# Novel Coronavirus – Salient Research Findings – A Review

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## Introduction

Rumours and misinformation are being spread widely through social media now a days. As the novel coronavirus continues to infect people around the world, such social media posts can be dangerous. One should abstain from forwarding posts without verifying its source and should rely on the reports of scientific studies. Findings of important scientific studies conducted across the world with reference to this virus outbreak are compiled here for a better understanding.

## Novel coronavirus and COVID 19

International Society for Taxonomy of Viruses named the novel coronavirus as SARS-CoV-2 and on February, 11, 2020 the World Health Organization (WHO) named the disease it causes as COVID-19. "CO" refers to corona, "VI" to virus, and "D" to disease. The virus is also commonly known as 2019-nCoV.

***SARS-CoV-2 is the name of the virus and the disease it causes is called COVID-19.***

## What are the other coronaviruses known to infect humans?

There are **seven** coronaviruses known to infect humans. SARS-CoV, MERS-CoV and SARS-CoV-2, which can cause severe disease whereas HKU1, NL63, OC43 and 229E are associated with mild symptoms (common cold).

## Is this virus a mutated form of common cold?

No. SARS-CoV-2 does share similarities with other coronaviruses, four of which can cause the common cold. All five viruses have spiky projections on their surfaces and utilize spike proteins to infect host cells. However, the four cold coronaviruses mentioned above utilize humans as their primary hosts. SARS-CoV-2 shares about 90% of its genetic material with coronaviruses that infect bats, which suggests that the virus originated in bats and later hopped to humans.

## How the virus invades into human and how it differs from viruses causing common cold?

Though the coronavirus uses many different proteins to replicate and invade cells, the spike protein or S-protein is the major surface protein that it uses to bind to a receptor and it acts like a doorway into a human cell. It attaches to a receptor on respiratory cells called

angiotensin-converting enzyme 2, or ACE2. It is reported that the molecular bond between SARS-CoV-2's spike protein and ACE2 looks fairly similar to the binding pattern of the coronavirus that caused the outbreak of SARS in 2003.

Other coronaviruses that circulate regularly, causing upper respiratory infections that most people think of as the common cold, don't interact with the ACE2 receptor, but rather, they get into the body using other receptors on human cells.

## Was it made by scientists and escaped from lab?

No evidence suggests that the virus is man-made. SARS-CoV-2 closely resembles two other coronaviruses that have triggered outbreaks in recent decades, SARS-CoV and MERS-CoV, and all three viruses seem to have originated in bats. Research analyses clearly show that SARS-CoV-2 is not a laboratory construct or a purposefully manipulated virus.

Scientists have studied how SARS-CoV differs from SARS-CoV-2 — with several key letter changes in the genetic code. Yet in computer simulations, the mutations in SARS-CoV-2 do not seem to work very well at helping the virus bind to human cells. If scientists had deliberately engineered this virus, they wouldn't have chosen mutations that computer models suggest won't work. The overall molecular structure of this virus closely resembles viruses found in bats and pangolins that had been little studied and never known to cause humans any harm. If someone were seeking to engineer a new coronavirus as a pathogen, they would have constructed it from the backbone of a virus known to cause illness.

## How did the virus reach humans?

Evidence suggests that the virus passed through an intermediate animal before infecting humans. The SARS virus transmitted from bats to civets (a farmed wild animal) on its way into people, whereas MERS infected camels before spreading to humans. In case of novel coronavirus, this could be a domestic animal, a wild animal, or a domesticated wild animal and, as of yet, has not been identified. Until the source of this virus is identified and controlled, there is a risk of reintroduction of the virus in the human population and the risk of new outbreaks.

Exactly how the virus jumped from a wild animal, presumably a bat, to another animal and then humans remains a mystery. However, certain reports throw light into this scenario.

Pangolins are the most-commonly illegally trafficked mammal, used both as food and in traditional medicine. Two groups of coronaviruses related to the SARS-CoV-2 have been identified in Malayan pangolins smuggled into China. A report reveals that bats are certainly involved, pangolins may be, but it is very possible that other animal species are involved as well. The animal's scales are in high demand for use in traditional Chinese medicine, while pangolin meat is considered a delicacy. Therefore, sale of these wild animals in wet markets should be strictly prohibited to avoid future zoonotic (animal to human) transmissions, the report reiterates.

## Is it airborne?

SARS-CoV-2, the COVID-19 causing virus is mainly transmitted through droplets generated when an infected person coughs, sneezes, or speaks. These droplets are too heavy to hang in the air. They quickly fall on floors or surfaces. The virus is not thought to spread via smaller droplets that can remain airborne for long periods of time. Measles, for example, can live in the air for hours after an infected person coughs or sneezes. This is not currently believed to be the case for SARS-CoV-2. One can be infected by breathing in the virus if he / she is within 1 metre of a person who has COVID-19 or by touching a contaminated surface and then touching your eyes, nose or mouth before washing your hands.

Airborne transmission is different from droplet transmission as it refers to the presence of microbes within droplet nuclei, which are generally considered to be particles <5µm in diameter, can remain in the air for long periods of time and be transmitted to others over distances greater than 1 m.

However, a non-peer reviewed study in the US reported that SARS CoV-2 can remain viable in the air for up to 3 hours indicating that aerosol transmission of the virus is plausible. These initial findings need to be interpreted carefully. There exists a theoretical possibility, though no reports suggest that anyone has been infected through breathing it from the air.

According to a research published in the Journal of the American Medical Association by on 26 March, 2020 by the researchers of Massachusetts Institute of Technology (MIT), Cambridge, the gas cloud from a cough or sneeze may help virus particles travel up to 8 metres. “Peak exhalation speeds can reach up to 33 to 100 feet per second (10-30 m/s), creating a cloud that can span approximately 23 to 27 feet (7-8 m)”. However, scientists at the University of Washington School of Medicine clarified that the question is not how far the germs can travel, but how far can they travel before they're no longer a threat. If the coronavirus were effective at ranges of up to 27 feet (8.2 meters), as MIT scientists contends in their research, more people would be sick. It takes a certain number of viral particles, 'virions,' or individual viruses, it takes a certain number of individual viruses to actually get a foothold inside the body and cause that infection to get going. At present it is not known exactly what that number is, but it's probably more than a single virus. If the virus really travelled very efficiently by air, everybody would be infected.

In the context of COVID-19, airborne transmission may be possible in specific circumstances and settings in which procedures or support treatments that generate aerosols are performed; i.e., endotracheal intubation, bronchoscopy, open suctioning, administration of nebulized treatment, manual ventilation before intubation, turning the patient to the prone position, disconnecting the patient from the ventilator, non-invasive positive-pressure ventilation, tracheostomy, and cardiopulmonary resuscitation.

Based on the available evidence, WHO continues to recommend droplet and contact precautions for those people caring for COVID-19 patients. WHO continues to recommend airborne precautions for circumstances and settings in which aerosol generating procedures and support treatment are performed.

## How long does the virus survive on surfaces?

It seems to behave like other coronaviruses. Studies suggest that coronaviruses may persist on surfaces for a few hours or up to several days. This may vary under different conditions (e.g. type of surface, temperature or humidity of the environment).

Studies reveal that human coronaviruses such as SARS-CoV and MERS-CoV can persist on inanimate surfaces like metal, glass or plastic for up to 9 days, (In comparison, flu viruses can last on surfaces for only about 48 hours.) But some of them may not remain active for as long at temperatures higher than 30 degrees Celsius and coronaviruses can be effectively wiped away by household disinfectants. They can be efficiently inactivated by surface disinfection procedures with 62–71% ethanol, 0.5% hydrogen peroxide or 0.1% sodium hypochlorite within 1 minute.

SARS-CoV-2 RNA was found on a variety of surfaces in cabins of both symptomatic and asymptomatic people who were infected with COVID-19 on the Diamond Princess cruise ship, up to 17 days after the passengers disembarked.

## Do vitamin C supplements prevent the infection?

Vitamin C serves essential roles in the human body and supports normal immune function and it should absolutely be included in the daily diet to maintain a healthy immune system. But megadosing on Vitamin C supplements is unlikely to lower the risk of catching COVID-19. Researchers have yet to find any evidence that vitamin C supplements can render people immune to COVID-19 infection. In fact, for most people, taking extra vitamin C does not even ward off the common cold, though it may shorten the duration of a cold may be by a day if you catch one. It is reported that high doses of vitamin C, exceeding a daily level of 2,000 mg, can cause nausea, diarrhoea and abdominal pain in many people.

## What is the likelihood of kids getting infected?

Children are as likely as adults to become infected. Still, when children become infected, they seem less likely to develop severe disease. It may be because of differences in the immune responses of children compared to adults. A previous study has revealed that adults are 25 times more likely to die from chickenpox than children are. Kids aren't any less likely than adults to be exposed to respiratory ailments. It seems most likely that they are catching the infection but recovering more easily than adults. There are other possible reasons beyond the strength of the innate immune system that could explain this resilience. Kids might have healthier respiratory tracts because they've been exposed to less cigarette smoke and air pollution than adults. Another factor seems to be that kids are healthier in general, with fewer chronic health conditions. In both the SARS outbreak of 2003 and the MERS outbreak of 2012, adults with chronic health conditions were at a higher risk of death than adults without co-occurring conditions. Studies have found that adults are also more susceptible to a detrimental immune response that causes a condition called acute respiratory distress syndrome (ARDS). ARDS was frequently fatal in adults with the SARS coronavirus, whereas even though children (with SARS) had pneumonia, they didn't get the immunologic complications that adults had.

## Can pets spread the novel coronavirus?

Several dogs and cats tested positive for SARS-CoV, during an outbreak in 2003. Animal health experts reported that cats and dogs will not become sick or transmit the virus to humans. One dog in China contracted a low-level infection from its owner, who has a confirmed case of COVID-19. The infected animal has not fallen ill or shown symptoms of disease and there is no evidence of viral transmission from pet dogs or cats to humans.

## Can face masks protect you from the virus?

Standard surgical masks cannot protect us from SARS-CoV-2, as they are not designed to block out viral particles and do not lay flush to the face. It is not uncommon to see people wearing surgical masks in public to protect against pathogens and pollution. But those masks don't help much in the context of a virus as they are not designed to keep out viral particles. However, surgical masks can help prevent infected people from spreading the virus further by blocking any respiratory droplets that could be expelled from their mouths. Therefore, people sick with COVID-19, should wear face masks to reduce the risk of infection to people around them. A face mask is not a substitute for staying home when one is sick. A more specialized mask, known as an N95 respirator, can protect against the virus. The respirator is thicker than a surgical mask and is challenging to wear them for long periods of time. People require training to properly fit N95 respirators around their noses, cheeks and chins to ensure that no air can sneak around the edges of the mask.

Touching the face often to adjust ill-fitting masks increases the risk of infection. A study reported that cloth masks might lead to more infections than medical masks as cloth holds on to moisture, is often reused and filters poorly to medical masks. It is important to dispose of used masks appropriately, and clean the hands after removing them. WHO warns that wearing multiple masks can be harmful. If too many people unnecessarily stockpile N95 respirators, a shortage could put the health of medical workers and those who need them at risk.

## Is it safe to receive a parcel from an infected area?

The risk of catching the virus from a package that has been moved, travelled, and exposed to different conditions and temperature is low. Though coronaviruses can stay on surfaces such as metal, glass or plastic for as long as nine days, the surfaces present in common packaging are not ideal for the virus to survive. There is no evidence to support transmission of COVID-19 associated with imported goods.

## Who can spread the virus and at what stage?

A German-based team showed that some people with COVID-19 had high levels of the virus in throat swabs early in their illness, when their symptoms were mild. This indicates that the pathogen could easily be released through coughs or sneezes (a process known as viral shedding) and spread to others. Another team, in China also detected high viral loads soon after they became ill. Moreover, an infected individual never developed symptoms but shed a similar amount of virus. Data on the extent of viral shedding at different stages of the

disease, confirm that some infected people can be highly contagious when they have mild or no symptoms. Most people with mild infections would not be ill enough to seek medical help but would have already acted as carriers.

The best-documented evidence for asymptomatic cases has come from the Diamond Princess cruise ship, which had a COVID-19 outbreak in early February. The ship was quarantined and the 3,711 passengers and crew members were repeatedly tested and closely monitored. About 18% of around 700 infected individuals on the ship never showed symptoms.

It is suspected that the rate of asymptomatic infections in a general population might be closer to the 31%. Taking the results from several studies into account, mathematical epidemiologist at Atlanta assumes that asymptomatic or mild cases combined represent about 40–50% of all infections.

Implementing strong social-distancing measures is the only way to stop the virus from spreading.

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