Contribution ID: **265** Contribution code: **S1 Physics Innovation** Type: **Oral Presentation**

Competition of SARS-CoV-2 Delta and Omicron variants: A modeling study

Friday 24 June 2022 09:00 (15 minutes)

Throughout the COVID-19 pandemic, SARS-CoV-2 has been mutated several times into new variants. Some of them are classified as variants of concern (VOCs) by the World Health Organization, such as Alpha (B.1.1.7), Beta (B.1.351), Gamma (P.1), Delta (B.1.617.2), and Omicron (B.1.1.529). In this work, we developed an extended Susceptible-Exposed-Infection-Recovered model with cross-immunity between two co-circulating strains to investigate the transmission and competition of two VOCs, Delta and Omicron, that recently emerged in Thailand during the mid and late 2021. Here, the basic reproduction number of the Omicron variant was estimated higher than that of the Delta variant. The results showed that the Omicron variant has a significantly faster transmission, leading to a higher number of infected cases than the Delta variant. Moreover, lowering cross-immunity induced by primary infection also increases the re-infection rates. These results suggested that the capacity of transmission illustrated by the basic reproduction number and cross-immunity play an important role in determining the competition and equilibrium of transmission.

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Session Classification: S1 Physics Innovation

Track Classification: Physics Innovation