

Knowing About Booster Shots Against COVID-19

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Since WHO designated Delta variant (B.1.617.2) as a variant of concern due to its high transmissibility, it has now been reported in more than 104 countries. Numerous research has shown that spread of the Delta variant is estimated to be 50-60% more contagious than Alpha variant which was first identified in the UK. The variant contains three RBD (receptor binding domain) mutations [1].

- Lysine to asparagine substitution at amino acid position 417 in the S protein. This mutation is also common in Beta variant and involved in immune escape.
- Leucine to arginine substitution at amino acid position 452 in the S protein. This mutation is common to the former variant of interest Epsilon and confers a stronger affinity to the ACE₂ receptor of various human cells.
- Threonine to lysine substitution at amino acid position 478 in the S protein. This mutation is common in B.1.1.519 variant predominantly present in Mexico. It has been predicted that change of the non-charged amino acid to positively charged amino acid may potentially switch the electrostatic surface of the protein which further increases ACE₂ binding affinity and immune evasion [2].

Scientists reported that high transmissibility of the variant could come from the combination of its high viral load (1000 times higher than original COVID-19 variant) and short incubation period [3].

Now there is a question of whether vaccines could protect us against the infection of Delta variant of COVID-19. A study published in the New England Journal of Medicine demonstrated the effectiveness of the BNT16b2 (Pfizer-BioNTech) and ChAdOx1 (AstraZeneca) vaccines against the Delta variant. Effectiveness of the first dose of each vaccine was markedly lower among persons infected with the Delta variant (35.6% and 30.0%, respectively), while after the second dose, the effectiveness was increased to 88% and 67%, respectively [4]. Even though these numbers may be dramatically higher, the duration and durability of the protective immunity through vaccination is far more in doubt. According to numerous studies, vaccine efficacy seems to be fading over the time [5]. A study published in Nature by Pouwels et al. revealed that BNT16b2 (Pfizer-BioNTech) vaccine efficacy fell to 85% after 30 days and 78% after 90 days of vaccination. In the case of ChAdOx1 (AstraZeneca) vaccine, 69% effectiveness against a high viral load 14 days after the second dose fell to 61% by 90 days [1]. So this means that Delta variant can cause breakthrough infections in already vaccinated individuals due to vaccine effectiveness dropping away over time. This is the main reason why Booster vaccination is important right now against currently circulating variants.

Booster shot is an additional vaccine dose that should afford extra protection against COVID-19. Last week, the New England Journal of Medicine published a study of third COVID shots involving participants over 60 years age or older in Israel. The data was collected from July through August when the Delta variant was spreading throughout the country [6, 7]. It showed that a booster shot of BNT16b2 (Pfizer-BioNTech) vaccine restored an immune response similar to the protection generated after a second dose, and severe illness was significantly lower among participants. Further, several countries including Britain, Germany, France, Belgium have decided to offer booster shots to older adults and people with weakened immune systems, even though EU drug regulators have not yet been recommended the additional dose of vaccination [8, 9]. As for the USA, booster shots will be widely available from September 20th to Americans who received two dose COVID-19 vaccine. In the case of Asian countries, China will complete booster shots to elderly as well as high-risk employees by the end of October, while South Korea plans to begin booster shots from October to people who have weakened immune systems, or who received their second dose 6 months ago [10, 11].

Even though booster shots are essential to those with weak immune or high risk for occupational exposure, WHO called for a global moratorium on booster shots until the end of September since it could increase inequality in vaccine access. Moreover, WHO says current vaccine supplies could save more lives of unvaccinated populations.

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