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COVID-19 Variants and Mutations

All viruses constantly go through changes in their genome and have a very fast mutation rate (rate at which DNA nucleotides change within the genome prompting mutations) and COVID-19 or the Sars-Cov2 virus has gone through this cycle as well, creating new viruses or variants that are resistant to certain pre-established treatments, making them more dangerous because it is just as transmissible just harder to detect and treat. The Sars-Cov2 virus has a mutation rate of 1.12×10^3 per year found through however many variants have been detected since the heat of COVID-19. The first one was detected in December 2020 in the US traced back to the UK known as the B.1.1.7 variants, with other variants such as B.1.351 variant from South Africa found in December 2020, P.1 which was found to be originating in Brazil and originated in the US and then the latest notable variant is the B.1.427 and B.1.429 variants appearing in the US this past February.

These mentioned 5 variants are noted as variants of concern by the CDC due to their high increase in transmission, some having upwards of a 50% increase in transmission. Due to such an increase in transmission rates, the CDC has noted these variants as variants of concern and the changes in these viruses to have such an increase in transmission comes from changes to the spike protein. For example, the variant B.1.1.7 that causes a 50% increase in transmission compared to the original Sar-Cov2 is made more transmissible due to mutations in the spike proteins of the virus. Spike proteins are proteins on the COVID-19 virus that are used to bind and transfer the virus RNA genome into the cell that gets reverse transcribed into DNA that gets

integrated into the human cellular genome to make more COVID-19 viral proteins and infect the rest of the body. This mutation at the spike protein is known as *D614G* and it was documented during the initial stages of the pandemic and there is evidence that suggests that viruses with this mutation have a greater transmission rate than viruses without.

As of now all of the variants of the coronavirus are classified by the CDC as variants of concern rather than the higher level that is variant of high consequence so it is safe to say that as of now these variants are not too serious in regards to their damage on the world. However, with the higher transmission rates of these variants, especially the variants of concern, they have definitely caused damage and have led to higher rates of spread in certain parts of the world. Some areas such as in India consisted of multiple of these variants discussed earlier such as the B.1.1.7 and other variants that work in a similar fashion to the ones discussed above such as B.1.618 and B.1.617 found in New Delhi, the state of Punjab, and the state of Maharashtra respectively. Due to lack of social distancing practices during political elections and other events combined with the higher transmission rates from these new variants, all of India was hit with a disaster of a second wave due to these COVID-19 variants caused by mutations in the genome.

In the long term, these variants put into question whether the new vaccines produced by Pfizer Biotech would work on these variants and we are happy to say that yes the vaccines do still work on these variants and this was proven in a study by Adeel A. Butt M.D. of the Hamad Medical Corporation in Doha, Qatar. This study saw groups of people given the COVID vaccine either first or second doses and then checked the effectiveness of infection of the COVID variant B.1.1.7. The results showed that the vaccine was still 100% effective 14 days after the second dose even against both the B.1.1.7 variant and B.1.351 variant. Results from this study shows that the COVID vaccine is still effective against this variant and this is due to the fact that the

variant does not change the way that the virus infects the body so much as it does make an infection more possible and makes COVID more transferable.

While such instances with the variants such as what has occurred and continues to occur in India seems alarming as to what the variant could do to a population, the variants overall add more spike proteins or at least make entry into the cells of the host easier rather than change the way that COVID-19 infects the body. Due to this, the same precautions of social distancing, wearing a mask, washing hands and using hand sanitizers should still prevent infection. The lack of such precautions was the true cause of the outbreak in India due to the higher transmission rates of the COVID-19 variants and still following those precautions and taking the present vaccines can still prevent the variants from spreading, even with their more dangerous and faster spreading modifications to the Sars-Cov2 virus.

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