Serological Characterization of Drosophila S2 Cells-Expressed SARS-CoV-2 Spike Proteins

Tsuchiya, Hinano (School: Kalani High School)

Purpose: COVID-19 is a respiratory disease caused by the Severe Acute Respiratory Syndrome coronavirus 2 (SARS-CoV-2) which emerged globally in early 2020. The rapid spread of SARS-CoV-2 spike variants has lessened the effectiveness of current FDA-approved vaccines at preventing disease. This study aimed to evaluate the immunogenicity of a protein subunit COVID-19 vaccine by comparing the antibody response in heat-inactivated sera previously harvested from mice immunized with Drosophila S2-expressed spike protein from the prototypic Wuhan strain, B.1.351 (Beta), and B.1.617 (Delta) variants. Procedure: The full-length spike genes were inserted into a plasmid vector and transfected into Drosophila S2 cells. Stably-expressing cell lines were produced through serial passage under antibiotic selection and protein expression was monitored using western blotting. Spike-specific antibody titers from mice immunized with each spike variant and adjuvant B were measured using spectrally distinct antigen-coupled beads in a multiplexed microsphere immunoassay. Statistical significance was calculated using Prism software. Results: Seroconversion was observed in the sera of all immunized mice after the first dose (PD1) and an increase in antibody titers was observed after the second dose (PD2). The antibody response generated by one spike variant equally recognized the spike protein from other variants at both time points. Conclusions: The antibody responses generated by one spike variant elicited equally cross-reactive antibodies to other spike variants. This information suggests that a protein-based COVID-19 vaccine may be effective against SARS-CoV-2 variants. Further study, such as virus neutralization tests, is needed to fully evaluate vaccine efficacy.