

## BROAD-SPECTRUM THERAPEUTICS FOR VIRAL DISEASES: A MEDICAL COUNTERMEASURE PLATFORM FOR EMERGING THREATS

### Development Of Abn101, Interferon-beta Mutein, As A Broad-spectrum Antiviral Drug

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At the end of 2019, severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) was identified from the pneumonia patients in Wuhan, China. SARS-CoV-2 was rapidly spread to the world and the World Health Organization (WHO) declared coronavirus disease 2019 (COVID-19) pandemic. Since many types of vaccines were developed and released in relatively short period by global effort of governments, institutes, and pharmaceutical companies, over 60% of world population is fully vaccinated. However, new variants of SARS-CoV-2 were continuously emerged, which made previously developed vaccines less effective. Even though antiviral drugs, such as Remdesivir and Paxlovid, have been approved and used in the hospitals, the usage is limited to hospitalized patients with severe symptoms. In addition, it takes at least 1 year to develop and release vaccines and drugs for emerging viruses and their variants. Therefore, there are unmet needs to prophylactically and therapeutically treat high-risk population and COVID-19 patients with mild-to-moderate symptoms.

Despite natural IFN- $\beta$  showed superior antiviral and antiproliferative activity to IFN- $\alpha$ , IFN- $\beta$  has rarely been treated for infectious diseases, because poor physiochemical properties of IFN- $\beta$  made it difficult for mass production and development in various types of formulation. ABN101 is an interferon- $\beta$  (IFN- $\beta$ ) mutein with additional glycosylation, which improves physiochemical properties and its activity. The productivity was also improved not only by physiochemical properties of ABN101 but also by optimization of culture condition and purification process. With high activity and productivity, ABN101 has advantage to develop in different formulation.

In this study, we have tested whether ABN101 showed anti-viral activity against SARS-CoV-2. ABN101 had the therapeutic activity to prevent the replication of SARS-CoV-2 in vitro and in vivo. The growth of delta variant was also inhibited by in vitro ABN101 treatment prior to or after infection. In addition, we have investigated the inhibition against other respiratory viruses. The replications of influenza virus and respiratory syncytial virus were inhibited by ABN101 in vitro. Beside the respiratory RNA viruses, DNA virus infected in liver, hepatitis B virus, was also less replicated upon ABN101 treatment, compared to IFN- $\alpha$  treatment. In addition to therapeutic activity of ABN101 against respiratory viruses, we also observed to prevent viral replication in cells pre-treated with ABN101 before viral infection. Lately, Abion is developing dried powder of ABN101 for inhaler, which is beneficial for delivery of ABN101 directly into lung to treat respiratory virus infections. Efficacy study of ABN101 dried powder inhaler is planned with in monkey. Taken these results together, we conclude that ABN101 has great potential for broad-spectrum antiviral drug by prophylactic and therapeutic treatment in many types of formulations and can be utilized as immediate countermeasure against emerging pathogens.