Characterizing SARS-CoV-2 Vaccine and Post-infection Humoral and Soluble Immune Responses

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Introduction

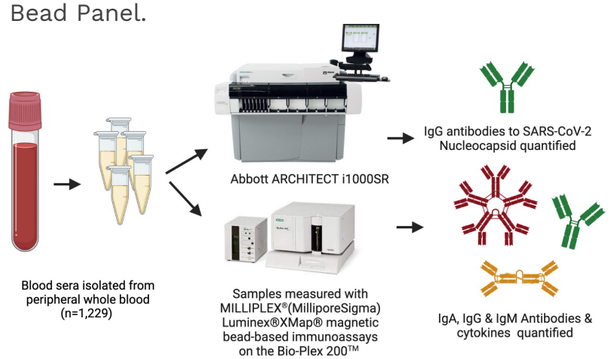
Monitoring severe-acute-coronavirus-disease-2(SARS-CoV-2) seroprevalence with well established antibody cut-offs is crucial to understanding a susceptible population and guiding appropriate public health response. Understanding the cytokine/chemokine responses pre- and post-SARS-CoV-2 exposure improves understanding of the viral immune response.

Objective

1) Determine positive cut-offs for MILLIPLEX ® Immunoglobulin(Ig)-A,G,M antibody immunoassays to four SARS-CoV-2 proteins and compare to literature;(2)Compare clinically validated and experimental immunoassays for SARS-CoV-2 nucleocapsid(N) protein and;(3)Compare cytokine/chemokine responses between unvaccinated, vaccinated, and recovered groups.

Methods

IgA, IgG, and IgM were evaluated in serum samples collected from Faculty of Health Sciences Students to spike-1(S1), spike-2(S2), receptor-binding-domain(RBD) and Nucleocapsid(N)-proteins were measured using MILLIPLEX® SARS-COV-2 immunoassays and Bio-Plex™ 200 analyzer. SARS-CoV-2 N proteins IgG were also quantified using the Abbott ARCHITECT i2000SR IgG SARS-CoV-2. Serum cytokines/chemokines were measured using the MILLIPLEX® 12-plex Human Cytokine/Chemokine/Growth Panel A Magnetic Bead Panel.



Results

Figure 1. Median fluorescence intensity (MFI) Positive cut-offs for MILLIPLEX® SARS-COV-2 IgA, IgG,and IgM immunoassays to SARS-CoV-2 spike-1(S1), spike-2(S2), nucleocapsid(N), and receptor-binding-domain(RBD) proteins. Calculated as the mean plus 1, 2 or 3 standard deviations (SD) from pre-COVID-19 serum samples(n=41). Values show are AVRG+1SD.

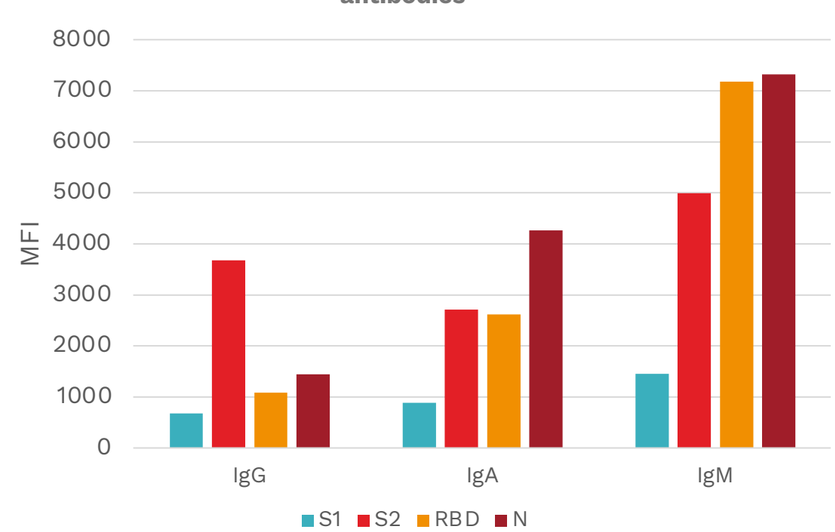


Figure 2. The Abbott (n=1235) and MILLIPLEX® (n=1247) IgG antibody to the SARS-CoV-2 N-protein were positively correlated (r^2 = 0.25, p<0.0001). Linear regression.

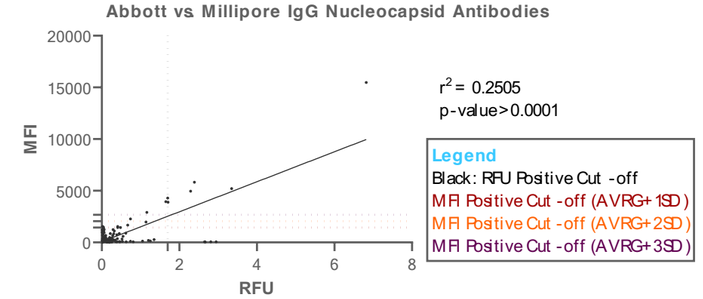
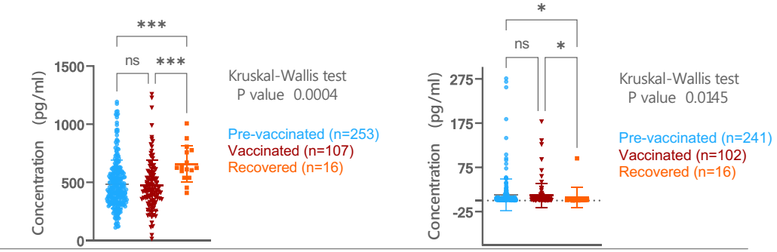


Figure 3. In recovered participants, **A)** Monocyte-Chemoattractant-Protein-1 (MCP-1) was significantly higher (p=0.0145), and **B)** Interleukin (IL)-4 was significantly lower compared to unvaccinated and vaccinated participants (p=0.0004). Mann-Whitney U test. **A)** MCP-1 **B)** IL-4



Conclusions

- MILLIPLEX® positive cut-off values are consistent with the literature.[1-5]
- The strong positive correlation between the Abbott and MILLIPLEX® IgG antibody for the SARS-CoV-2 N-protein suggests that the MILLIPLEX® is a robust immunoassay.
- Generally, cytokine and chemokine levels were similar between unvaccinated, vaccinated and recovered groups.

References

1. Colombini A et al. (2022) Exploratory assessment of serological tests to determine antibody titer against SARS-CoV-2: Appropriateness and limits. 2. Endothelial dysfunction contributes to severe COVID-19 in combination with dysregulated lymphocyte responses and cytokine networks 3. Fraley E, et al (2022) The Impact of Prior Infection and Age on Antibody Persistence After Severe Acute Respiratory Syndrome Coronavirus 2 Messenger RNA Vaccine. 4. Antibody Responses after a Single Dose of SARS-CoV-2 mRNA Vaccine | 5. JCI Insight - Consecutive BNT162b2 mRNA vaccination induces short-term epigenetic memory in innate immune cells.

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