



# A Comparative Characteristics of Both Variants of Severe Acute Respiratory Syndrome Coronavirus-2 (SARS-CoV-2): Delta and Omicron

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## Abstract:

One of the viruses that infects both animals and humans is the coronavirus, a group of viruses belonging to the family of Coronaviridae. The symptoms of COVID-19 are always variable, but often include fever, cough, headache, fatigue, difficulty in breathing, also loss of smell and taste. Emerging SARS-CoV-2 variants are of particular concern, as they can affect the viability of the virus and its pathogenesis, as well as the effectiveness of diagnostic devices and vaccine effects. Although the SARS-CoV-2 Delta variant (B.1.617.2) emerged during the second wave of infection in India, this type of delta has become very dominant internationally and is still evolving in other countries to its potential. The WHO recognized B.1.1.529 as a type of anxiety on November 26, 2021, and renamed it Omicron. Based on some evidence, it has been suggested that omicron mutates in a number of ways, which can affect its overall behavior.

**Keywords:** Coronavirus, COVID-19, SARS-CoV-2, Delta variant, Omicron variant

## Introduction:

One of the viruses that infects both animals and humans is the coronavirus, a group of viruses belonging to the family of Coronaviridae. Covid-19 is a contagious disease caused by the coronavirus. The epidemic has spread to all countries of the world, with the coronavirus causing an ongoing global epidemic. Outbreaks appear to be exacerbated during respiratory disease, with acute respiratory syndrome coronavirus 2 (SARS-CoV-2) being the main cause of ongoing respiratory illness, (Zimmer C, 2021). The virus was previously temporarily named the 2019-novel coronavirus (2019-nCoV) and later called the human coronavirus-2019 (HCoV-19), (Andersen KG, et.al, 2020). The virus was first reported in December 2019 in the Chinese city, the name of that city was Wuhan. Since then, the disease has spread throughout the world, and even today, the epidemic coronavirus still exists, which can spread the disease at any time, (Page J, 2021).

SARS - CoV - 2 is a positive-sense single-stranded RNA virus that has always been known to infect humans as contagious, (Chan JF, 2020). On January 20, 2020, it was confirmed that SARS-CoV-2 had been transmitted from an infected person to a healthy person during the outbreak of Covid-19. The disease is mainly spread through the respiratory way. When infected patients exhale, speak, cough loudly, sneeze or sing, when they come in physical contact with a healthy person, small particles and airdrops reach in the body through their breath, (Wang CC, 2021). People infected with the disease are more likely to spread COVID-19 when they are physically close. Infections can occur, especially at home. The maximum contamination occurs when contact is made at a distance less than a distance of about 1.8 m (6 ft), (Li JY, 2020).

The symptoms of COVID-19 can always vary, but often include fever, cough, headache, fatigue, difficulty breathing, and loss of smell and taste. Symptoms appear about one to fourteen days after exposure to the virus, (Saniasiaya J, 2021). People who are infected with the virus have some symptoms, so they are classified into a specific classification, of which 81% develop mild to moderate (mild pneumonia) symptoms, and 14% develop severe symptoms (including shortness of breath, Hypoxia, or more than 50% of lung involvement), and 5% have some severe symptoms (respiratory failure, shock or multiorgan dysfunction). Older people are at greater risk of developing some serious symptoms. Deaths due to COVID-19 infection usually refer to people who have died after testing positive for Corona. The first confirmed death from COVID-19 occurred on January 9, 2020, in Wuhan, China, (New York Times, 2020).

All viruses are mutated, such as the SARS-CoV-2 coronavirus, which is constantly undergoing new mutations in late 2019. A mutation is a new change in the virus's genetic code, and the mutated virus is known as a new type of virus or also known as a variant. Some new strains of the coronavirus spread more rapidly than others, increasing the risk of infection and adding to the daily life of humans. The increasing incidence of coronavirus infection is having a huge impact on healthcare facilities. This leads to death due to the untimely availability of hospital facilities and medicine. Thus, the coronavirus has once again mutated into new variants after delta variants, the name of the new coronavirus variant is Omicron. Which has now re-emerged in some countries of the world, disrupting human daily life. Omicron is spreading faster than Delta.

### **Delta Variant (B.1.617.2):**

The coronavirus mutated to form a new variant, the name of that Delta variant. Delta variant is a variant of SARS-CoV-2, which causes COVID-19. The strain of the virus was first detected in India in late 2020. On May 31, 2021, the new strain of the coronavirus was renamed the Delta variant. In June 2021, the World Health Organization (WHO) stated that this delta strain of coronavirus could spread globally as well as disrupt entire human life and that the strain can become more prevalent globally, (Jr. Berkeley Lovelace, 2021). Common symptoms have been reported in patients with delta-type infections, mainly headache, sore throat, runny nose, or fever, (Grover, 2021).

The information is noteworthy because the Delta variant is capable of transmitting 40 to 60% more than the alpha strain, and the Delta variant has almost twice the transition capacity of the original Wuhan strain of SARS-CoV-2. A study by a Chinese researcher found that the viral load in Delta infections was ~ 1,000 times higher than in other types of infections. The Delta type is considered by the World Health Organization (WHO) to be the "fastest and most suitable" type to date. <https://asm.org/Articles/2021/July/How-Dangerous-is-the-Delta-Variant-B-1-617-2>

## Omicron Variant (B.1.1.529):

Another new strain of SARS-CoV-2 has emerged, the Omicron variant, which causes COVID-19. Infection with a new strain of coronavirus began in South Africa. This new variant from South Africa was first noted by the World Health Organization (WHO) on 24 November 2021. The World Health Organization (WHO) identified the variant of the virus as a matter of concern on November 26, 2021, and later renamed it Omicron, (Parekh, 2021). In late September or early October 2020, the Omicron variant is expected to be diverged based on a comparison of the Omicron genome. According to estimated information, the Omicron variant became dominant in South Africa by November 2021, the month in which it was first introduced.

This omicron variant has undergone unusually large mutations. Many of them are new types and a significant number of them appear to have an effect on spike proteins, (Torjesen, 2021). There are approximately 60 mutations that occur in the Omicron variant as compared to the original Wuhan Coronavirus: 50 nonsynonymous mutations, 8 synonymous mutations, and 2 non-coding mutations, (William A. Haseltine, 2021). The first female patient to be infected with the Omicron variant in South Africa was found to have some symptoms, including fatigue, pain, and aches, but no change in her cough, smell, or taste, according to the were South African Medical Association, (BBC News, 2021).

	Delta	Omicron
<b>1. Mutations</b>	The Delta variant has about 13 mutations. 9 of these mutations are contained in spike proteins, with protrusions on the outside of the virus, which they use to attach to human cells. Specifically, the 2 mutations in the molecular hook, called the "receptor-binding domain", help human cells to attach more tightly.	In Omicron variant at least 32 mutations are in the spike protein and 10 are in the receptor-binding domain. Although there are many mutations found in earlier forms, including delta, there are also mutations found earlier. Many of these mutations are on some spike proteins, which can increase the ability of cells to infect and prevent immunity.
<b>2. Contagion</b>	The original SARS-CoV-2 virus was transmitted from one person to other an average of 2 or 3 people. But unlike the original SARS-CoV-2 virus in Delta, Delta infected more than six people from one person. Also, Delta's incubation period is faster than the six days seen in the original virus and is only four days apart, so people get infected very quickly.	Preliminary evidence suggests that Omicron may be at greater risk of infection than other coronavirus types of anxiety. The rapid rise in Omicron cases across South Africa is a cause for concern, and based on that information, it is understood that Omicron seems to be overtaking the Delta in that country. Omicron is also spreading rapidly in other countries.
<b>3. Immune escape</b>	The Delta variant acquired some mutations in itself, thus avoiding vaccine-induced antibodies to some extent. But while there has been smallest evidence increase in the Delta variant's associated reinfection risk, antibodies created with the help of older strains have been	It occurs mutations similar to previous beta and gamma variants, which may be more resistant to vaccination than the Delta variant. Similarly, a recent study of epidemics in South Africa, which has just been published, shows a threefold increase in the risk of infection due to the Omicron variant as compared to Delta.

	<p>shown to be effective in protecting people.</p>	
<p><b>4. Emergence</b></p>	<p>The Delta variant was first introduced in India in December 2020, probably due to a variety of drugs or diseases such as HIV / AIDS, which had a weakened immune system. It is speculated that the Delta variant may have come from such a person.</p>	<p>Researchers say that Omicron is younger than others, as evidenced by its genetic tree branches. Other estimates suggest that the rise of Omicron occurred in mid-October. According to the Science Journal, the Omicron variant has not evolved from any of the earlier types of anxiety, like other alpha or delta. Instead, the Omicron variant appears to have evolved in parallel. Also, Omicron seems so different from other types that even its closest relatives are hard to identify.</p>
<p><b>5. Severity of illness</b></p>	<p>A report from last summer found that delta-infected patients in England had twice as much risk of hospitalization as patients with previous types (alpha and beta).</p>	<p>The number of hospital admissions in South Africa is growing rapidly - although the number of hospital admissions has increased, the use of ICU beds has not increased in any way to date. Therefore, less serious illness is warned.</p> <p>Omicron infection occurs mainly in young people. It has also been shown that patients who have been vaccinated and have previously been infected with the corona virus also become infected with Omicron. This indicates that our antibodies are not protective.</p>

This information taken from <https://www.mercurynews.com/author/lisa-krieger/>

**Conclusion:**

The spike protein on the omicron has more mutations than the delta type. It has been found that the Omicron variant is almost certainly not more severe than the Delta. Omicron can also cause mild disease than other types of coronaviruses (alpha, beta, and delta). One thing is for sure, there is a difference between omicron and delta variants, as omicron appears to have a more transmissible speed or more severe form than other forms. The purpose of this comparative study was to compare the binding affinity of SARS-CoV-2 with the binding affinity of the delta and omicron types in humans. Also, how do both of them mutate, when did

it start, how did they get infected, what was the speed of their infection and what are the symptoms of both. In this way, different characteristics and comparative studies of the two were done.

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