



# Are the COVID-19's vaccines efficient on the most dangerous variant of SARS-CoV-2?

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Severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) is the name of an RNA virus that has changed the equations of the world since December 2019. More than 3.8 million people have been death caused by coronavirus [1,2].

The rate of evolution in SARS-CoV-2 is slow in comparison with other RNA viruses, but during this time, due to the high rate of spread among the people, it has been able to find significant genetic diversity and it is the main reason of the emergence of its several variants. B.1.1.7 (Alpha), B.1.351 (Beta), and P.1 (Gamma) are the different variant types of SARS-CoV-2 that were discovered in in Southeastern England, South Africa, and Germany, respectively. B.1.617.1, B.1.617.2, and B.1.617.3 are the primary subtypes of the B.1.617 lineage. Each of these variants has mutations in the N-terminal domain (NTD) and receptor-binding domain of the SARS-CoV-2 spike protein, which may help them evade the immune system. The B.1.617.2 (Delta) variant was emerged in the state of Maharashtra in late 2020 and has outspreaded from India, and it has been discovered in many countries [3].

The reports regarding Delta variant are not enough, but all the studies show that this variant in comparison with the wild-type of SARS-CoV-2 is more contagious. It has become the major concerns of the world, because of widespread coronavirus disease 2019 (COVID-19) disease in Southeast Asia, Europe, the United States, and elsewhere. In June, Dr. Wilson commented on Delta's spread in the United States, saying, "It's actually fairly dramatic how the growth rate will shift." According to him, Delta spread 50% quicker than Alpha, which was 50% more contagious than the original SARS-CoV-2 strain. The average person infected with the original coronavirus strain will infect 2.5 other persons in a completely uncontrolled environment—where no one is vaccinated or using masks—according to Dr. Wilson. "Delta could spread from one individual to 3.5 or 4 more people in the same environment" [3,4].

The spike is a transmembrane glycoprotein that is encoded by S gene. Evaluation of Delta variant demonstrated that the main difference between Delta and other variants is related to spike protein mutations T19R, Δ157-158, L452R, T478K, D614G, P681R, and D950N. Various of these mutations may impact immune responses directed at the receptor-binding protein's important antigenic areas (452 and 478) as well as the deletion of a portion of the NTD. Also, these mutations have increased replication that can leads to higher viral loads of this variant and increase the rate of transmission. In a recent investigation, scientists discovered that the Delta variant is less sensitive to neutralizing antibodies in serum from recovered individuals. This variation has a higher replication efficiency than the Alpha form [5].



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The introduction of COVID-19 vaccine has resulted in a reduction in the number of new cases and deaths in many countries, but the appearance of the Delta variant has raised serious concerns. Since March 20, 2021, around 17% of Delta cases have occurred in vaccinated individuals in Houston, Texas, where a team from Houston Methodist Hospital has been sequencing and recording SARS-CoV-2 variants for nearly every COVID-19 case in the hospital system. Limited studies have been conducted in the Delta species to investigate the efficacy of several vaccinations against SARS-CoV-2, and there is still a lot of conflicting information available [4,5].

Sinopharm vaccine is a Chinese product that was given emergency approval by the World Health Organization in May 2021. Based on the assessment the ability of it against Delta variant, researchers have found that Immunogenicity was fairly significant in people under 40 years of age in 98% of cases, but in those over 60 years of age, the success rate was excellent in 93% of cases.

The most famous and well-known vaccine among people is Pfizer that is a novel technology vaccine. The result of a study in Israel shows following the occurrence of the Delta variant, Pfizer infection-prevention efficiency dropped from 94% to 64%. Lopez Bernal et al. [6] evaluated the efficiency of the BNT162b2 and ChAdOx1 nCoV-19 vaccines. In adults with Delta, the efficacy of a single dose of Pfizer (BNT162b2) and AstraZeneca (ChAdOx1 nCoV-19) vaccine was much lower than in Alpha patients. Furthermore, it demonstrates that two Pfizer vaccine doses are more effective than two AstraZeneca vaccine doses. The efficiency of Pfizer was 88% and 36% after two and one dose, respectively. Another study that was published in *Nature* demonstrated that a single dose of a two-dose vaccine, such as those developed by Pfizer-BioNTech or AstraZeneca, provided “barely” any protection. The results of Pouwels et al. [7] was interesting. They discovered that the efficiency of AstraZeneca is lower than Pfizer-BioNTech, but over time efficiency of Pfizer-BioNTech decreases.

The third vaccine of the list is Moderna. Individuals who were fully vaccinated with Moderna’s mRNA-1273 product were substantially less likely than unvaccinated individuals to get moderate or severe outcomes after B.1.617.2 infection, according to several studies. A laboratory evaluation of the Moderna vaccine found that it could protect against the Delta form and other variants tested. In addition, they compared the efficiency of it with Pfizer-BioNTech, and the efficiency for both was approximately 94% [8].

Johnson & Johnson vaccine is another COVID-19’s vaccine that is produced by Janssen Pharmaceutical Companies. The single shot of this vaccine was estimated 91% to 96.2% protection against death and when the Delta variant is dominant, hospitalization is prevented in around 71% of cases [9,10].

According to a trial study, the Johnson & Johnson vaccine is roughly 85% effective against the Delta variation, and it also generated higher levels of “neutralizing antibody activity” against the Delta form than the Beta variant, which inhibits the virus from infecting healthy cells [10].

All in all, the results of different studies show that vaccination still is the best to protect people and stop the spread of COVID-19. Unfortunately, due to several reasons, some countries have used some vaccines that we do not have any information about them, and they have not been approved by the US Food and Drug Administration. Hence, we are not able to understand they are effective on Delta variant or not.

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