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Editorial

Virus Mutation and Countermeasures

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While the worldwide second epidemic which is due to the characteristics of the virus in the winter season and the effect of lifting the NPI since summer is continuing, more than 100 million people are affected, and 2 million people have lost their lives. Currently, 90 million people in 62 countries have been vaccinated with seven vaccines [1]. The fact that the epidemic has become somewhat slower in recent is not caused by vaccination but by tightening NPI. The overall decline of the incidence and deaths is expected only in second quarter of the year when the herd immunity reaches the 70% level in some countries. However, due to some countries that pre-purchased the vaccine, the supply of supplies was limited, so Dr. Tedros, WHO DG, criticized vaccine nationalism at 148th Executive Board Meeting [2]. It is not easy to implement vaccination due to the program errors and to make matters worse the delay in the timely supply of the scheduled amount. In mid-January, the WHO urgently convened the meeting on COVID-19 vaccine knowledge gaps and research priorities to discuss what we know and what to do for appearing the mutants [3]- B.1.1.7 (a mutation in the receptor-binding domain (RBD) of the spike protein at position 501) in the UK, B.1.135 (multiple mutations

in the spike protein, including K417N, E484K, N501Y) in South Africa, P. 1 (K417T, E484K, and N501Ye mutations in the spike protein receptor-binding domain) in Brazil. WHO recommended urgently, the important thing is to expand the surveillance network to prevent the spread of variants.

Under the mutants and its epidemic, some countries are banning movements such as lockdown and shutdown and closing the borders to UK, RSA, Brazil. Although it was analyzed that this mutation would naturally occur due to the natural selection, in some countries, as the mutant became the major epidemic, the rate of transmission was accelerated and even though evidence was limited, the UK data was suggested that the severity of the disease was increasing. As a result of the efficacy evaluation of the vaccine, there are reports that the receptor-binding activity was conserved or partially reduced. By the clinical trial data of the Novavax vaccine. In phase 2 clinical trials, South Africa was 49.4%, which is very low compared to 89.3% in the UK [4]. One dose of Johnson & Johnson vaccine is an excellent in convenience, but is 72% of efficacy in clinical trials were conducted in the US, 57% in South Africa [5], and there is no problem with the efficacy of more than 50%, which is the recommendation of WHO, but it may be somewhat disadvantageous in the formation of population immunity.

Among these, in Korea, all of these mutant species are also found in local communities. It is time for rapid isolation, and rapid contact tracing are needed. Active virus surveillance full sequencing of genome is required. So why is viral mutation a problem? In other words, it affects diagnosis, treatment, and vaccine efficacy. First of all, the diagnosis can be delayed. The response may be delayed as the mutated virus test may not be

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confirmed by the existing test kits and method even though the PCR method. The surveillance network needs to be fine-tuned, and rapid isolation is required. It will also impact the treatment. In particular, there is a possibility that monoclonal antibodies will not work. In other words, E484 mutation is known to have decreased antibody response in 9 out of 11 types of the recovery phase, and some serum reduced by more than ten-fold in neutralization [6]. Therefore, the antibody structure produced one year ago will be difficult to prepare for the mutant species, so it will be necessary to remake it. Third is the question of how it will affect vaccination. That concern is becoming a reality. When immunocompromised patients (immunocompromised) such as inadequate immunity, AIDS patients, and cancer treatment patients are infected and not properly treated, mutants can appear. It is becoming a reality in the UK and South Africa. As the rate of transmission increases by 50-70%, the R value changes, so the target for the level of vaccination required for group immunity should be raised to 80% or more. Therefore, more inoculum is needed. In addition, vaccination can also promote mutation, so the rate of vaccination should be faster. However, even if the vaccine's efficacy is low, it is known that the mRNA vaccine can be re-produced at the factory by tailoring a new model in 6 weeks in the laboratory. In this case, further review will be needed to determine whether additional phase 3 clinical trials are needed.

You should not expect everything to be normal with vaccination. First of all, if more than 70% of the population is to be hit, further data on the efficacy and safety of the vaccine against under 16 or 18 years of age, pregnant and lactating women, and asymptomatic infections prevention (Atrogeneca is 58.3%, Moderna 2/3, Pfizer did not address) can be obtained to expand the number of targets. The continuation of asymptomatic infection means that it can

change like endemic disease, and the need to re-vaccination every year or change of route of vaccination increases. And it need to redouble the effort to vaccinate many people as soon as possible. Moreover, contact tracing, quarantine, and isolation approaches are essential and effective in blocking the propagation of mutant species. The need to continue wearing a mask, washing hands, and social distancing also increase.

Conflicts of Interest

The author has no conflicts of interest to declare.

References

- [1] Bloomberg [Internet]. More than 108 million shots given: Covid-19 tracker. [cited 2021 Feb 3]. Available from: <https://www.bloomberg.com/graphics/covid-vaccine-tracker-global-distribution/>.
- [2] World Health Organization [Internet]. WHO Director-General's closing remarks at 148th session of the Executive Board. [cited 2021 Feb 3]. Available from: <https://www.who.int/director-general/speeches/detail/who-director-general-s-closing-remarks-at-148th-session-of-the-executive-board>.
- [3] Centers for Disease Control and Prevention [Internet]. New Variants of the Virus that Causes COVID-19. [cited 2021 Feb 2]. Available from: <https://www.cdc.gov/coronavirus/2019-ncov/transmission/variant.html>.
- [4] Novavax [Internet]. Novavax COVID-19 Vaccine Demonstrates 89.3% Efficacy in UK Phase 3 Trial. [cited 2021 Feb 2]. Available from: <https://ir.novavax.com/news-releases/news-release-details/novavax-covid-19-vaccine-demonstrates-893-efficacy-uk-phase-3>.
- [5] Johnson & Johnson [Internet]. Johnson & Johnson Announces Single-Shot Janssen COVID-19 Vaccine Candidate Met Primary Endpoints in Interim Analysis of its Phase 3 ENSEMBLE Trial. [cited 2021 Feb 2]. Available from: <https://www.jnj.com/johnson-johnson-announces-single-shot-janssen-covid-19-vaccine-candidate-met-primary-endpoints-in-interim-analysis-of-its-phase-3-ensemble-trial>.
- [6] Greaney AJ, Loes AN, Crawford KHD, et al [Preprint]. Comprehensive mapping of mutations to the SARS-CoV-2 receptor-binding domain that affect recognition by polyclonal human serum antibodies. *bioRxiv*: 2020.12.31.425021v1. 2021 [cited 2021 Feb 02]. Available from: <https://www.biorxiv.org/content/10.1101/2020.12.31.425021v1>.