Antibody titers against SARS-CoV-2 Omicron variant B.1.1.529 and subvariant BA.2 following vaccination

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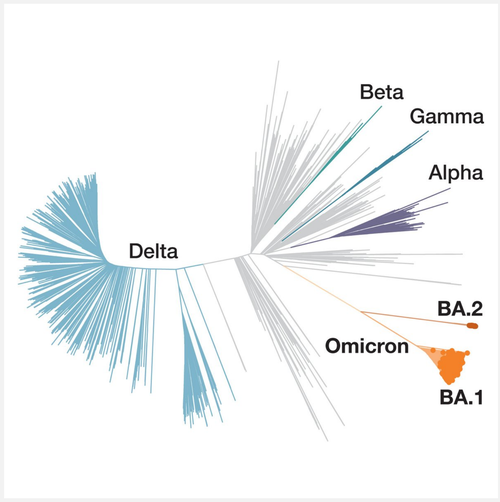
Introduction

Severe Acute Respiratory Syndrome Coronavirus 2 (SARS-CoV-2) was first described in human populations in Wuhan, China in December 2019. Despite global efforts, the virus quickly spread throughout the world and was declared a pandemic in March 2020. This led to a worldwide endeavor to develop a vaccine in order to provide immunity against the virus and slow its spread. The Pfizer vaccine was first approved for emergency use on December 31st, 2020, and was followed by several other vaccines, including the Moderna and Johnson & Johnson vaccines, in early 2021.



Omicron variant B.1.1.529 and subvariant BA.2 were first detected in late 2021. The Omicron variant quickly became the most widespread in the United States due to its increased transmissibility compared to previous SARS-CoV-2 variants. It is unknown if this increased infectivity of BA.2 is due to depressed antibody quantities following vaccination against wild-type virus or previous infection with other strains of SARS-CoV-2.

Methods

Subjects were enrolled in a natural history study of the immune response to COVID-19 infection. Informed consent was obtained, and 10 ml of blood was collected and tested for antibodies against COVID-19 proteins. Subjects were followed at 6-month intervals or after vaccination. A subset of 23 subjects were more closely examined after initial vaccination and follow-up boosting (2nd or 3rd dose depending on original vaccine received) comprising a total of 60 samples. In the post-vaccine and post-boost groups, samples were collected 27 ± 15 days (mean ± SD) after receiving the respective injection.

RBD antigen for either the B.1.1.529 and BA.2 strain were coated on 96 well Immulon-2 plates overnight at 4°C. The plates were washed with PBS, blocked, 2-fold dilutions of serum were added to the antigen coated plates and incubated at room temperature for 2 hours. The plates were washed and then coated with goat anti-human IgG linked to alkaline phosphatase for another 2 hours, developed, and read at 405nm absorbance. End-point dilution titers were determined and compared between wild type (WT, previously done), B.1.1.529, and BA.2 strains.

Data were analyzed using Microsoft Excel and GraphPad Prism 9.4.0.673 software.

Objective

The goal of this study is to determine antibody titers against the receptor binding domain (RBD) of strains B.1.1.529 and BA.2 following vaccination and/or infection with the virus and compare this data to that of the wild-type (WT) strain.

Antibody Response

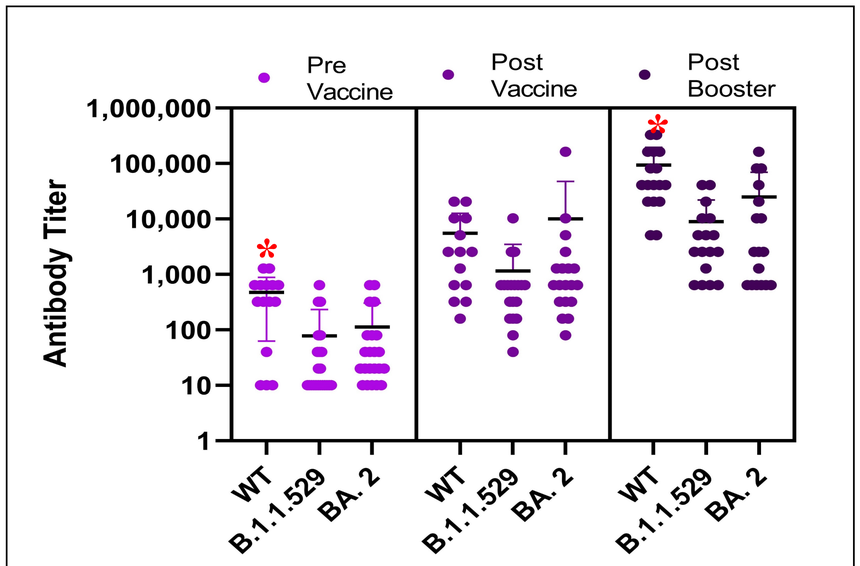


Figure 1. Antibody titers against RBD of WT, B..1.1.529, and BA.2 strains in samples collected before patients were vaccinated, after they completed their original vaccine series, and after they received a booster dose. * - denote statistically significant higher WT titers compared to the two omicron strains in the pre-vaccine and post-boost groups.

- ❑ Pre-vaccine: WT titers were significantly higher than B.1.1.529 and BA.2 strains (p<0.0001, p=0.0003). There was no significant difference between B.1.1.529 and BA.2 titers
- ❑ Post-vaccine: No significant difference in titer levels against all three strains (p=0.4935)
- ❑ Post-booster: WT titers were significantly higher than B.1.1.529 and BA.2 strains (p=0.0013, p=0.0101). There was no significant difference between B.1.1.529 and BA.2 titers (p=0.760)

Demographics

n	19
Age (mean +/- SD)	46.3 ± 13.2
Gender	
Male	9 (47.4%)
Female	10 (52.6%)
Vaccine Received	
Pfizer	18 (94.7%)
Johnson & Johnson	1 (5.3%)

Table 1. Patient demographics, 4 patients were excluded.

Results

Pre-Vaccine	Titer (mean ± SD)	n
WT	474 ± 411	15
B.1.1.529	78 ±154	22
BA.2	113 ± 192	22
Post-Vaccine		
WT	5,543 ± 7,163	14
B.1.1.529	1,160 ± 2,310	19
BA.2	10,076 ± 37,313	19
Post-Booster		
WT	93,344 ± 103,126	17
B.1.1.529	8,960 ± 13,057	17
BA.2	24,847 ± 44,792	17

Conclusions/Future Plans

- ❑Higher titers were seen against WT strain likely due to vaccines being developed against this strain.
- ❑A rise in titer against omicron was seen in those vaccinated, reaching statistical significance for B.1.1.529.
- ❑There was no difference in antibody response between the two omicron variants.
- ❑Boosting increased titer significantly for WT and B.1.1.529.
- ❑Small sample size limits further conclusions.
- ❑Vaccination against WT appears to provide some immunological protection against omicron.
- ❑Pseudo neutralization assays against omicron could provide additional insight.
- ❑Future plans are to measure the serological response to the omicron variant vaccine.

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