're very small, much smaller than the cells of living things, and are basically just packages of nucleic acid and protein.

Still, viruses have some important features in common with cell-based life. For instance, they have nucleic acid genomes based on the same genetic code that's used in your cells (and the cells of all living creatures). Also, like cell-based life, viruses have genetic variation and can evolve. So, even though they don't meet the definition of life, viruses seem to be in a "questionable" zone.

How are viruses different from bacteria?

Even though they can both make us sick, bacteria and viruses are very different at the biological level. Bacteria are small and single-celled, but they are living organisms that do not depend on a host cell to reproduce. Because of these differences, bacterial and viral infections are treated very differently. For instance, antibiotics are only helpful against bacteria, not viruses.

Bacteria are also much bigger than viruses. The diameter of a typical virus is about 20-300 nanometers (1 nm = 10^{-9}m). This is considerably smaller than a typical *E. coli* bacterium, which has a diameter of roughly 1000 nm! Tens of millions of viruses could fit on the head of a pin.

The structure of a virus

There are a lot of different viruses in the world. So, viruses vary a ton in their sizes, shapes, and life cycles. If you're curious just how much, I recommend playing around with the ViralZone website. Click on a few virus names at random and see what bizarre shapes and features you find!

Viruses do, however, have a few key features in common. These include:

- A protective protein shell, or **capsid**
- A nucleic acid genome made of DNA or RNA, tucked inside of the capsid
- A layer of membrane called the **envelope** (some but not all viruses)

Let's take a closer look at these features:

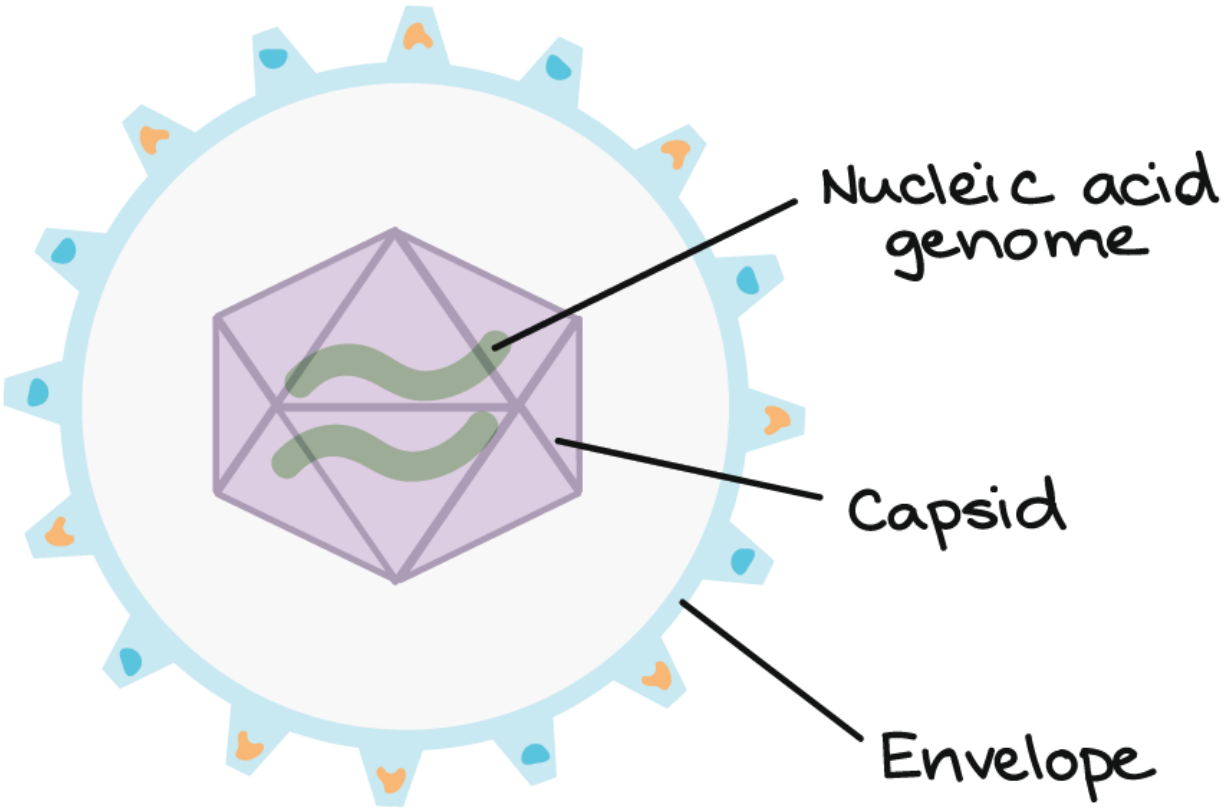
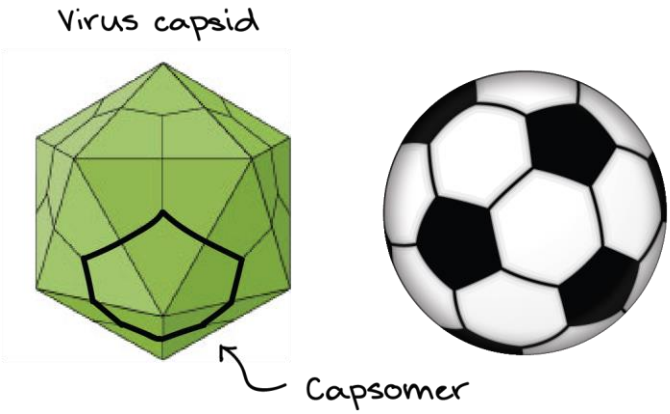


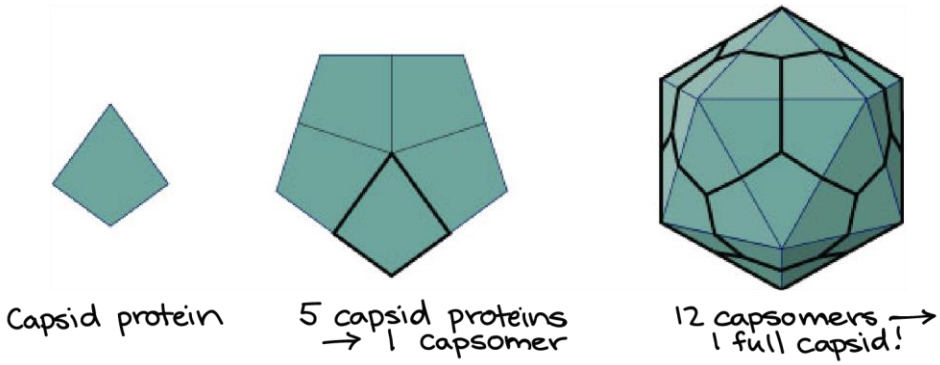
Diagram of a virus. The exterior layer is a membrane envelope. Inside the envelope is a protein capsid, which contains the nucleic acid genome.

Virus capsids

The **capsid**, or protein shell, of a virus is made up of many protein molecules (not just one big, hollow one). The proteins join to make units called **capsomers**, which together make up the capsid. Capsid proteins are always encoded by the virus genome, meaning that it's the virus (not the host cell) that provides instructions for making them.



Comparison of a soccer ball with a virus capsid. The hexagons are one type of capsomer while the pentagon are another type. Both types of capsomer are assembled from individual virus proteins.



Capsid protein

5 capsid proteins = 1 capsomer

12 capsomers = one full capsid

Capsids come in many forms, but they often take one of the following shapes (or a variation of these shapes):

1. **Icosahedral** – Icosahedral capsids have twenty faces and are named after the twenty-sided shape called an icosahedron.
2. **Filamentous** – Filamentous capsids are named after their linear, thin, thread-like appearance. They may also be called rod-shaped or helical.
3. **Head-tail** –These capsids are kind of a hybrid between the filamentous and icosahedral shapes. They basically consist of an icosahedral head attached to a filamentous tail.

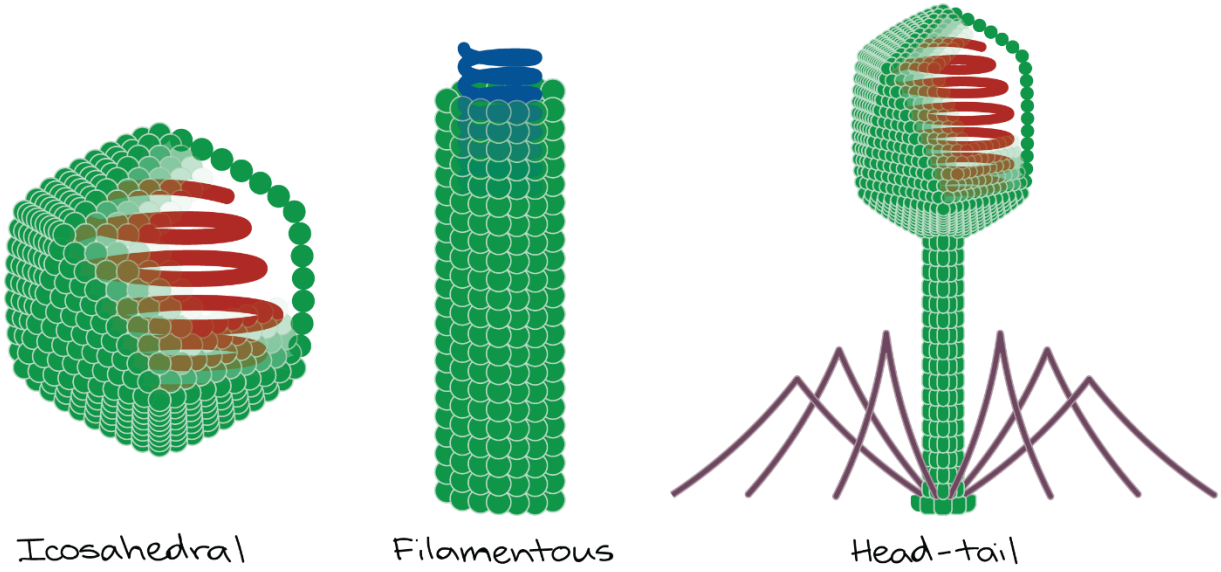


Diagram of icosahedral (roughly spherical), filamentous (rod-like), and head-tail (icosahedral head attached to filamentous tail) virus capsid shapes.

Virus envelopes

In addition to the capsid, some viruses also have an external lipid membrane known as an **envelope**, which surrounds the entire capsid.

Viruses with envelopes do not provide instructions for the envelope lipids. Instead, they "borrow" a patch from the host membranes on their way out of the cell. Envelopes do, however, contain proteins that are specified by the virus, which often help viral particles bind to host cells.

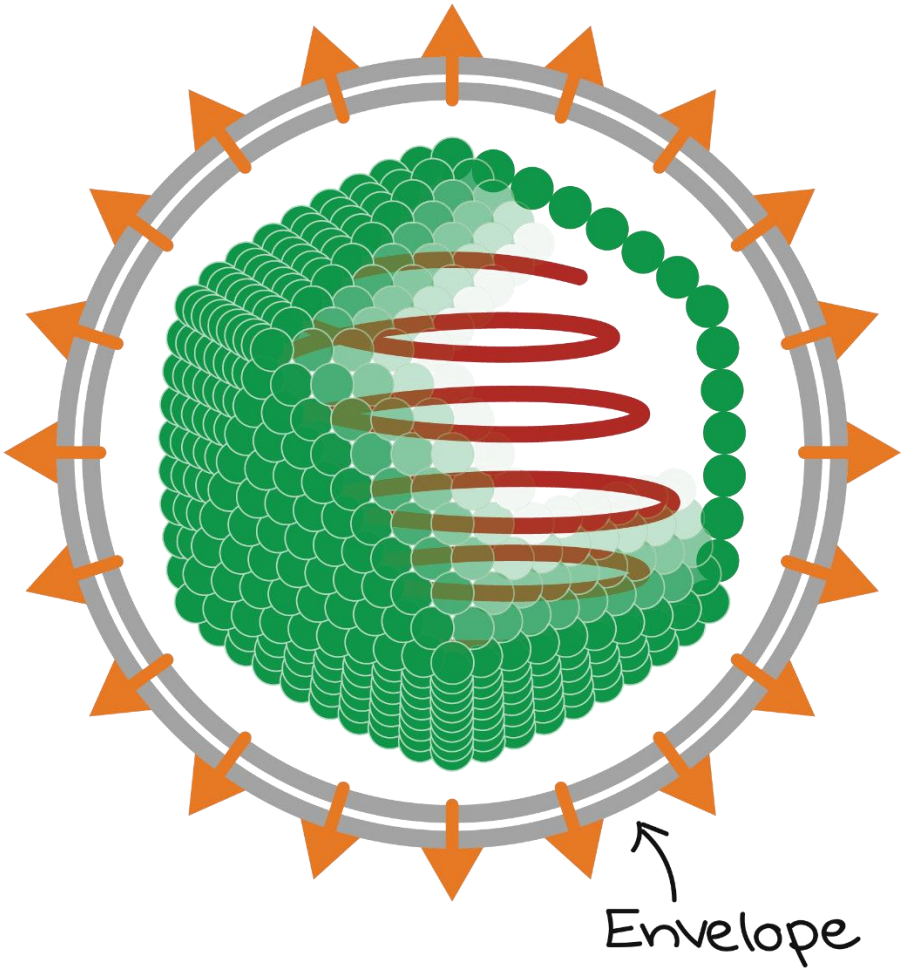


Diagram of enveloped icosahedral virus.

Although envelopes are common, especially among animal viruses, they are not found in every virus (i.e., are not a universal virus feature).

Virus genomes

All viruses have genetic material (a **genome**) made of nucleic acid. You, like all other cell-based life, use DNA as your genetic material. Viruses, on the other hand, may use either RNA or DNA, both of which are types of nucleic acid.

We often think of DNA as double-stranded and RNA as single-stranded, since that's typically the case in our own cells. However, viruses can have all possible combos of strandedness and nucleic acid type (double-stranded DNA, double-stranded RNA, single-stranded DNA, or single-stranded RNA). Viral genomes also come in various shapes, sizes, and varieties, though they are generally much smaller than the genomes of cellular organisms.

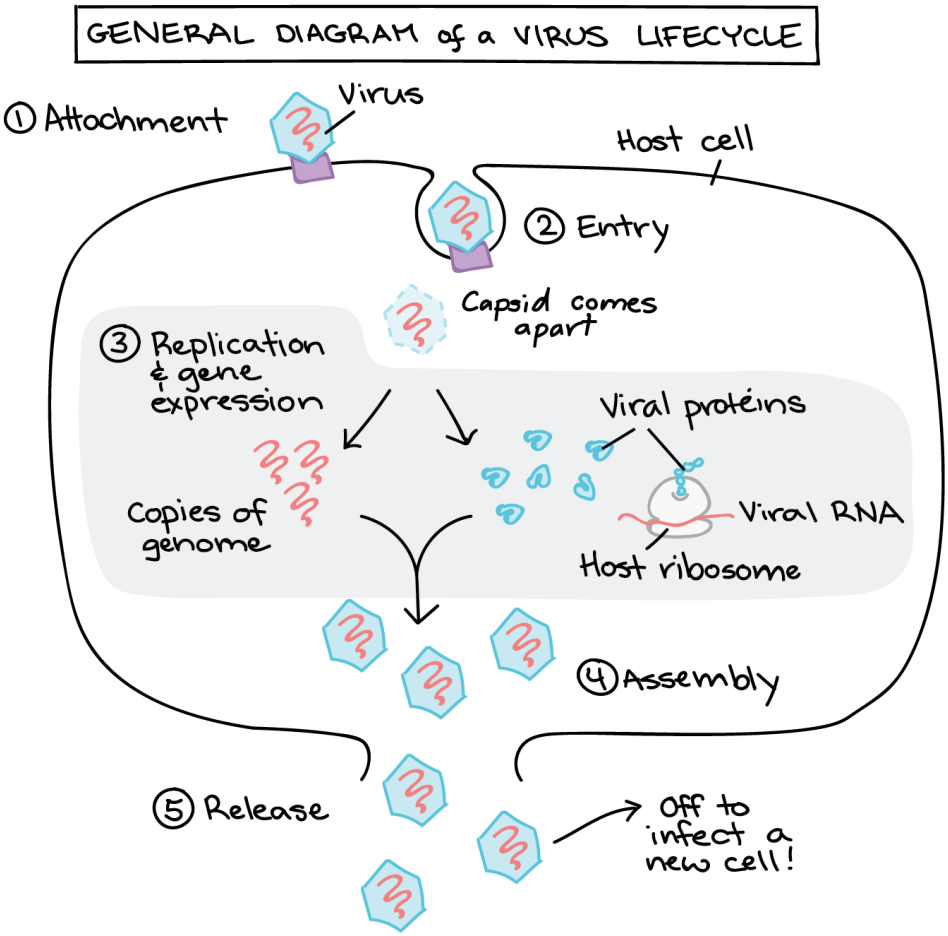
Notably, DNA and RNA viruses always use the same genetic code as living cells. If they didn't, they would have no way to reprogram their host cells!

What is a viral infection?

In everyday life, we tend to think of a viral infection as the nasty collection of symptoms we get when catch a virus, such as the flu or the chicken pox. But what's actually happening in your body when you have a virus?

At the microscopic scale, a viral infection means that many viruses are using your cells to make more copies of themselves. The viral **lifecycle** is the set of steps in which a virus recognizes and enters a host cell, "reprograms" the host by providing instructions in the form of viral DNA or RNA, and uses the host's resources to make more virus particles (the output of the viral "program").

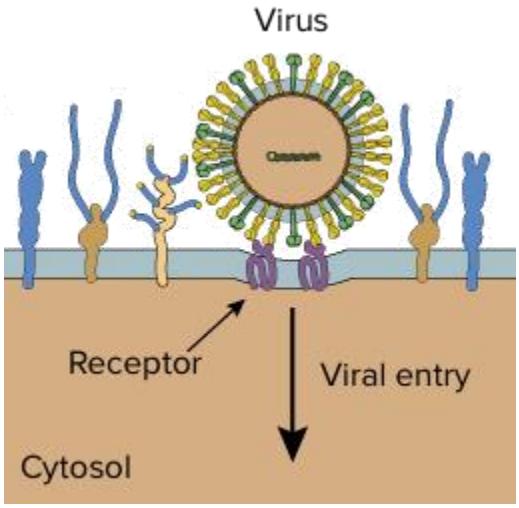
For a typical virus, the lifecycle can be divided into five broad steps (though the details of these steps will be different for each virus):



Steps of a viral infection, illustrated generically for a virus with a + sense RNA genome.

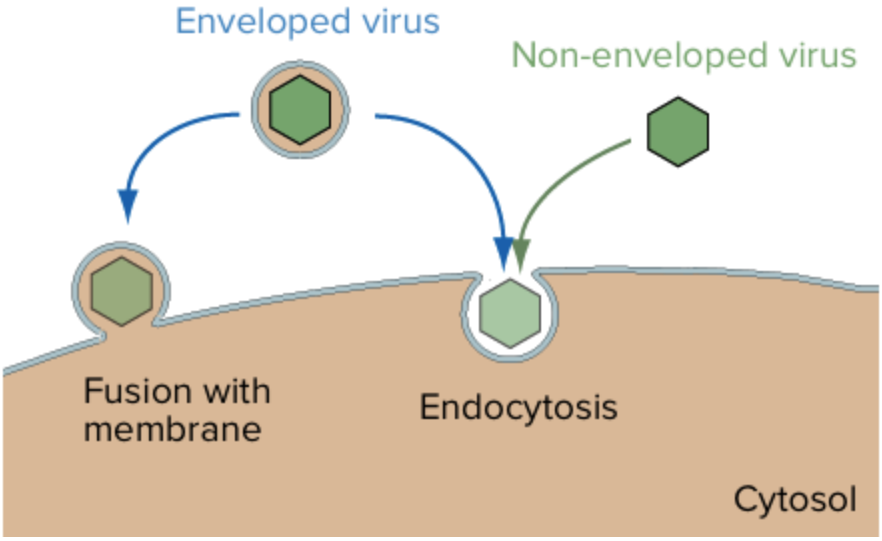
1. **Attachment.** Virus binds to receptor on cell surface.
2. **Entry.** Virus enters cell by endocytosis. In the cytoplasm, the capsid comes apart, releasing the RNA genome.
3. **Replication and gene expression.** The RNA genome is copied (this would be done by a viral enzyme, not shown) and translated into viral proteins using a host ribosome. The viral proteins produced include capsid proteins.
4. **Assembly.** Capsid proteins and RNA genomes come together to make new viral particles.
5. **Release.** The cell lyses (bursts), releasing the viral particles, which can then infect other host cells.

1. **Attachment**. The virus recognizes and binds to a host cell via a receptor molecule on the cell surface.



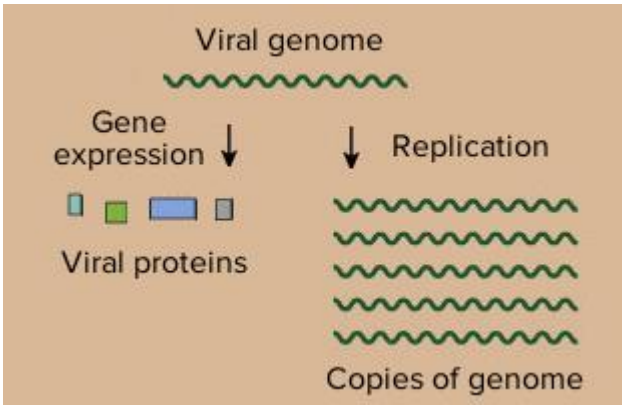
Virus binding to its receptor on the cell surface.

2. **Entry**. The virus or its genetic material enters the cell.



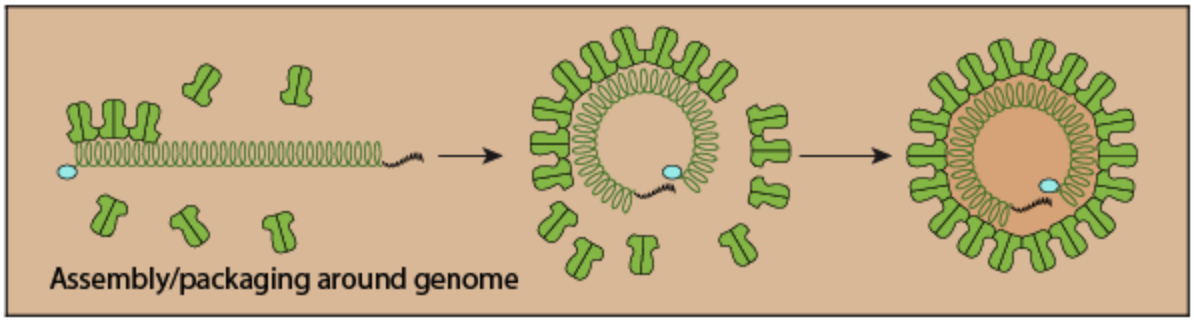
Routes of entry include endocytosis (in which the membrane folds inward to bring the virus into the cell in a bubble) and direct fusion of the viral particle with the membrane, releasing its contents into the cell.

3. **Genome replication and gene expression.** The viral genome is copied and its genes are expressed to make viral proteins.



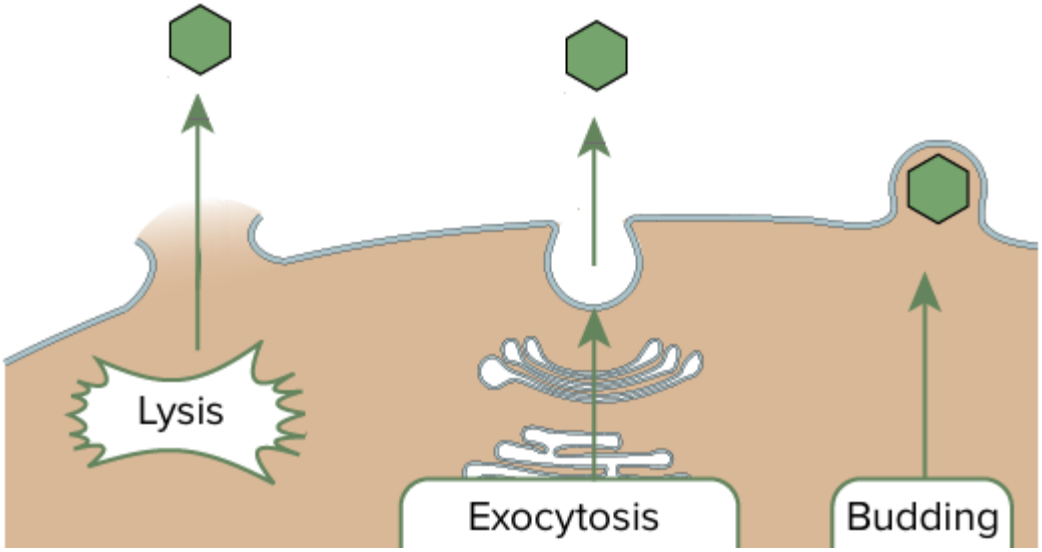
The viral genome is copied, and its genes are also expressed to make viral proteins.

4. **Assembly.** New viral particles are assembled from the genome copies and viral proteins.



Proteins of the capsid assemble around the viral genome, forming a new viral particle with the genome on the inside (encased by the capsid).

5.**Release**. Completed viral particles exit the cell and can infect other cells.



Viruses may exit through lysis of the cell, exocytosis, or budding at the plasma membrane.

The diagram above shows how these steps might occur for a virus with a single-stranded RNA genome. You can see real examples of viral lifecycles in the articles on bacteriophages (bacteria-infecting viruses) and animal viruses.

Article: https://www.khanacademy.org/science/high-school-biology/hs-human-body-systems/hs-the-immune-system/a/intro-to-viruses

What Does Novel Coronavirus Do to the Lungs? Here's What Doctors Know So Far

It all depends on the severity of your illness.

By: Korin Miller
Mar 25, 2020
https://www.prevention.com/health/a31912784/what-does-coronavirus-do-to-lungs/

The novel coronavirus, officially named SARS-CoV-2, is often compared to the flu, due to their overlap in symptoms. But when you take a closer look at how this newly discovered virus impacts the body, that comparison doesn't seem to be totally accurate anymore.

COVID-19, the respiratory illness caused by this coronavirus, seems to have the potential to cause more respiratory distress than the flu. Out of its three symptoms listed by the Centers for Disease Control and Prevention (CDC)—fever, dry cough, and shortness of breath—one seems to set COVID-19 apart from other similar illnesses.

Shortness of breath: The latest to speak publicly about this symptom is former *Bachelor* star Colton Underwood. The 28-year-old shared an update on his condition on Instagram, and said his "most prominent symptoms" are a cough, night sweats, and shortness of breath. Breathing is "challenging," Underwood wrote. **"The best way to describe it is feeling like I only have access to 20% of my lungs."**

The World Health Organization (WHO) says that COVID-19 can actually cause a range of symptoms—from a sore throat to muscle aches—and the illness varies in severity. **But experts believe that, in more advanced cases, this coronavirus can directly damage the lungs, the effects of which may last even after a person** has recovered. Here's what doctors know so far.

What does the novel coronavirus do to your lungs?

"SARS-CoV-2 and influenza are different viruses with different behaviors and sites of attack," explains Reynold Panettieri, M.D., a lung specialist and vice chancellor for translational medicine and science at Rutgers University. **"SARS-CoV-2 is very aggressively attacking the upper airway, throat, sinuses, and mouth cavity as compared to flu. As a consequence, the infectivity is greater."**

Any coronavirus infection starts with your respiratory system via infected droplets, which are released into the air when you cough or sneeze, per the CDC. If you're close enough to someone who is sick, those droplets can make their way into your body through your eyes, nose, or mouth.

Mild Infection

In 80% of patients, the illness that ensues will be mild, per a recent report from the WHO. "Many cases of COVID-19 are going to be an upper respiratory infection that usually spares the lungs," says infectious disease expert Amesh A. Adalja, M.D., senior scholar at the Johns Hopkins Center for Health Security.

But ultimately, the way in which coronavirus impacts your lungs largely depends on the severity of your infection, Dr. Adalja says. If you're in a high-risk group, it can even cause life-threatening complications.

The coronavirus has crown-like spikes on its surface, which help the virus latch onto and hijack healthy cells—say, in the back of your throat or other parts of your upper airway. This causes symptoms "from the neck up—a sore throat, stuffy nose, and a little bit of fever," says William Schaffner, M.D., an infectious disease specialist and professor at the Vanderbilt University School of Medicine. These patients can often recover on their own at home under self-quarantine.

However, people with mild cases of COVID-19 may not even realize they're infected, he adds. The incubation period is typically between two and 14 days, meaning someone can carry the virus for up to two weeks before they begin to show any signs of illness.

NARVIKKGETTY IMAGES
Coronavirus gets its name from the crown-like spikes on its surface.

Moderate infection

"If you have a fever and cough, you already have a moderate illness," Dr. Schaffner explains. Fortunately, many people impacted with a moderate case of COVID-19 "are being sent home and are doing perfectly well."

In this stage, the virus has replicated enough to travel down your chest and into the bronchial tubes, "causing inflammation that will result in a dry cough," Dr. Schaffner says.

Your bronchial tubes lead directly to your lungs from your trachea (a.k.a. windpipe), so they're a key player in circulating oxygen effectively. When they become irritated or swollen due to inflammation, they have a harder time performing their job well.

Severe to Critical Infection

When someone has a severe case of COVID-19, the coronavirus leaves the bronchial tubes and gets deep into the lungs, Dr. Schaffner says, impacting "the tissue that's involved in gas exchange—getting good air in and bad air out." These patients often have severe shortness of breath and develop pneumonia from the virus itself.

That's different from the flu, where patients may develop pneumonia as a secondary infection, Dr. Schaffner says. **"Unlike other kinds of pneumonia, coronavirus pneumonia tends to affect most or all of the lungs, instead of just certain areas," he explains.**

In severe cases, COVID-19 also has the capacity to cause what's known as acute respiratory distress syndrome, or ARDS, says Richard Watkins, M.D., infectious disease physician and professor of internal medicine at the Northeast Ohio Medical University.

ARDS is a dangerous and potentially fatal condition that happens when lungs are severely injured, typically by an infection or trauma. In the condition's earliest stages, small blood vessels in the lungs start to leak fluid into the tiny air sacs responsible for oxygen exchange, which eventually makes it difficult to breathe as the lungs become smaller and stiffer.

At this point, your body is likely firing an excessive immune response as it tries to fight the virus, possibly attacking healthy cells in the process, which can "lead to worsening respiratory failure," Dr. Schaffner says.

Patients with a severe to critical case of COVID-19—often those in high-risk groups, such as the elderly or immunocompromised—"are being admitted to the hospital, may need to be admitted to the intensive care unit, and be put on ventilators," Dr. Schaffner says. "Often both lungs are affected."

Can COVID-19 cause lasting lung damage?

In a media briefing earlier this month, Hong Kong doctor Owen Tsang Tak-yin, medical director of the authority's Infectious Disease Centre at Princess Margaret Hospital, said that doctors have seen about a dozen former coronavirus patients for follow-up appointments. **About three of them were unable to do things they had done in the past. "They gasp if they walk a bit more quickly," Tsang said, per the *South China Morning Post*. "Some patients might have around a drop of 20 to 30% in lung function [after recovery]."**

It's definitely possible that this novel coronavirus can cause lasting lung damage, Dr. Adalja says. "We know that when an individual has severe pneumonia—irrespective of the cause—they are going to be left with diminished lung function for some time."

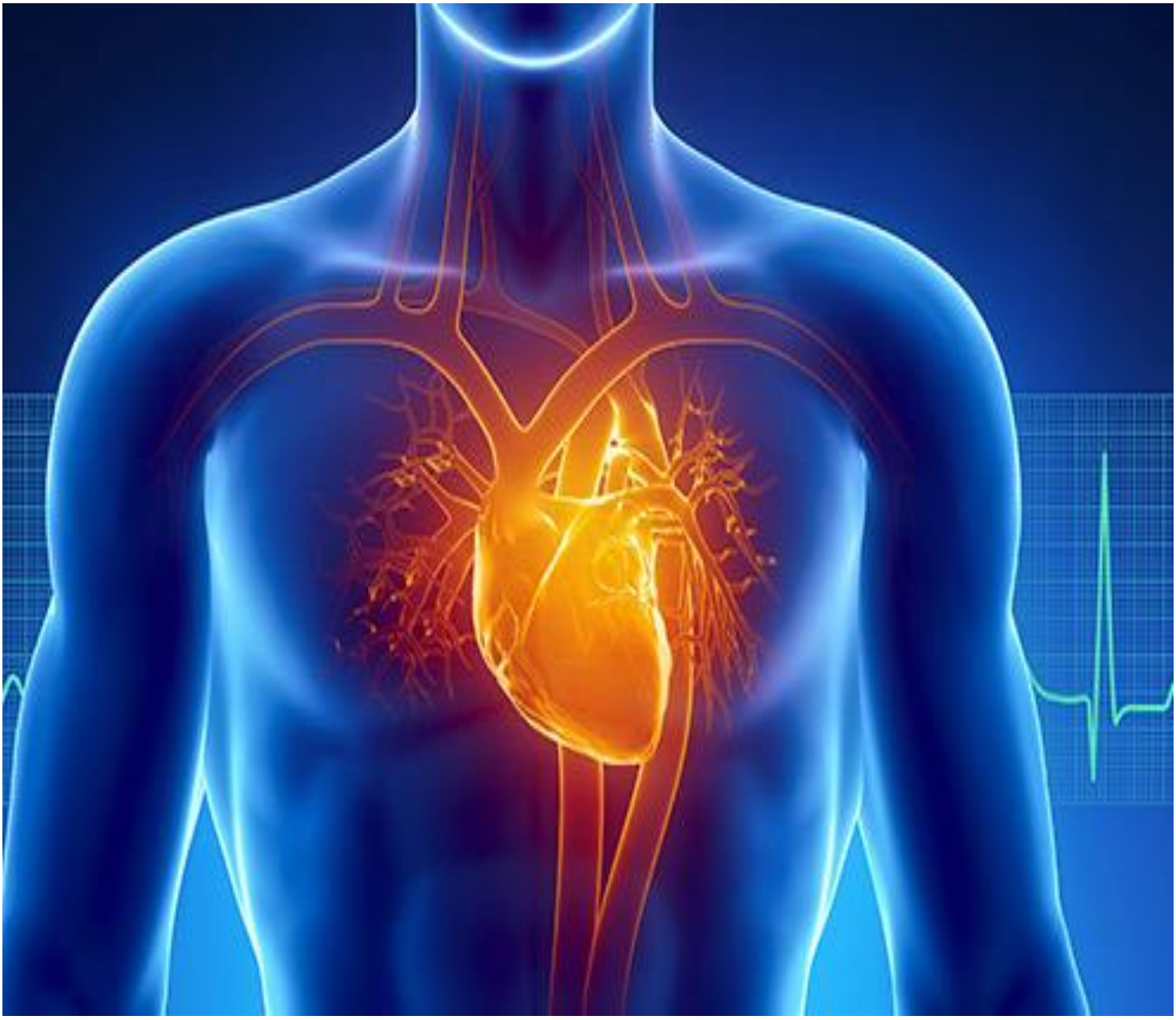
It's "unclear" what long-term damage COVID-19 might cause, though, says Dr. Panettieri. "Some apparent long-term consequences are seen in anyone who develops ARDS, but our experience is inadequate to say the lungs are irreparable," he says. "Collectively, our global experience is only three to four months."

"We are still in the early stages of the pandemic and don't yet know if this will be an issue." This includes decreased exercise capacity and pulmonary reserve, or the additional air volume your lungs can inhale and exhale at capacity in times of stress. "It may be months or years, it all depends on severity," Dr. Adalja says.

Dr. Watkins agrees. "We are still in the early stages of the pandemic," he says, "and don't yet know if this will be an issue."

New research shows COVID-19 is even more deadly for people with this condition

By: Meredith Lepore
March 29, 2020
https://www.theladders.com/career-advice/new-research-shows-covid-19-is-even-more-deadly-for-people-with-this-condition



Coronavirus just got even scarier, if that's possible. According to a new study published this week in JAMA Cardiology by experts at The University of Texas Health Science Center at Houston, COVID-19 can not only present itself **in a more deadly form for people with existing heart conditions, but it can also cause cardiac injury for people without pre-existing heart conditions.**

"It is likely that even in the absence of previous heart disease, the heart muscle can be affected by coronavirus disease," said Mohammad Madjid, MD, MS, the study's lead author and an assistant professor of cardiology at McGovern Medical School at UTHealth. **"Overall, injury to heart muscle can happen in any patient with or without heart disease, but the risk is higher in those who already have heart disease."**

The study, which was conducted from January to February, looked at a group of 416 COVID-19 patients hospitalized in Wuhan, China and found that 19.7% suffered a cardiac injury, which put them at higher risk for a fatal version of Coronavirus.

Cardiac injury (also known as myocardial injury) happens when the heart muscle is damaged which is usually a result of reduced blood flow and that is when a heart attack occurs.

The researchers found that 82 of the patients (19.7%) had cardiac injury and 334 patients (80.3%) did not. They then found that the death rate was higher among patients with cardiac injury, with 51.2% dying (or 42 patients) versus 4.5%. Dr. Erin Michos, the associate director of preventive cardiology at Johns Hopkins Medicine in Baltimore, told CNN, "We know that cardiac damage is a marker for more mortality," Michos said. **"This study clearly showed that even after you account for age and pre-existing cardiovascular disease, there was a still four-fold increased risk of dying. That's really important."**

"Approximately 30% and 60% of patients with cardiac injury in the present study had a history of coronary heart disease and hypertension, respectively, which were significantly more prevalent than in those without cardiac injury," the researchers wrote in the study.

In other words, COVID-19 can either cause heart problems or worsen the ones people already have. However, the researchers emphasized that "the severity, extent, and short-term vs long-term cardiovascular effects of COVID-19, along with the effect of specific treatments are not yet known and are subject to close scrutiny and investigation." They also said they need to look at a larger and more diverse group for conclusive results.

Also, those with mild COVID-19 symptoms are less likely to experience a cardiac injury. It is also not clear whether COVID-19 directly impacts the heart.

“COVID IS NOT JUST COUGH”

WHAT ARE WE MISSING?

IS DIARRHEA A COVID-19 SYMPTOM? CORONAVIRUS' REACH MAY EXTEND BEYOND THE LUNGS

BY: Ali Pattilo
March, 31, 2020
https://www.inverse.com/mind-body/covid-is-not-just-cough

At this stage of the Covid-19 pandemic, many of us have memorized the hallmark symptoms of the novel coronavirus; namely, fever, fatigue, dry cough and shortness of breath. But new research suggests we may be overlooking other, major signs of Covid-19. Signs that have nothing to do with the respiratory system.

Armed with emerging data drawn from over 400 infected patients in Wuhan, China, scientists on a pair of new studies suggest it may be time to rethink Covid-19 as a strictly respiratory illness. That's because the **coronavirus' reach may extend beyond the lungs, jeopardizing the body's gastrointestinal tract, too**.

According to two preliminary studies published this month in The American Journal of Gastroenterology, **diarrhea**, **nausea** and **lack of appetite** may be significant symptoms of Covid-19, even in patients who never develop respiratory symptoms or fever.

The studies are not peer-reviewed and so the findings need to be validated, but they jibe with emerging case reports from other localities outside China, including the United States, the researchers say. The results suggest that clinicians may have overlooked potential coronavirus patients who presented with GI and not respiratory symptoms of the virus. Covid-19 may be #NotJustCough.

Brennan Spiegel, director of Cedars-Sinai Health Services Research and editor-in-chief of the *The American Journal of Gastroenterology*, wants to challenge how the medical and academic community has characterized Covid-19. **"This is, to me, is becoming almost as much a GI condition as a pulmonary condition,"** Spiegel tells *Inverse*, "but we're not hearing about it nearly as much because people aren't running to the hospital with watery loose stools."

"People seek care when they can't breathe; that's an emergency. The initial wave of patients that are coming into hospitals are principally coming not because they have diarrhea but because they have shortness of breath, cough, pneumonia."

If the new research is replicated in larger studies, it means there may be thousands of people hit by diarrhea or vomiting who think they have an illness entirely unrelated to Covid-19. As a result, they may be unwittingly transmitting the novel coronavirus to friends, family, and strangers.

Other experts say that while the studies are interesting, it may be too soon to consider adding GI symptoms to the list of hallmark Covid-19 symptoms.

"I think it is certainly reasonable to query patients about GI symptoms, but in the absence of other symptoms, I would not recommend concluding that the individual has a high suspicion for Covid-19 infection," David Lieberman, head of Oregon Health and Science University's Gastroenterology Division, tells *Inverse*.

Ultimately, understanding these digestive symptoms could help clinicians diagnose Covid-19 patients better and faster than before.

GUT CHECK

The most recent study suggesting a link analyzed GI symptoms reported by 206 people with mild cases of Covid-19. This group is representative of the estimated 75 to 80 percent of global COVID-19 cases that are considered "mild," the researchers say.

The researchers compared people with mild disease and one or more digestive symptoms (diarrhea, nausea, vomiting), with or without respiratory symptoms, to a group of people who presented with respiratory symptoms alone. The research team then tracked the course of their illness until they tested negative for Covid-19 in two separate respiratory samples. They also tested their stool.

More than half the participants reported some kind of digestive issue. Almost one in four, 24 percent, of participants presented solely with digestive symptoms. Sixty two percent of patients with a digestive symptom also had a fever. A third reported both digestive and respiratory symptoms and 43 percent reported respiratory symptoms alone.

Among people with digestive symptoms, 67 people presented with diarrhea, of whom about one in five experienced diarrhea as their **first** Covid-19 symptom. The diarrhea lasted from one to 14 days, with most reporting this issue lasting for five days.

The diarrhea people are experiencing is relatively low-volume, Spiegel says.

"This isn't cholera. People are not running into the hospital dehydrated and dying, thankfully," Spiegel says. "And as a result, they're at home and are told by their doctors that they can't be tested, either because they don't meet CDC guidelines or because they don't have enough test kits."

At the same time, many doctors aren't aware that GI symptoms may be associated with Covid-19, he says.

For nearly one-third of patients, one of the major clues of Covid-19 — fever — never showed up, yet they still tested positive for the virus. Fever may not always reliably predict who has Covid-19.

The study comes hot on the heels of another pre-print study, published earlier in March in the same journal. In this study, researchers analyzed 204 people with Covid-19 in Wuhan, China. Most presented at the hospital with fever and respiratory symptoms but over fifty percent had at least one digestive symptom, too. Of the study participants, 78.6 percent reported a lack of appetite and 34 percent had diarrhea.

Both studies highlight some worrying trends: **People who had digestive symptoms sought medical care later and took longer to fight off the virus than those with respiratory symptoms alone.**

People with digestive symptoms also waited longer for a Covid-19 diagnosis than those with respiratory symptoms alone and were more likely to test positive for Covid-19 in their stool.

Diarrhea does ***not*** necessarily mean you have come down with Covid-19, Spiegel says. Diarrhea is extremely common and can be sparked by stress, lactose intolerance, and irritable bowel syndrome, among other conditions.

But taken together, **the research suggests clinicians should consider Covid-19 as a potential diagnosis if people experience digestive symptoms after being in contact of an infected person, or if these symptoms present with a fever.**

VIRAL INVASION

The reason why SARS-CoV-2, the novel coronavirus that causes Covid-19, ravages the GI tract may be because it invades a type of receptor known as ACE2. These receptors are common in the lungs, but they are expressed in far greater numbers in the GI tract, Spiegel says.

The virus can replicate very efficiently in the gut, which also happens to be the largest immune organ in the body, Spiegel says. This huge viral load may then overwhelm the intestinal system, and even the liver, prompting the GI symptoms.

"I'm getting case reports in every day of clear-cut evidence that the virus affects the entire GI tract, including the colon, the small intestine, the stomach," Spiegel says. "It seems that it can cause colitis that can cause inflammation in the colon, it can cause bleeding in the colon, and in the small bowel," he says.

In contrast, Lieberman says GI symptoms appear to be present only in a "minority of patients," although he agrees that diarrhea is the most common symptom. Liver test abnormalities have also been reported, but scientists don't know the significance of these early results yet, he says. "The actual frequency of these issues with Covid-19 is not really known, due to lack of widespread testing for Covid-19," Lieberman says.

Basically, until more infected people are tested for GI symptoms, we won't be able to pin down exactly how prevalent GI symptoms are.

Emma Farrer

Covid-19 can linger in the stool. Disinfecting bathroom surfaces, frequent handwashing, and closing the toilet lid can help limit the spread.

At the time of writing, the United States' Centers for Disease Control and Prevention does not include any digestive symptoms in its guidelines. The World Health Organization, by contrast, suggests "very few people" with Covid-19 will experience nausea or diarrhea.

"I can understand the reluctance to expand testing guidelines to everyone with diarrhea, because we can't keep up with even those with respiratory symptoms right now," Spiegel says. But at some point, we have to "face the facts," he says, and recognize there is clear evidence that the GI tract is affected by Covid-19.

Public health authorities may eventually adjust their guidance to reflect the emerging data, but until then people should take every precaution if they have new, rapid onset diarrhea or vomiting, Spiegel says.

"Be fastidious about hand cleaning, toileting, and exposing other people until it goes away," he says.

His warning fits with evidence suggesting the novel coronavirus shows up in stool samples, and that it can linger in certain environments, like bathrooms, for extended periods. **"Environmental sampling studies have repeatedly found virus in and around the toilet and bathroom,"** John Townes, interim head of the Oregon Health & Science University (OHSU) Infectious Diseases Division, explains. "Transmission of the virus from sources such as these may be an unappreciated mode of spread."

Ultimately, all three infectious-disease experts say **HAND HYGIENE** and **ENVIRONMENTAL CLEANING** are the key to keeping safe. **Both of these strategies, in addition to social distancing and mask use when ill with respiratory symptoms, can make a very real difference.**

At the same time, you can also get into some other good habits, Townes says. **"Close the toilet lid to avoid aerosols generated during flushing,"** he says. And if you do start showing unexplained digestive symptoms, regardless of whether it has to do with coronavirus, it is important to stay hydrated, Lieberman says. **"Patients should be concerned and notify their health care provider if they cannot remain hydrated, or develop blood in their bowel movements," he says.**

Study highlights from the pre-print study published March 31:

What is Known: Coronavirus disease 2019 (COVID-19) most commonly presents with respiratory symptoms, including cough, shortness of breath, and sore throat. However, digestive symptoms also occur in patients with COVID-19 and are often described in outpatients with less severe disease. In this study, we sought to describe the clinical characteristics, results of stool testing for viral RNA, and outcomes of COVID-19 patients with digestive symptoms and mild disease severity.

What is New Here: We describe a unique sub-group of COVID-19 patients with low severity disease marked by presence of digestive symptoms. These patients are more likely to test positive in stool for COVID-19 RNA, to have a longer delay before viral clearance, and to experience delayed diagnosis compared to patients with respiratory symptoms but no digestive symptoms. In some cases, the digestive symptoms, particularly diarrhea, can be the initial presentation of

COVID-19 and may only later or never present with respiratory symptoms or fever. These data emphasize that patients with new-onset digestive symptoms after a possible COVID-19 contact should be suspected for the illness, even in the absence of cough, shortness of breath, sore throat, or fever.