Comparison of the Antibody Response to COVID-19 Wild-type and its Variants in Naturally Infected versus Vaccinated Individuals

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Background

As the SARS-CoV-2 virus evolves, COVID-19 has led to an estimated total of 18 million; 1 in 4.0 reported infections. Genetic mutations have resulted in multiple lineages of variants for the SARS-CoV-2 virus. It is not known if Wuhan strains offer protection against these emerging variants. The current study utilizes a serum bank from those naturally infected with COVID-19 and a group of those vaccinated against the wild-type COVID-19 strains. These samples were compared with high contagions; Delta, mild contagions; Omicron, and subvariant BA.2 levels against the receptor binding domain (RBD) protein to determine the level of antibody response.

Hypothesis: Antibody responses will be stronger against wild type as compared to the variant. Antibody responses will be stronger in those vaccinated as compared to natural infection.

Objective: To determine whether infection or vaccinations against the Wuhan strain will offer protection against Delta, and Omicron.

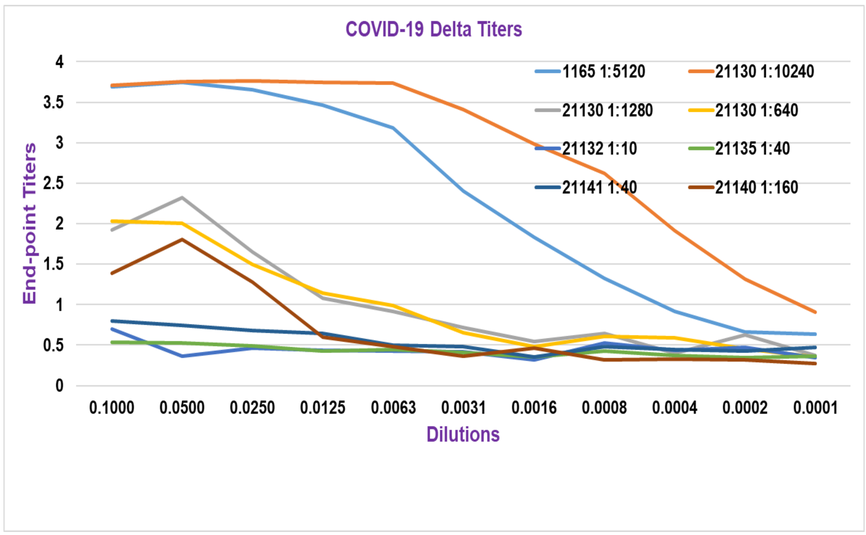
Desired Result: Responses will be statistically increased to the Wuhan strain as compared to the variants and higher in those vaccinated as compared to those naturally infected.

Demographic Table

	NATURALLY INFECTED	VACCINATED
RACE/ ETHNICITY		
HISPANIC	2 (14%)	1 (8%)
WHITE (Caucasian)	6 (50%)	10 (100%)
BLACK (African American)	6 (50%)	0 (0%)
AGE (YRS)		
30-50	6 (50%)	8 (67%)
51-70	6 (50%)	4 (33%)
SEX		
MALE	9 (75%)	6 (50%)
FEMALE	3 (25%)	6 (50%)

Results: Delta Titer Data

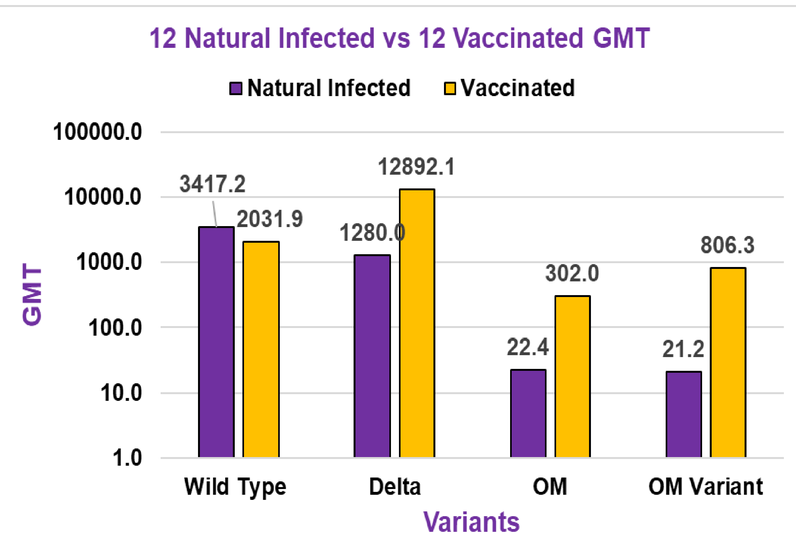
Figure 1: Dilution gradients for Delta variant serum titers.



An example of the dilution gradients for Delta variant serum titers. Serum sample 21130 had the highest endpoint dilution titer at 1:10,240.

Results: GMT of Variants

Figure 2: Statistical comparison between the Geometrical Mean Titers (GMT) of variants.



Both naturally infected and vaccinated individuals had statistically significant lower titers against the Omicron and Omicron variants as compared to the wild-type virus ($p<.001$).

Methods

ELISA Preparation: 96 well plates were coated with the various SARS-CoV-2 spike proteins (R & D Systems) in 10mL of carbonate buffer, incubated overnight at 4°C, washed and blocked for 1hr at room temperature; RT.

Dilution Titers 8x12:
Using a microchannel pipette, 24µL of each sample was added to 216µL of blocking buffer and injected into Wells A-H. 120 µL of excess blocking buffer was injected into Wells 2-11. 120 µL of the sample material was serially transferred from Wells 1-11. Well 12 contained the (+) and (-) controls; CTRLs. Titer material was transferred to the Serum plate and set at RT for 1 hr.

Second Antibody: The target protein is detected by Goat Anti Human IgG dilution at 1:1000 dilution. RT 1hr- Delta variant RT 2hr- Omicron variant).

Phosphate Substrate: For the greatest responses for 1hr, it was added to express yellow gradients.

Reading: Plates were read at OD 405nm and transferred to an Excel spreadsheet.

Conclusions

- There was a lower response to Omicron and Omicron variants in those with natural infection or vaccination against the Wuhan strain; the vaccine.
- The supported data implies that an Omicron vaccine should be developed for protection.
- In naturally infected cases, there is no difference between wild-type and delta, and the delta remains high in vaccinated cases.
- In most cases, those vaccinated had a higher response to all strains than those with natural infection.

References & Acknowledgments

Durier et al. Neutralizing antibodies against SARS-Cov-2 variants following mRNA booster vaccinations in adults older than 65 years. Sci Rep 12. 20373 (2022). 1-10.https://doi.org /10.1038/541598-022-24409-w.

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