

**CLINICAL RESEARCH IN INFECTIOUS DISEASES**

**IMMUNOGENICITY SUMMARY REPORT**

**for**

**DMID Protocol 20-0003:**

Phase I, Open-Label, Dose-Ranging Study of the Safety and  
Immunogenicity of 2019-nCoV Vaccine (mRNA-1273) in Healthy  
Adults

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## IMMUNOGENICITY SUMMARY REPORT

### DMID Protocol 20-0003

#### Phase I, Open-Label, Dose-Ranging Study of the Safety and Immunogenicity of 2019-nCoV Vaccine (mRNA-1273) in Healthy Adults

### 1. SUMMARY

DMID Protocol 20-0003 is designed to assess the safety, tolerability, and immunogenicity of 2 vaccinations of mRNA-1273 at 25 mcg, 100 mcg and 250 mcg. The immunogenicity data presented in this report focus on cumulative immune responses elicited in subjects aged 18 - 55 years, 56 - 70 years, and  $\geq 71$  years, through Day 57 post vaccination.

### 2. ELISA METHOD DESCRIPTION

Testing was performed using the automated ELISA method as detailed in VRC-VIP SOP 5500 *Automated ELISA on Integrated Automation System*. Quantification of IgG concentrations in serum/plasma were performed with a Beckman Biomek based automation platform. The IgG ELISA testing of clinical samples has been expanded to evaluate the presence of binding antibodies to either of two SARS-CoV-2 antigens, S-2P and RBD, each in singleplex format. The SARS-CoV-2 S-2P antigen (VRC-SARS-CoV-2 S-2P (15-1208)-3C-His8-Strep2x2) was described previously in the Immunogenicity Summary Report, 15 May 2020, SN 0014 and in the Clinical Information amendment for BB-IND 019635 SN 0017. Similar to the S-2P antigen, the SARS-CoV spike receptor binding domain (RBD - Ragon-SARS-CoV-2 S-RBD (319-529)-His8-SBP) antigen was produced, purified and generously provided by Dr. Dominic Esposito (Frederick National Laboratory for Cancer Research, NCI (see attached Protein Expression Laboratory Production Report for RBD).

Briefly, in singleplex format either SARS-CoV-2 S-2P at a working concentration of 2  $\mu\text{g/mL}$  (125  $\mu\text{L/well}$ ), or SARS-CoV-2 RBD antigen at a working concentration of 4  $\mu\text{g/mL}$  (125  $\mu\text{L/well}$ ) were coated onto Immulon 4HBX flat bottom plates overnight for 16 hours at 4° C. Antigen concentrations were defined during assay development and antigen lot titration. Plates were washed and blocked (3% milk TPBS) for 1 hour at room temperature. Duplicate serial 4-fold dilutions covering the range of 1:100 – 1:1638400 (8-dilution series) of the test sample (diluted in 1% milk in TPBS) were incubated at room temperature for 2 hours followed by Horseradish Peroxidase - labeled goat anti-human antibody detection (1 hour at room temperature) (Thermo Fisher Catalogue # A1881), and TMB substrate addition (15 minutes at room temperature; DAKO Catalogue # S1599) addition. Color development was stopped by addition of sulfuric acid and plates were read within 30 minutes at 450 nm and 650 nm via the Molecular Devices Paradigm plate reader. Each plate harbored a negative control (assay diluent), positive control and batches of 5 specimens run in duplicate. For SARS-CoV-2 S-2P, SARS-CoV-2 S2-specific monoclonal antibody S-652-112 (provided by VRC-VPL) spiked in NHS and/or pool of COVID-19 convalescent sera (VRC 200, NCT00067054) were used as a positive control. For SARS-CoV-2 RBD a pool of COVID-19 convalescent sera (VRC 200, NCT00067054) was included on each plate as positive control. All controls are trended over time. Endpoint Titer dilution from raw OD data was interpolated using the plate background OD + 10 STDEV by asymmetric sigmoidal 5-pl curve fit of the test sample. In the rare event, the asymmetric sigmoidal 5-pl curve failed to interpolate the endpoint titer, a sigmoidal

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4-pl curve was used for the analysis. Where the binding responses reached the upper limit of quantitation, the test samples were repeated in an 8-point, 4-fold dilution series starting at 1:5000 and the final reciprocal endpoint titer were reported. Area under the curve (AUC) was calculated with baseline anchored by the plate background OD + 10 STDEV. Data analysis was performed using Microsoft Excel and GraphPad Prism Version 8.0.

### 3. PLAQUE-REDUCTION NEUTRALIZATION TEST (PRNT) METHOD DESCRIPTION

Vaccine sera were incubated at 56°C for 45 min and manually diluted in gelatin saline (0.3% [wt/vol] gelatin in phosphate-buffered saline supplemented with CaCl<sub>2</sub> and MgCl<sub>2</sub>) to generate a 1:4 dilution of the original specimen, which served as a starting concentration for further serial log<sub>2</sub> dilutions in gelatin saline using an automated liquid handling system. The terminal serum concentration corresponded to 1/131,072 of the original. Antisera were combined with an equal volume of SARS-CoV-2 clinical isolate, SARS-CoV-2/human/USA/USA-WA1/2020 (GenBank: MN985325.1), in gelatin saline, producing an average final virus concentration of 580 plaque-forming units (PFU) per mL in each serum dilution ranging from final concentrations of 1/8 to 1/262,144 of the original. Virus/serum mixtures were incubated for 20 min at 37°C, followed by adsorption of 0.1 mL aliquots to each of two confluent Vero E6 cell monolayers in 10-cm<sup>2</sup> wells for 30 min at 37°C. Four aliquots of untreated (i.e., no serum) control virus were subjected to identical conditions. Cell monolayers were overlaid with Dulbecco's modified Eagle's medium containing 1% agar and incubated for 3 days at 37°C in humidified 5% CO<sub>2</sub>. Plaques were enumerated by direct visualization, and the average number of plaques in virus/serum (duplicate) and virus-only (quadruplicate) wells was used to calculate percent neutralization at each serum dilution according to the following formula: 1 - (ratio of mean number of plaques in the presence and absence of serum). Each specimen was tested in two independent assays performed at different times. Fractional neutralization from duplicate specimens was plotted as a function of log<sub>2</sub> serum dilution, and the dose-response relationship was fit to a five-parameter logistic regression model using the package nplr<sup>4</sup> in R<sup>5</sup>. PRNT<sub>80</sub> titers, expressed as the reciprocal of the highest serum dilution reducing virus infectivity by 80%, were calculated from resulting curves.

Convalescent sera were tested as described above with the following modifications: 1) serial log<sub>4</sub> serum dilutions to achieve final serum concentrations ranging from 1/4 to 1/524288 or 1/8 to 1/131072 of the original; 2) final virus concentration of 670 PFU per mL; 3) mean number of plaques in virus-only wells calculated from counts of four or 16 wells; 4) fractional neutralization from duplicate specimens plotted as a function of log<sub>4</sub> serum dilution; 5) duplicate specimen testing during the same work session.

Four dilutions of a COVID-19 convalescent serum control, spanning a 256-fold concentration range, were included with each performance of PRNT for longitudinal monitoring of assay stability. In addition, duplicate neutralization curves were inspected for agreement relative to expected deviations naturally arising from numerous interacting biological as well as technical variables inherent to PRNT. Unusually large disagreement between duplicate curves was resolved by additional testing.

Specimens exhibiting less than 80% inhibitory activity at the lowest dilution tested, 1:8, were assigned a titer of 4.

**PRNT Assay Optimization.** The Vanderbilt laboratory has extensively explored conditions for assay optimization and reproducibility, including identification of top-performing cell type and plating density, defining the incubation period that maximizes accuracy of plaque enumeration, and incorporation of robotic liquid handling for accurate and precise serum dilution. SARS-CoV-2 PRNT has been optimized as a fit-for-purpose research assay, permitting discrimination of day 1 signal from the day 43 neutralizing antibody response to vaccination

#### 4. PSEUDOVIRUS NEUTRALIZATION ASSAY (PsVNA) DESCRIPTION

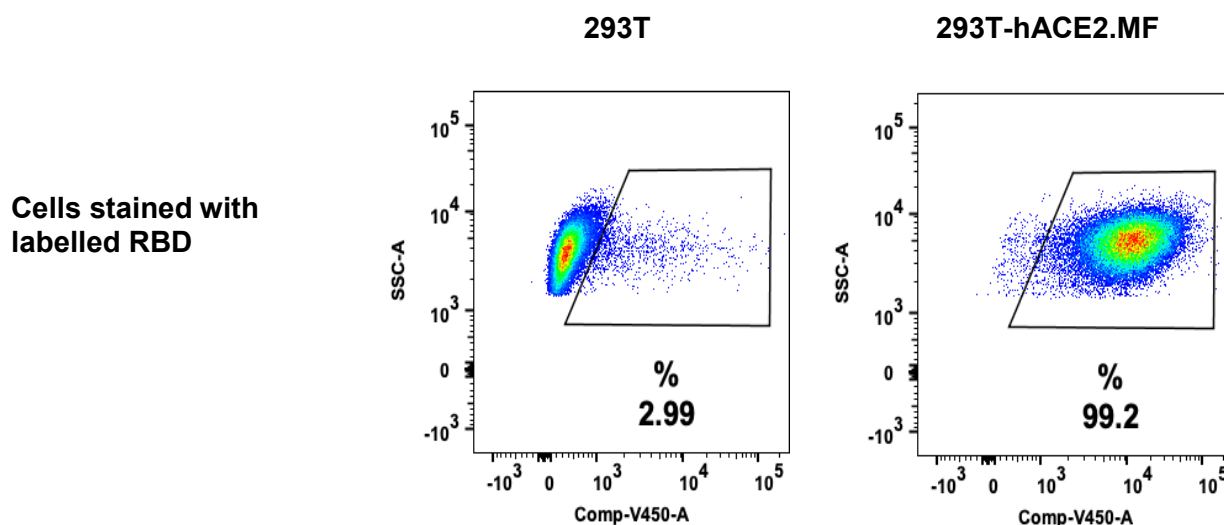
SARS-CoV-2 neutralizing antibodies in serum were measured in a pseudovirus neutralization assay (PsVNA), an exploratory readout. This is a research assay under development for the purpose of evaluating the samples in the clinical trial DMID Protocol number 20-0003.

This assay uses pseudotyped virus particles, also called pseudoviruses, in a single round of infection. It is performed according to the Human Immunology Core (HIC) SOP. Briefly: to produce SARS-CoV-2 pseudoviruses, an expression plasmid bearing codon-optimized CMV/R-SARS-CoV-2 full-length S (parental sequence Wuhan-1, Genbank #MN908947.3) is co-transfected into HEK293T/17 cells (ATCC # CRL-11268) with packaging plasmid pCMVDR8.2, luciferase reporter plasmid pHR' CMV-Luc, and a TMPRSS2 expression plasmid. Pseudoviruses are mixed with serial dilutions of sera or antibodies and then added to monolayers of ACE-2-overexpressing 293T cells in triplicate. Three days post infection, cells are lysed, luciferase is activated with the Luciferase Assay System (Promega), and relative light units (RLU) are measured at 570 nm on a Spectramax L luminometer (Molecular Devices). After subtraction of background RLU (uninfected cells), % neutralization is calculated as  $100 \times ((\text{virus only}) - (\text{virus plus antibody})) / (\text{virus only})$ . Virus only is measured as the average of 8 wells. Dose-response curves are generated with a 5-parameter nonlinear function, and titers reported as the serum dilution required to achieve 50% or 80% neutralization (50% inhibitory dilution (ID<sub>50</sub>) or 80% inhibitory dilution (ID<sub>80</sub>)). Assays are performed twice, in separate sessions, unless laboratory capacity constraints or sample volumes preclude a second run; and data are reported as the geometric mean of the values from both runs.

The lower limit of detection is the input dilution of serum, for example 1:20, and samples that do not neutralize at the 50% level are expressed as “less than” the input dilution, in this example <20. For statistical analysis and presentation, such ID<sub>50</sub> values are plotted or reported as half of the input dilution; in this example, <20 is plotted as 10. If duplicate assays return one value above 20 and one <20, the result is reported as the geometric mean of 10 and the positive assay; therefore, some values between 10 and 20 are reported.

The ACE-2-overexpressing 293T cells, here called 293T-hACE2.MF, were the kind gift of Michael Farzan (Department of Immunology and Microbiology, the Scripps Research Institute). ACE2 is a cellular receptor for SARS-CoV-2 (Hoffmann et al. *Cell* <https://doi.org/10.1016/j.cell.2020.02.052> (2020)). Upon receipt, the HIC laboratory established a research bank of cells comprised of 40 aliquots of passage 2 cells, stored in liquid nitrogen; these were tracked in our laboratory reagent database. After 9 weeks in culture, hACE2 expression was measured by flow cytometry; as seen in Figure 1, 99.2% of cells expressed hACE2.

**Figure 1. Cells Stained with Fluorescently Labelled RBD to Reveal hACE2 Expression**



Left, parental 293T cells; right, 293T-hACE2.MF.

Each assay setup always includes the same six controls: three pre-pandemic sera (collected in the time period 2009-May 2019 from participants in the clinical protocol VRC500, NCT01375530), two sera from SARS-CoV-2 convalescent donors (clinical protocol VRC200, NCT00067054), and one pool of convalescent sera (pooled from five donors from clinical protocol VRC200, NCT00067054). Sufficient volumes of these sera are on hand to serve as controls. Typically, an assay setup includes 18 or 21 assay plates, with 54 or 63 samples respectively, including the six controls.

After development of our SOP, and prior to running any clinical samples, an assay fit-for-purpose test was performed. This testing included three pools of mouse sera from mice vaccinated with SARS-CoV-2 S-2P protein (Kizzmekia Corbett, unpublished data), selected to cover a range of expected ID<sub>50</sub> and ID<sub>80</sub> values; and the pool of human convalescent sera described above. A total of nine assays were performed, by 6 operators subsequent to their training. Data are deemed acceptable if ID<sub>50</sub> and ID<sub>80</sub> are within 3-fold above or below the geometric mean of all runs, similar to the reported variability for HIV-1 Env-pseudovirus assay on TZM-bl cells (Sarzotti-Kelsoe, *Immunol Methods* 409, 131-146, 2014). **Table 1** shows the data from the fit-for-purpose test. It was observed that, for all but 2 of the 36 data points, ID<sub>50</sub> and ID<sub>80</sub> values were within three-fold of the geometric mean for the sample; and in most cases, data were within 2-fold of the geometric mean.

To monitor the assay performance over time, the values for the positive and negative controls are monitored in each run. The control data from 12 assays performed with clinical samples are shown in **Table 2**. The highest and lowest values for each sample observed varied no more than 2-fold higher or lower than the geometric mean. Thus, the assay performance with the clinical samples was improved over that observed in the fit-for-purpose test.

Subsequent to the start of the assays, the SOP was modified to allow the use of the D614G variant virus. This single amino acid mutation in Spike is now present in sequences from most of the cases worldwide,

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and appears to be more sensitive to neutralization by convalescent serum (ref: Korber et al Cell. 2020 Aug 20;182(4):812-827.e19). To make the pseudoviruses with D614G spike, we used a modified plasmid (gift of David Montefiori): our plasmid bearing codon-optimized CMV/R-SARS-CoV-2 full-length S (parental sequence Wuhan-1, Genbank #MN908947.3) was subjected to site-directed mutagenesis to provide the D614G amino acid change. The plasmid was sequenced to ensure that this mutation was present and no others. No other aspects of the assay were changed.

**Table 1. ID<sub>50</sub> and ID<sub>80</sub> Values for Assay Controls in 9 Runs of SARS-CoV-2 Pseudovirus Neutralization Assay during Fit-for-Purpose Testing**

<b>ID50</b>										
<b>Sample</b>	<b>1</b>	<b>2</b>	<b>3</b>	<b>4</b>	<b>5</b>	<b>6</b>	<b>7</b>	<b>8</b>	<b>9</b>	<b>geomean</b>
nCoV mouse serum pool #1	913	1427	721	552	1070	312	531	642	586	<b>688</b>
nCoV mouse serum pool #2	236	383	225	142	111	68	130	145	182	<b>162</b>
nCoV mouse serum pool #3	168	212	190	110	83	108	148	148	115	<b>137</b>
Human pool SARS-COV2-POS-1	213	192	285	198	271	110	379	156	152	<b>204</b>
<b>ID80</b>										
<b>Sample</b>	<b>1</b>	<b>2</b>	<b>3</b>	<b>4</b>	<b>5</b>	<b>6</b>	<b>7</b>	<b>8</b>	<b>9</b>	<b>geomean</b>
nCoV mouse serum pool #1	518	491	330	196	296	118	249	287	244	<b>278</b>
nCoV mouse serum pool #2	85	199	95	100	20	20	64	72	77	<b>66</b>
nCoV mouse serum pool #3	135	121	78	65	44	20	95	112	68	<b>72</b>
Human pool SARS-COV2-POS-1	106	76	66	64	56	46	62	84	88	<b>70</b>

**Table 2. ID<sub>50</sub> and ID<sub>80</sub> Values for Assay Controls in 12 Runs of SARS-CoV-2 Pseudovirus Neutralization Assay during Testing of Clinical Samples**

ID <sub>50</sub>													
Run #													
Sample	1	2	3	4	5	6	7	8	9	10	11	12	geomean
Pre-pandemic Serum #1	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	n/a
Pre-pandemic Serum #2	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	n/a
Pre-pandemic Serum #3	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	n/a
Human pool SARS-COV2-POS-1	321	117	129	219	277	233	187	190	160	242	159	167	<b>192</b>
Convalescent Serum #1	266	98	99	125	185	140	145	127	96	155	95	106	<b>130</b>
Convalescent Serum #2	3554	5057	1826	6055	4839	2591	3976	4691	4298	3820	2272	3670	<b>3689</b>

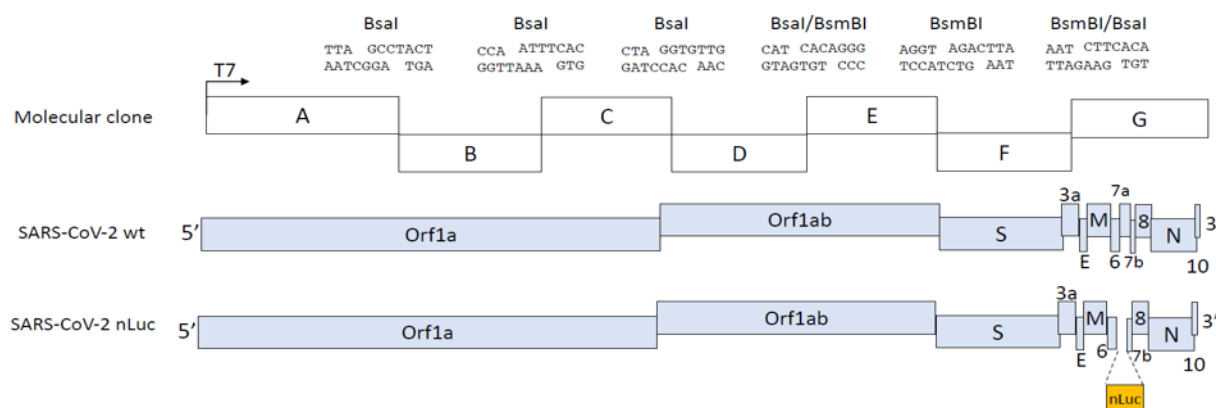
ID <sub>80</sub>													
Run #													
Sample	1	2	3	4	5	6	7	8	9	10	11	12	geomean
Pre-pandemic Serum #1	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	n/a
Pre-pandemic Serum #2	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	n/a
Pre-pandemic Serum #3	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	n/a
Human pool SARS-COV2-POS-1	84	31	59	59	54	76	61	59	41	91	46	46	<b>56</b>
Convalescent Serum #1	37	32	32	30	49	78	34	41	24	72	62	32	<b>41</b>
Convalescent Serum #2	1241	1103	1037	1797	2071	970	1417	1338	1534	716	1007	1137	<b>1232</b>

## 5. SARS-CoV-2 nLuc HIGH THROUGHPUT NEUTRALIZATION ASSAY DESCRIPTION

The SARS-CoV-2 nLuc High Throughput Neutralization Assay (HTNA) is a research assay under development to serve as a rapid, high-throughput live virus neutralization assay for evaluation of the neutralizing antibody response elicited by the mRNA-1273 investigational vaccine in the DMID 20-0003 Phase 1 clinical trial. The assay is performed in biosafety level 3 containment.

The SARS-CoV-2 recombinant virus, SARS-CoV-2-Seattle nLuc, which encodes for nLuciferase (nLuc) as an assay readout, was designed to express GFP-nLuc<sup>1</sup> (**Figure 2**) and recovered via reverse genetics as described previously<sup>2,3</sup>, and is derived from a molecular clone based on the Seattle, Washington isolate (GenBank:MN985325)<sup>4</sup>. SARS-CoV-2-Seattle nLuc was titrated in Vero E6 cells (ATCC® CRL-1586; provided by USAMRIID) to obtain a relative light units (RLU) signal of at least >100X the cell only control background.

**Figure 2. Genome organization of the SARS-CoV-2-Seattle nLuc recombinant virus**



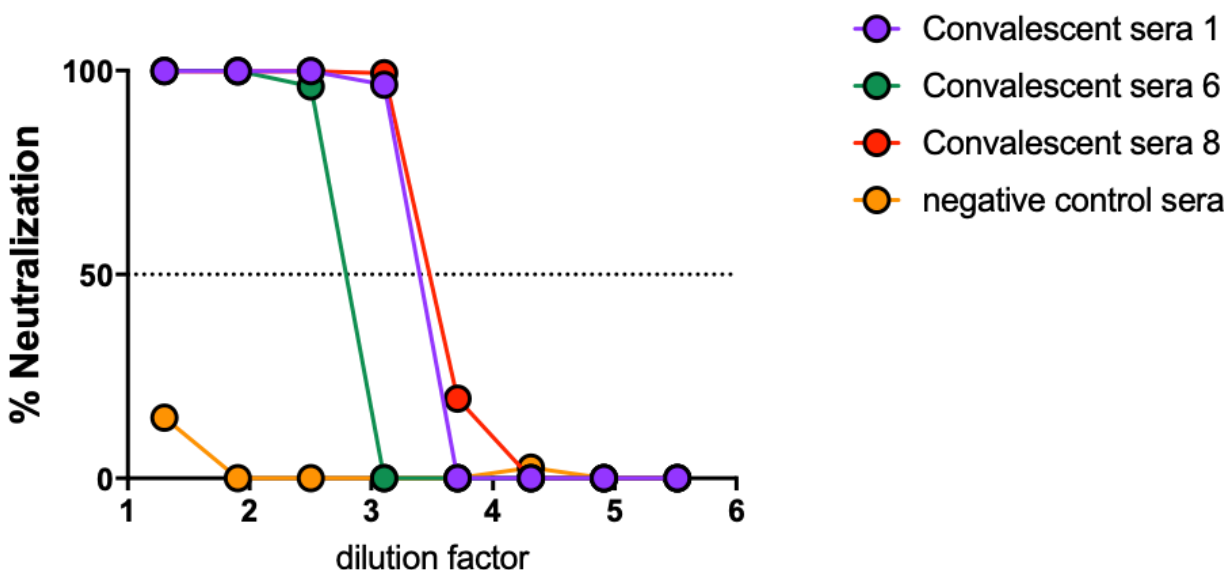
The GFP-nLuc expression cassette was inserted into the SARS-CoV-2 genome, replacing ORF7<sup>1</sup>.

For the neutralization assay, Vero E6 cells in growth medium (DMEM, 10% FetalClone II (Hyclone), 1% penicillin streptomycin, 1% Antibiotic Antimycotic) were plated at  $2 \times 10^4$  cells per well the day prior in clear bottom, black-walled 96 well plates. Clinical serum samples were heat-inactivated at 56°C for 30 minutes and were serially diluted 3-fold at a starting dilution of 1:20, with up to 8 dilution points in growth medium, on a separate 96 well plate ('serum dilution plate'). Sixty microliters of SARS-CoV-2-Seattle nLuc working stock (1500 plaque forming units (PFU) per mL, in growth medium) was plated on a separate 96 well plate ('serum/virus incubation plate'), and an equal volume of serially diluted sera was transferred from the serum dilution plate to the serum/virus incubation plate. Well contents were mixed, and antibody-virus complexes were incubated at 37°C with 5% CO<sub>2</sub> for 1 hour. Following incubation, growth medium was removed from the plated Vero E6 cells and 100 µL of virus-antibody dilution complexes from the serum/virus incubation plate was transferred to the cells in duplicate. Virus-only and cell-only controls were included in each neutralization assay plate. Plates were incubated at 37°C with 5% CO<sub>2</sub> for 48 hours. After the 48-hour incubation, plates were equilibrated to room temperature for 10 minutes, cells were lysed with the Nano-Glo Luciferase Reagent (Nano-Glo Luciferase System, Promega, Cat #N1130) for 2 min at room temperature, and luciferase activity was measured on a Spectramax M3 plate reader with the standard CellTiter Glo program. SARS-CoV-2-Seattle nLuc neutralization titers were defined as the sample dilution at which a 50% reduction in RLU was observed relative to the average of the virus control wells. GraphPad Prism was used to calculate the ID<sub>50</sub> based on a sigmoidal dose-response curve.

To demonstrate the dynamic range and specificity of the SARS-CoV-2 nLuc assay, we evaluated 9 serum samples obtained from COVID-19 survivors, who had cleared infection, under UNC IRB 20-1141 which was compliant with institutional IRB oversight. Starting at a 1:20 dilution with subsequent serial 3-fold dilutions, the SARS-CoV-2-Seattle nLuc assay afforded discrimination of a 2.5 log range of neutralization titers, with ID<sub>50</sub> values ranging from 28.2 to 3380, in this small subset of human sera samples. Importantly, negative control sera (collected under UNC IRB-approved protocol 08-0895 for collection of sera from individuals that have travelled to areas that are endemic for flaviviruses) gave values of <20 under identical conditions of treatment (**Figure 3**).

**Figure 3. Human COVID-19 convalescent sera tested in the SARS-CoV-2 nLuc HTNA**

Convalescent sera obtained from discharged COVID-19 patients under an IRB approved protocol were tested for neutralizing activity using the SARS-CoV-2 nLuc HTNA. The sera were serially diluted 3-fold, mixed with virus, and ID<sub>50</sub> values were calculated using a sigmoidal dose-response curve in Graph Pad Prism. % neutralization is plotted against log dilution factor. The neutralization curves for representative sera are shown as examples in the graph. ID<sub>50</sub> neutralization titers for the full set of convalescent sera are provided in the lower panel.



COVID-19 human sera										
	Convalescent sera 1	Convalescent sera 2	Convalescent sera 3	Convalescent sera 4	Convalescent sera 5	Convalescent sera 6	Convalescent sera 7	Convalescent sera 8	Convalescent sera 9	Negative control sera
Sera ID <sub>50</sub>	1689	169.5	28.21	403.7	118.2	415.2	1609	3380	1250	<20

These data demonstrate a range of neutralizing titers from natural infection, demonstrate the range and sensitivity of the assay, and provide a high-throughput assay for clinical testing.

Data for the nLuc HTNA for cohorts 1 and 2 were derived from a 3-fold dilution series at a starting dilution of 1:20. During optimization, the assay was further modified using a 2-fold-dilution series. Data for the nLuc HTNA for cohorts 5 and 8 were derived from a 2-fold dilution series at a starting dilution of 1:40. Data for the convalescent sera provided by the VRC were derived from a 2-fold dilution series at a starting dilution of 1:50. The lower limit of detection is the input dilution of serum, for example 1:20, and samples that do not neutralize at the 50% level are expressed as “less than” the input dilution, in this example <20. For statistical analysis and presentation, such ID<sub>50</sub> values are plotted or reported as half of the input dilution; in this example, <20 is plotted as 10.

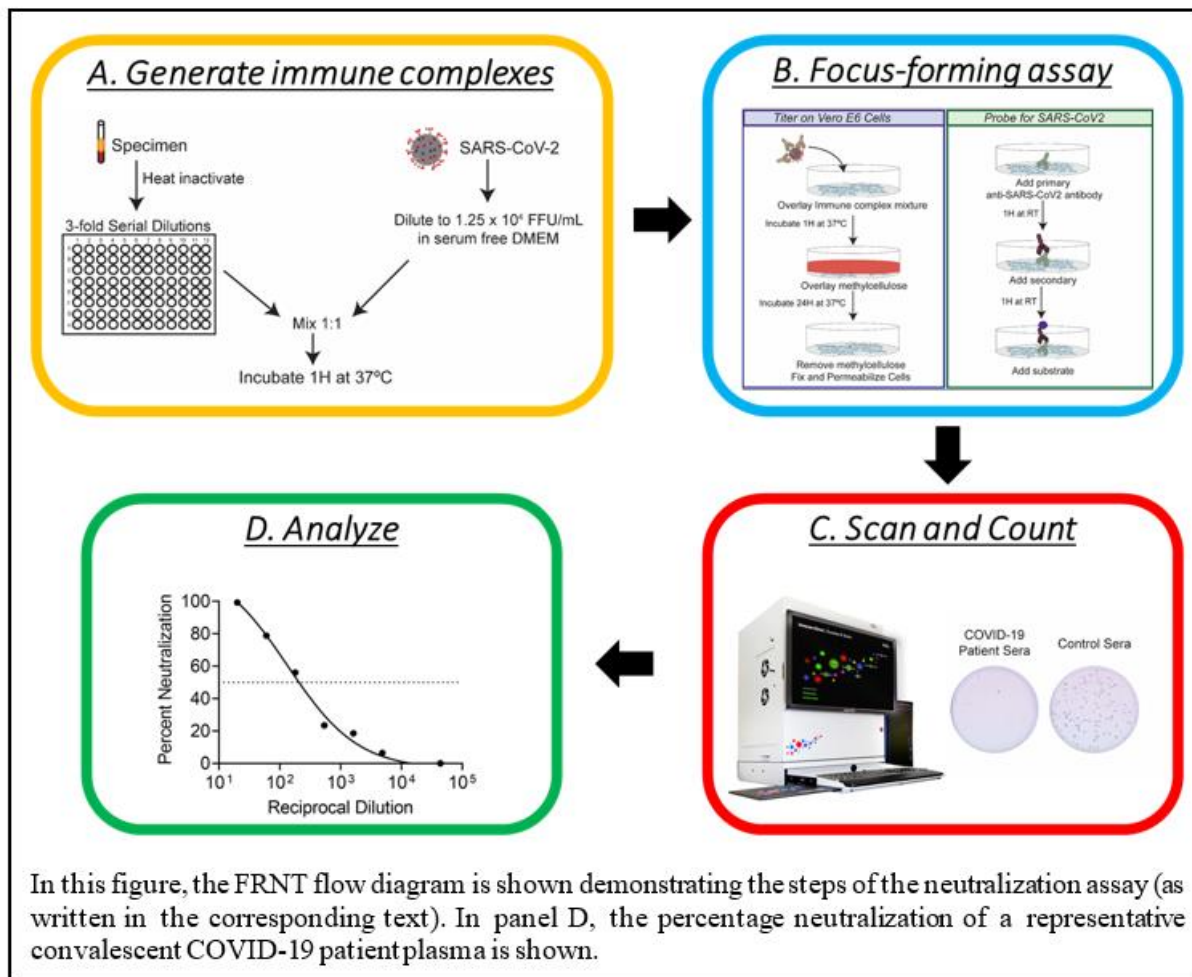
The nLuc HTNA was evaluated in concert with different virus neutralization assays (PRNT, pseudovirus neutralization assay, and nLuciferase HTNA) to identify a high-throughput SARS-CoV-2 virus neutralization assay for evaluation of the phase 1 sera from all cohorts.

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## 6. FOCUS-REDUCTION NEUTRALIZATION TEST (FRNT) METHOD DESCRIPTION

The ultimate functional test for evaluating immunity following SARS-CoV-2 exposure or determining the potential efficacy of a vaccine candidate is through a virus neutralization assay. A PRNT assay is a classic method for determining the neutralization capacity of a plasma sample against coronavirus infection/vaccination<sup>1</sup>. However, this assay is labor-intensive, costly, time-consuming and low throughput. To further increase throughput, we recently developed an FRNT assay, which involves using an infectious clone (ic) derived wild type SARS-CoV-2 virus (strain USA-WA1/2020; GenBank: MN985325.1)<sup>2</sup>. In this assay, a patient serum or plasma sample is incubated with icSARS-CoV-2 followed by infection of Vero E6 cells<sup>3</sup>. The neutralization potency of the serum/plasma sample is measured by the reduction in virally infected foci. The FRNT assay allows for rapid turnaround time (<24 hours), and increased throughput (~750 samples/week). The workflow is shown in **Figure 4**.

**Figure 4. Schematic of the FRNT assay**



### Protocol:

Prior to the day of the neutralization test, Vero E6 cells (ATCC C1008 Cat# ATCC CRL-1586) were seeded at  $2.5 \times 10^4$  cells/well. The Vero E6 cells were initially passaged eight times and a bank of cells were frozen down. Vero E6 cells are used until passage 25. COVID-19 patient specimen or vaccinee specimen were incubated at 56°C for 30 min to inactivate complement factors. The specimen can be either serum or plasma. Samples were manually diluted in duplicate in serum-free Dulbecco's modified Eagle's medium (DMEM) to generate a 1:10 dilution of the original specimen, which served as a starting concentration for further serial dilutions in DMEM. Three-fold serial dilutions (8-point) were performed and correspond to the following dilutions: 1/10, 1/30, 1/90, 1/270, 1/810, 1/2430, 1/7290, and 1/21,870. An equal volume of icSARS-CoV-2 virus<sup>2</sup> (strain USA-WA1/2020; GenBank: MN985325.1) was added to the diluted specimen in DMEM, producing an average final virus concentration of 1,000 focus-forming units per mL in each specimen dilution ranging from final concentrations of 1/20 to 1/43,740 of the original. Virus/specimen mixtures were incubated for 60 min at 37°C with 5% CO<sub>2</sub> (85-95% humidity), followed by adsorption of 0.1 mL onto a confluent Vero E6 cell monolayer in a well of a 96-well plate for

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60 min at 37°C with 5% CO<sub>2</sub> (85-95% humidity). Virus only controls were included in each batch of neutralization assays, where columns within a 96-well plate were incubated with DMEM containing either no specimen or a negative control specimen (healthy control or pre-pandemic). After 60 min, the inoculum was removed and replaced with 100 µL of DMEM containing 0.85% methylcellulose and incubated for 24-30 hours at 37°C with 5% CO<sub>2</sub> (85-95% humidity). Methylcellulose was removed and cells washed 3 times with 150 µl Phosphate-buffered saline (PBS) followed by fixation with 100 µL of 2% paraformaldehyde in PBS for 30 min at room temperature (RT). The 2% PFA is removed and cells washed twice with 150 µL PBS. The cells were then washed once with 150 µL of PBS followed by permeabilization using 100 µl 0.1% saponin and 0.1% Bovine Serum Albumin (Perm/Wash) for 30 min at RT. The cells were then incubated with a cross-reactive biotinylated SARS-CoV anti-RBD antibody (monoclonal CR3022) at a dilution of 1:10,000 for 1 hour at room temperature or overnight at 4°C (12-18 hours; antibody is diluted in Perm/Wash). Cells were washed four times with 150 µL of PBS and incubated with Avidin-HRP (diluted in Perm/Wash) at 1:2000 for 1 hour at RT. Cells were washed four times with 150 µL of PBS and incubated with TrueBlue substrate for 30 min at RT. Cells were washed two times with 150 µL of PBS and lightly dried.

**Table 3. Viridot FRNT settings**

Parameter Setting	Setting
Step 1. Light Setting	Saturation
Step 2. Blur image	3
Step 3.1. Cut well edges	30
Step 4.1. Apply contrast to image based on background intensity	3
Step 4.2. Apply contrast to image based on plaque intensity	2
Step 5.1. Select difference in pixel value to distinguish plaque from background	0.09
Step 5.2. Select size (in pixels) of the window for applying the thresholding algorithm to the image	40
Step 6. Dilate your plaques to ensure they are counted as single plaques	8
Step 7. Cut overlapping plaques so they are counted separately	3
Step 8.1. Define the minimum pixel size to count as a plaque	30
Step 8.2. Define the maximum pixel size to count as a plaque	3000

Foci were visualized using an ELISPOT reader (CTL ImmunoSpot S6 Universal Analyzer) using visible light, and enumerated using Viridot<sup>4</sup>. The plates were visualized under the ELISPOT clear plate configuration using the visible light from the bottom of the plate (auto-exposure setting). The Lens control, Range and Precision are set to default settings and the Zoom is set to 1.6X. Once the images are acquired, the CTL extension on the filenames are changed to .TIF using Bulk Rename Utility (version 3.3.1.0). The foci in each well were enumerated using Viridot<sup>4</sup>. Viridot is an R-based software with a user interface in shiny that can enumerate foci. For the FRNT assay, we use the “saturation” light setting and adjusted the parameters as described in **Table 3**. The average number of foci in each virus/serum sample (duplicate) at the highest dilution were used to calculate the neutralization curves: 1 - (ratio of mean number of foci in the presence of sera and foci at the highest dilution of respective sera serum). The FRNT<sub>50</sub> titer is interpolated using a 4-parameter nonlinear regression in GraphPadPrism 8.4.3. Each specimen was tested in two independent assays performed at different times. To determine the final titer, the geometric mean titer is calculated using the titers from each of the duplicates from the two

independent runs. Specimens were retested if the geometric mean titers from the two independent assays displayed greater than a 3-fold difference in neutralization titers. In this case, the assay is run a third time. Two independent assays that fall within a 3-fold difference are used to calculate the final titer. The final titer is reported as the reciprocal dilution which neutralizes 50% of SARS-CoV-2.

**Generation of CR3022 monoclonal antibody.** The SARS-CoV S glycoprotein specific antibody CR3022 was generated recombinantly using previously reported heavy and light variable domain sequences deposited in GenBank under accession numbers DQ168569 and DQ168570<sup>5</sup>. Antibody variable domain gene sequences were synthesized by IDT and cloned into human IgG1 and human kappa expression vectors as previously described<sup>6</sup>. Antibodies were produced in Expi293F cells (ThermoFisher Scientific Cat# A14527) according to the manufacturer's recommendations by co-transfecting heavy and light chain plasmids at a ratio of 1:1.5. Antibodies were purified using rProtein A Sepharose Fast Flow antibody purification resin (GE Healthcare Cat# GE17-1279-03) and buffer exchanged into PBS before use. Biotinylated versions of CR3022 used in viral neutralization assays were produced by combining the antibody with a 20 molar excess of EZ-Link NHS-PEG4-Biotin (ThermoFisher Scientific Cat# 21330) for 1 hour at room temperature. Reactions were stopped by adding Tris pH 8 to a final concentration of 10 mM. The biotinylated antibody was then buffer exchanged >1000X into PBS using a 10 kDa protein spin-concentrator (Amicon).

**FRNT Assay Optimization.** The Emory laboratory is currently exploring conditions for assay optimization and reproducibility, including cell plating density, defining the incubation period that maximizes the accuracy of foci enumeration, viral infection titers, second operator intermediate precision, repeatability, and intermediate precision, quantitation limit/sensitivity, and specificity. We have tested over 50 combined healthy control samples that were taken either before or after the COVID-19 pandemic<sup>7</sup>. Some of the samples were plasma samples that were collected prior to the COVID-19 pandemic and others were samples collected by a collaborator as part of their routine analysis of evaluating Cholera or Dengue infection in humans (all of these samples that were tested are de-identified). The samples did not show any neutralization activation against SARS-CoV-2 at a titer of 1:50, which represents the lowest dilution tested in this study<sup>7</sup>. The SARS-CoV-2 FRNT assay is a fit-for-purpose research assay. The intent of evaluating the FRNT assay was to identify a high-throughput SARS-CoV-2 virus neutralization assay for evaluation of the phase 1 sera from all cohorts, which involved demonstration of concordance between the different virus neutralization assays (PRNT, pseudovirus neutralization assay, and nLuciferase HTNA).

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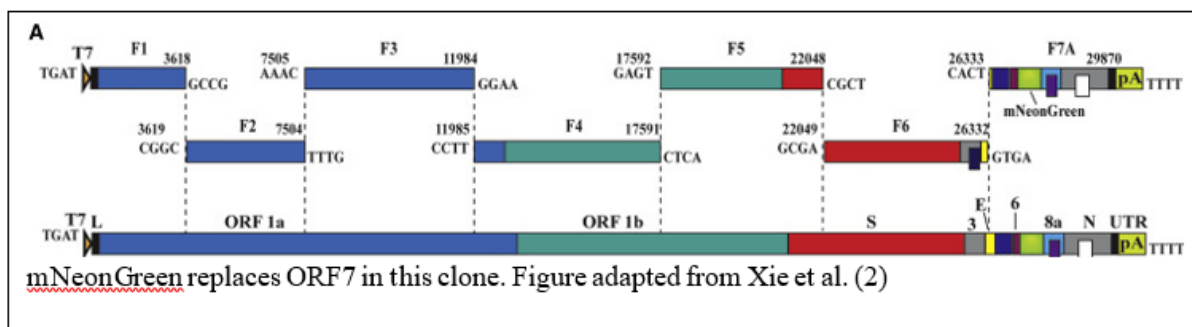
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## 7. FOCUS-REDUCTION NEUTRALIZATION TEST mNEONGREEN (FRNT-MNG) METHOD DESCRIPTION

The FRNT-mNG assay involves using a recombinant infectious clone (ic) SARS-CoV-2-mNeonGreen (mNG) live virus (**Figure 5**)<sup>1</sup>. In this assay, a patient serum or plasma sample is incubated with icSARS-CoV-2-mNG followed by infection of Vero E6 cells. The neutralization potency of the serum/plasma sample is measured by the reduction in fluorescent foci. The FRNT-mNG assay allows for fewer post-processing steps (no antibody cell staining), rapid turnaround time (<24 hours), and increased throughput (~750 samples/week). The workflow is described in **Figure 6**.

**Figure 5. Schematic of icSARS-CoV-2-mNG**



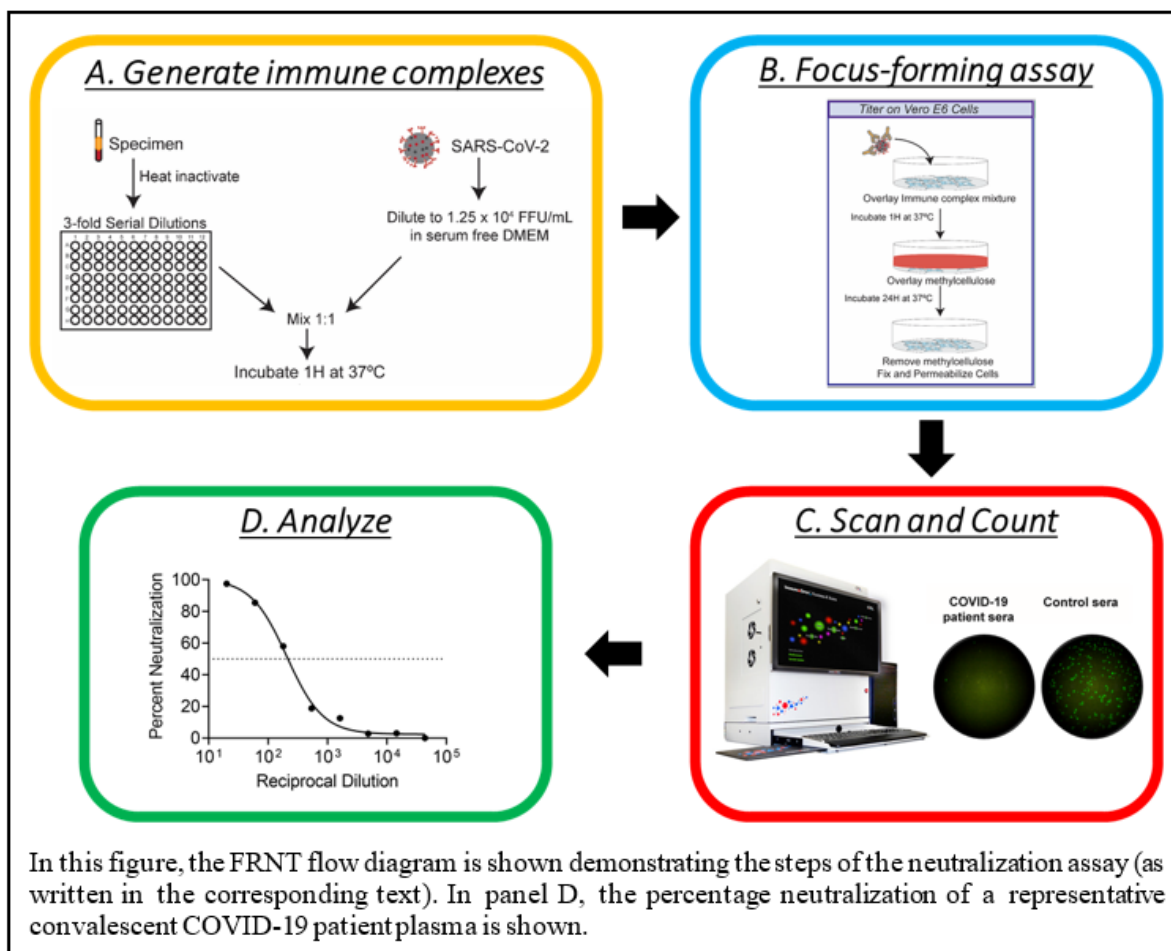
### Protocol:

Prior to the day of the neutralization test, Vero E6 cells (ATCC C1008 Cat# ATCC CRL-1586) were seeded at  $2.5 \times 10^4$  cells/well. The Vero E6 cells were initially passaged eight times, and a bank of cells was frozen down. Vero E6 cells are used until passage 25. COVID-19 vaccinee or patient specimens were incubated at 56°C for 30 min to inactivate complement factors. The specimen can be either serum or plasma. Samples were manually diluted in duplicate in serum-free Dulbecco's modified Eagle's medium (DMEM) to generate a 1:10 dilution of the original specimen, which served as a starting concentration for further serial dilutions in DMEM. Three-fold serial dilutions (8-point) were performed and correspond to the following dilutions: 1/10, 1/30, 1/90, 1/270, 1/810, 1/2430, 1/7290, and 1/21,870. An equal volume of icSARS-CoV-2-mNG virus<sup>1</sup> (strain USA-WA1/2020; GenBank: MN985325.1; **Figure 5**) was added to the diluted specimen in DMEM, producing an average final virus concentration of 1,667 GFP focus forming units per mL in each serum dilution ranging from final concentrations of 1/20 to 1/43,740 of the original. Virus/specimen mixtures were incubated for 60 min at 37°C with 5% CO<sub>2</sub> (85-95% humidity), followed by adsorption of 0.1 ml onto a confluent Vero E6 cell monolayer in a well of a 96-well plate for 60 min at 37°C with 5% CO<sub>2</sub> (85-95% humidity). Virus only controls were included in each batch of neutralization assays, wherein a column within a 96-well plate was incubated with DMEM containing no

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sera or a negative control specimen (healthy control or pre-pandemic). After 60 min, the inoculum was removed and replaced with 100  $\mu$ l DMEM containing 0.85% methylcellulose and incubated for 24-30 hours at 37°C with 5% CO<sub>2</sub> (85-95% humidity). Methylcellulose was removed, and cells washed 3 times with 150  $\mu$ l Phosphate-buffered saline (PBS) followed by fixation with 100  $\mu$ l of 2% paraformaldehyde in PBS for 30 min at room temperature (RT). The 2% PFA is removed and cells washed twice with 150  $\mu$ l PBS. A final volume of 35  $\mu$ l PBS is added to each well for visualization (**Figure 6**, blue panel). Foci were visualized using an ELISPOT reader (CTL ImmunoSpot S6 Universal Analyzer) under a FITC channel (**Figure 6**, red panel).

**Figure 6. Schematic of the FRNT-mNG assay**

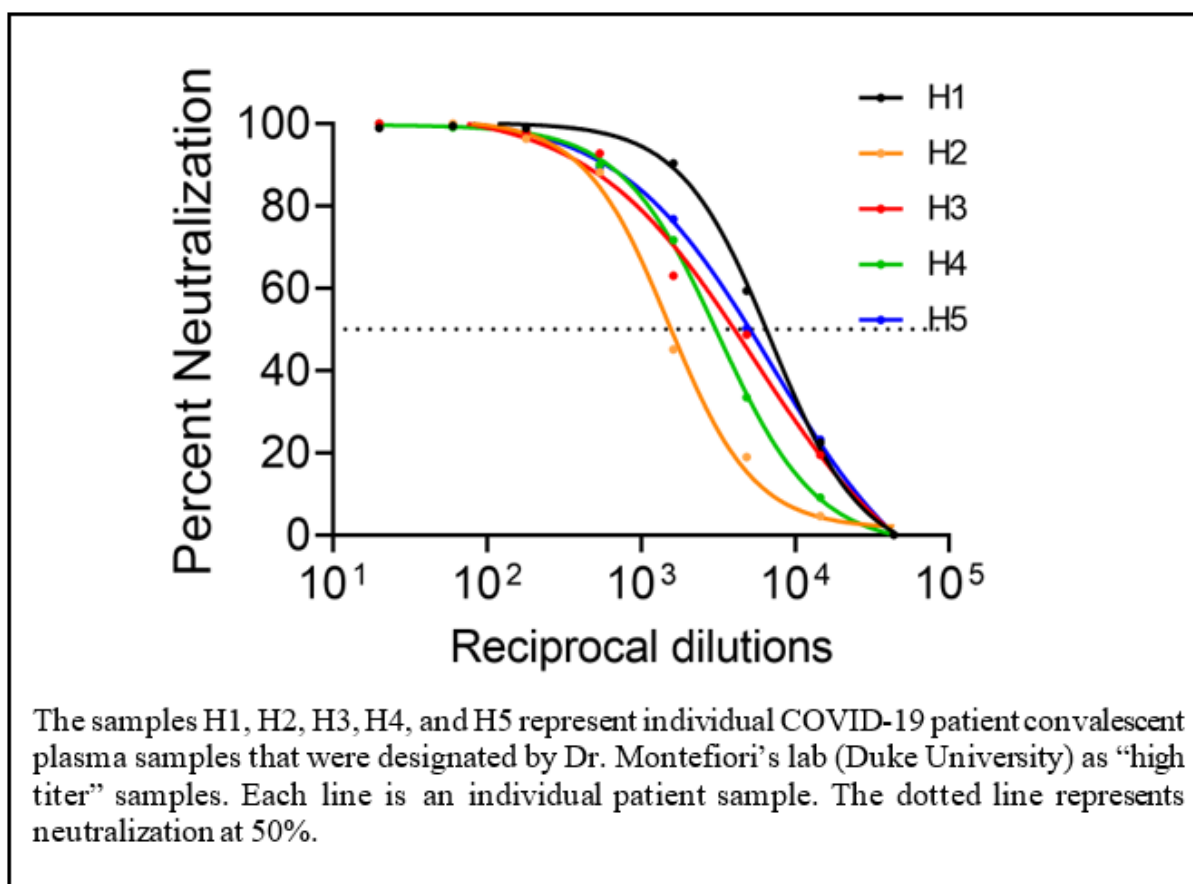


Plates can be visualized immediately following fixation, or stored at 4°C for up to 3 days. The plates were visualized under the Fluorospot plate configuration using an excitation band of 480 nm, gain setting of 28.0 and time setting of 2800. The Lens control is set to the position at 6196, Range at 600, Precision at 10, and Zoom at 1.8X. Once the images are acquired, the CTL extension on the filenames is changed to .TIF using Bulk Rename Utility (version 3.3.1.0). The foci in each well were enumerated using Viridot (version 1.0)<sup>2</sup>. Viridot is an R-based software with a user interface in shiny that can enumerate foci. For

accurate counting, a two-step process was involved for counting foci with the FRNT-mNG assay. First, foci were counted, which included automated counting of both green foci, which represent virally infected cells, and background signal. Thus, a correction is needed to remove the background signal. To do this, we set the Viridot parameters to the FRNT-mNG settings. (Table 4). Next, each well is counted again under the Background correction settings (Table 5). The foci counted under the Background correction settings are subtracted from the foci counted under the FRNT-mNG parameter settings for each individual well. This represents the foci counts per well. Then, the average number of foci in each virus/serum sample (duplicate) at the highest dilution was used to calculate the neutralization curves:  $1 - (\text{ratio of the mean number of foci in the presence of sera and foci at the highest dilution of respective sera serum})$ .

Figure 7 shows representative neutralization curves. The FRNT<sub>50</sub> titer is interpolated using a 4-parameter nonlinear regression in GraphPad Prism 8.4.3. Each specimen was tested in two independent assays performed at different times. To determine the final titer, the geometric mean titer is calculated using the titers from each of the duplicates from the two independent runs. Specimens were retested if the geometric mean titers from the two independent assays displayed greater than a 3-fold difference in neutralization. In this case, the assay is run a third time. Two independent assay that fall within a 3-fold difference are used to calculate the final titer. The final titer is reported as the reciprocal dilution which neutralizes 50% of SARS-CoV-2.

Figure 7. Sample Curves



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**FRNT-mNG Assay Optimization.** The Emory laboratory has explored conditions for assay optimization and reproducibility, including cell plating density, defining the incubation period that maximizes the accuracy of foci enumeration, viral infection titers, second operator intermediate precision, repeatability, and intermediate precision, quantitation limit/sensitivity and specificity. In terms of sensitivity, we tested COVID-19 convalescent patient samples provided by Duke University (David Montefiori), which were grouped between pre-determined low, medium, and high titer ranges, as part of a Pilot Concordance Assay. We also tested serial dilutions of COVID-19 patient samples to determine the endpoint titer. The average coefficient of variation (CV) for the low titer samples (GM= 212.2) was 38.0%, with a range from 17.9% to 58.6%. 3. The average CV for the medium titer samples (GM= 1577.2) was 47.7%, with a range from 28.0% to 67.5%. The average CV for the high titer samples (GM= 3647.5) was 31.9%, with a range from 12.4% to 43.6%. We have also tested over 50 healthy control samples that were taken either before or after the COVID-19 pandemic. Some of these samples were plasma samples that were collected prior to the COVID-19 pandemic and others were samples collected by a collaborator as part of their routine analysis of evaluating Cholera or Dengue infection in humans (all of these samples are de-identified). 0/50 samples displayed any neutralization activity against SARS-CoV-2 at a titer of 1:50, which represents the lowest dilution tested in this study. The SARS-CoV-2 FRNT-mNG neutralization assay is a high-throughput fit-for-purpose research assay. The intent of evaluating the FRNT-mNG assay was to identify a high-throughput SARS-CoV-2 virus neutralization assay for evaluation of the phase 1 sera from all cohorts, which involved demonstration of concordance between the different virus neutralization assays (PRNT, pseudovirus neutralization assay and, nLuciferase HTNA). The FRNT-mNG assay will be employed to quantify neutralizing antibody responses in sera from the mRNA-1273 phase 1 clinical trial going forward, in addition to the pseudovirion neutralization assay. It was important to demonstrate that the data from the FRNT and the reporter virus-based FRNT-mNG assays were highly correlative.

**Table 4. Viridot FRNT-mNG settings**

Parameter Setting	Setting
Step 1. Light Setting	Red
Step 2. Blur image	3
Step 3.1. Cut well edges	30
Step 4.1. Apply contrast to image based on background intensity	1.3
Step 4.2. Apply contrast to image based on plaque intensity	1
Step 5.1. Select difference in pixel value to distinguish plaque from background	0.13
Step 5.2. Select size (in pixels) of the window for applying the thresholding algorithm to the image	40
Step 6. Dilate your plaques to ensure they are counted as single plaques	13
Step 7. Cut overlapping plaques so they are counted separately	3
Step 8.1. Define the minimum pixel size to count as a plaque	30
Step 8.2. Define the maximum pixel size to count as a plaque	3000

**Table 5. Viridot background correction settings**

Parameter Setting	Setting
Step 1. Light Setting	Green
Step 2. Blur image	3
Step 3.1. Cut well edges	30
Step 4.1. Apply contrast to image based on background intensity	1.4
Step 4.2. Apply contrast to image based on plaque intensity	1
Step 5.1. Select difference in pixel value to distinguish plaque from background	0.14
Step 5.2. Select size (in pixels) of the window for applying the thresholding algorithm to the image	40
Step 6. Dilate your plaques to ensure they are counted as single plaques	8
Step 7. Cut overlapping plaques so they are counted separately	2
Step 8.1. Define the minimum pixel size to count as a plaque	30
Step 8.2. Define the maximum pixel size to count as a plaque	3000

#### References

- 1 Xie, X., Muruato, A., Lokugamage, K. G., Narayanan, K., Zhang, X., Zou, J., Liu, J., Schindewolf, C., Bopp, N. E., Aguilar, P. V., Plante, K. S., Weaver, S. C., Makino, S., LeDuc, J. W., Menachery, V. D. & Shi, P. Y. An Infectious cDNA Clone of SARS-CoV-2. *Cell host & microbe* 27, 841-848 e843, doi:10.1016/j.chom.2020.04.004 (2020). PMID: PMC7153529.
- 2 Katzelnick, L. C., Coello Escoto, A., McElvany, B. D., Chavez, C., Salje, H., Luo, W., Rodriguez-Barraquer, I., Jarman, R., Durbin, A. P., Diehl, S. A., Smith, D. J., Whitehead, S. S. & Cummings, D. A. T. Viridot: An automated virus plaque (immunofocus) counter for the measurement of serological neutralizing responses with application to dengue virus. *PLoS neglected tropical diseases* 12, e0006862, doi:10.1371/journal.pntd.0006862 (2018). PMID: PMC6226209.

## 8. CONVALESCENT SERA DESCRIPTION

Convalescent sera were collected from a total of 41 individuals with confirmed Covid-19 diagnosis. These samples were included in convalescent sera panels and tested along with the vaccine trial participant samples as comparators for the ELISA and PsVNA vaccine-induced responses and to establish correlations across the ELISA (S-2P and RBD) and the PsVNA. Binding and PsVNA data are shown for one serum sample from each of the 41 individuals. The samples were collected under IRB approved protocols at the National Institutes of Health, Bethesda MD (NCT00067054); Aaron Diamond AIDS Research Center, Columbia University, New York NY (NCT04342195); the University of Washington, Seattle WA (HAARVI study and STUDY00000959); and Vanderbilt University Medical Center, Nashville, TN (NCT04362176 and IRB VUMC protocol # 070258). Time since diagnosis (onset of symptoms or positive PCR test) ranged from 23-54 days (median 34 days). Ages ranged from 20-77 years (median 49); 19 were female, 22 were male. Race and ethnicity were reported as follows: 4 were Asian, 2 were Black, 4 were White/Hispanic or Latino, 5 were White/ethnicity unreported, and 26 were White/Not Hispanic or Latino. The Covid-19 illness severity was known for 38 of these individuals and was classified as mild in 63%, moderate in 22%, and severe (hospitalization requiring intensive care and/or ventilation) in 15%. Data for these convalescent sera are shown as comparators for the various serological assays (see **Table 6** below).

**Table 6. Convalescent Sera Tested in Serological Assays**

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SN	ELISA	PSVN	PRNT	FRNT	nLuc
0044-0002-01	Y	Y	-	-	-
0044-0007-01	Y	Y	-	-	-
0044-0008-01	Y	Y	-	-	-
0044-0010-01	Y	Y	-	-	-
0044-0011-01	Y	Y	-	-	-
0044-0012-01	Y	Y	-	-	-
0047-0008-01	Y	Y	-	-	-
0047-0009-01	Y	Y	-	-	-
0047-0014-02	Y	Y	-	-	-
0047-0015-01	Y	Y	-	-	-
0047-0016-01	Y	Y	-	-	-
0047-0018-01	Y	Y	-	-	-
0047-0019-01	Y	Y	-	-	-
0047-0020-01	Y	Y	-	-	-
0047-0021-01	Y	Y	-	-	-
0047-0022-01	Y	Y	-	-	-
20A-768-30	-	-	-	-	Y
20A-769-30	Y	Y	-	-	Y
20A-770-30	Y	Y	-	Y	Y
20A-771-30	Y	Y	-	Y	Y
20A-772-30	Y	Y	-	-	Y
20A-773-30	Y	Y	-	-	Y
20A-774-30	Y	Y	-	Y	Y
20A-776-30	Y	Y	-	Y	Y
20A-777-30	Y	Y	-	-	Y
20A-778-30	Y	Y	-	-	Y
20A-779-30	Y	Y	-	-	Y
20A-780-30	Y	Y	-	Y	Y
20A-781-30	Y	Y	-	-	Y
20A-782-30	Y	Y	-	Y	Y
20A-783-30	Y	Y	-	Y	-
20A-785-30	Y	Y	-	-	Y
20A-786-30	Y	Y	-	-	Y
20A-787-30	Y	Y	-	Y	Y
20A-788-30	Y	Y	-	-	Y
20A-789-30	Y	Y	-	Y	Y
20A-790-30	Y	Y	-	-	Y
20A-791-30	Y	Y	-	Y	Y
20A-792-30	Y	Y	-	-	Y
20A-793-30	-	-	-	Y	Y
20A-794-30	-	-	-	-	Y

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SN	ELISA	PSVN	PRNT	FRNT	nLuc
20A-795-30	-	-	-	Y	Y
VUMC1	Y	Y	Y	Y	Y
VUMC2	Y	Y	Y	Y	Y
VUMC3	Y	Y	Y	Y	Y

## 9. T CELL MEDIATED IMMUNE RESPONSE ANALYSIS DESCRIPTION

Intracellular cytokine stimulation (ICS) assay was used to evaluate T cell responses elicited by the mRNA-1273 vaccine in clinical samples collected on day 1, day 29, and day 43 post-vaccination. The protocol for this assay is detailed in VRC-VIP SOP 5521 *Intracellular Cytokine Staining Assay*. Briefly, frozen peripheral blood mononuclear cells (PBMC) were thawed, counted and rested in R10 culture media (90% RPMI 1640 with 10% Fetal Bovine Serum (FBS) and 1% Penicillin Streptomycin and L-Glutamine) overnight at 37°C with 5% CO<sub>2</sub>. Following the rest period, cells were counted on day 2 and resuspended in R10 cell culture media. 0.5-1.5 x 10<sup>6</sup> cells were transferred to individual wells of a 96-well V-bottom plate(s) and incubated with pools of 15-mer peptides overlapping by 10 amino acids covering the N-terminus of SARS-CoV-2 Spike protein up to the furin cleavage site (S1 pool), the C-terminus of the SARS-CoV-2 Spike protein up to the furin cleavage site (S2 pool) for 6 hours at 37°C with 5% CO<sub>2</sub>. Peptide pools were custom ordered from JPT Peptide Technologies and were >85% pure. Cells were also stimulated with *Staphylococcus* enterotoxin B (SEB; positive control), or Dimethylsulfoxide (DMSO; no stimulation control) for 6 hours at 37°C with 5% CO<sub>2</sub>. Following stimulation, cells were washed and stained with viability dye for 20 minutes at room temperature, followed by surface stain for 20 minutes at room temperature, cell fixation and permeabilization with BD cytofix/cytoperm kit (catalog # 554714) for 20 minutes at room temperature, and then intracellular stain for 20 minutes at room temperature (see **Table 7** for complete list of antibodies). Upon completion of staining, cells were collected on a BD FACSymphony Flow Cytometer. A single SARS-CoV-2 naïve, CMV-reactive control PBMC sample (VRC 200-002-37) was included with each batch. This sample was stimulated with all of the stimuli listed above (negative control for SARS-CoV-2 stimulation) as well as a Cytomegalovirus (CMV) peptide pool (quantitative control for peptide stimulated cytokine response).

Samples were analyzed using FlowJo 10.6.2. Anomalous “bad” events were separated from “good” events using FlowAI. “Good events” were used to determine cytokine responses. Cytokine positive cells were determined by gating on singlets, lymphocytes, viability dye-CD3<sup>+</sup>, followed by CD4<sup>+</sup> or CD8<sup>+</sup> (**Figure 8**). Individual cytokines were plotted on the Y-axis vs. CD69 on the X-axis and only the CD69<sup>+</sup>cytokine<sup>+</sup> events were used to determine positive responses. Positive cytokine gates were determined using unstimulated samples during qualification testing. A template of gating was created during assay qualification and was applied to all vaccine samples without manipulation. “Any responses” are any combination of the indicated individual cytokines by a population of CD4 or CD8 T cells and were calculated using Boolean combination gates. All antigen-specific cytokine frequencies are reported after background subtraction of identical gates from the same sample incubated with the control stimulation (DMSO).

### Assay Development and Optimization

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This 13-color flow cytometry panel was developed at the VRC (**Table 7**). Seven-point titrations were performed on each new lot of antibody-fluorochrome to determine the concentration that yielded optimal marker resolution while minimizing fluorochrome spreading and spillover. The assay was qualified for evaluation of the phase 1 mRNA-1273 clinical trial samples. Briefly, Th1 specificity was qualified using PBMCs from patients with CMV-reactive T cells stimulated with CMV peptide pools, which generate robust Th1-type responses. Th2 specificity was qualified using PBMCs from patients with *Filaria* parasite-reactive T cells stimulated with *Filaria* crude antigen, which generate strong Th2-type cytokines. For the VRC 200-002-37 quantitative control used in each experimental batch, cytokine tolerance ranges were determined following 20 different ICS assays performed on this sample.

**Table 7. 13-color ICS Antibody Panel**

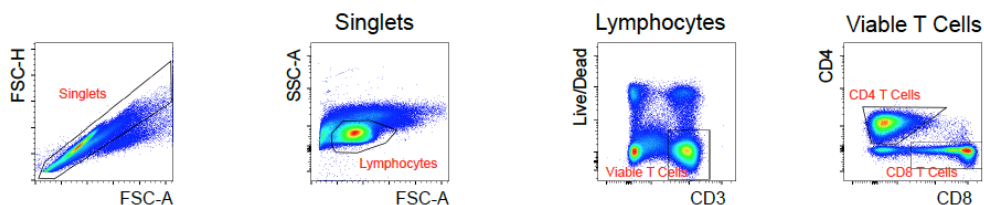
Detector	Fluorophore	Specificity	Clone	Dilution	Stain
B710	BB700	IL-4	MP4-25D2	1:160	intracellular
G560	PE	CD28	CD28.2	1:20	surface
G610	ECD	CD69	TP1.55.3	1:20	intracellular
G660	PE/Cy5	CD8a	RPA-T8	1:40	surface
G780	PE/Cy7	IFN $\gamma$	B27	1:160	intracellular
R660	APC	IL-2	MQ1-17H12	1:20	intracellular
R780	APC/H7	CD3	SK7	1:80	intracellular
U395	BUV395	CCR7	150503	1:40	surface
U450	UV-Blue	Viability	-	1:500	surface
U570	BUV563	TNF	Mab11	1:10	intracellular
U785	BUV805	CD4	SK3	1:10	surface
V450	BV421	IL-13	JES10-SA2	1:10	intracellular
V785	BV785	CD45RO	UCHL1	1:20	surface

The specificity of the ICS assay for SARS-CoV-2 S-specific T cell responses was demonstrated using a small panel of COVID-19 convalescent patient samples and naïve SARS-CoV-2 PBMC samples (**Figure 9**). Importantly, Th1 predominant responses (CD4<sup>+</sup> T cells expressing IL-2, IFN- $\gamma$  and/or TNF- $\alpha$ ) with minimal to no detectable Th2 responses (IL-4, IL-13 expression in CD4<sup>+</sup> T cells) were observed in a small panel of convalescent PBMC samples stimulated with either the S1 or S2 S-specific peptide pools; detection of S-specific CD4<sup>+</sup> responses were negligible in SARS-CoV-2 naïve samples. S-specific CD8<sup>+</sup> T cell responses were only marginally observed in either convalescent and naïve PBMCs following stimulation with S1 and S2 peptides.

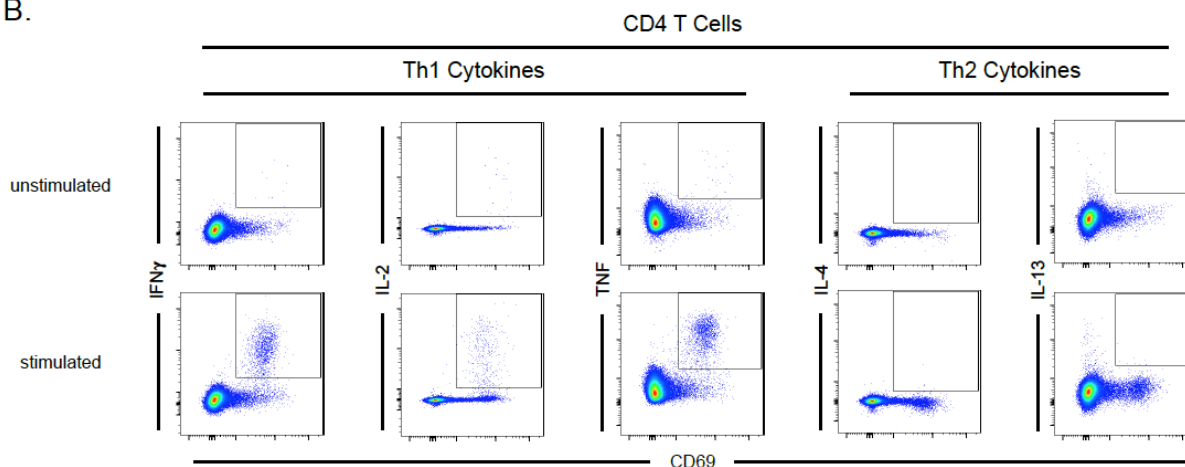
**Figure 8. Flow Cytometric Gating Strategy**

PBMCs stained with the 13-color panel. (A) Lineage gating of T cells. After gating on single cells, lymphocytes, and viable CD3<sup>+</sup> T cells, T cells were further subdivided into CD4<sup>+</sup> and CD8<sup>+</sup> T cells. (B,C) Gating to measure T cell function following no stimulation or stimulation with CMV peptide pool. Cytokine staining is shown following gating on CD4<sup>+</sup> T cells (B) or CD8<sup>+</sup> T cells (C).

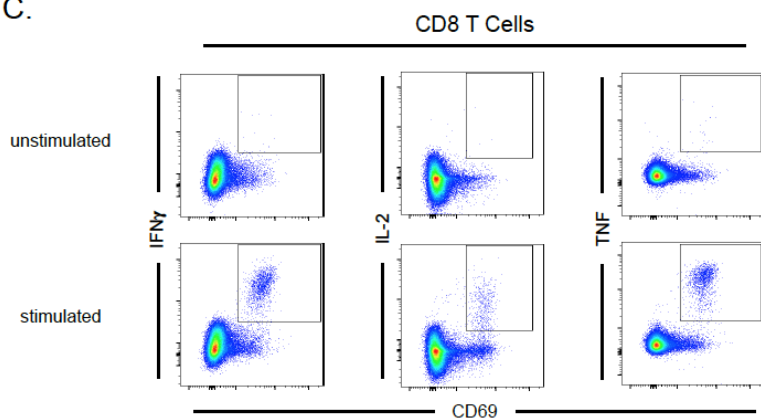
A.



B.

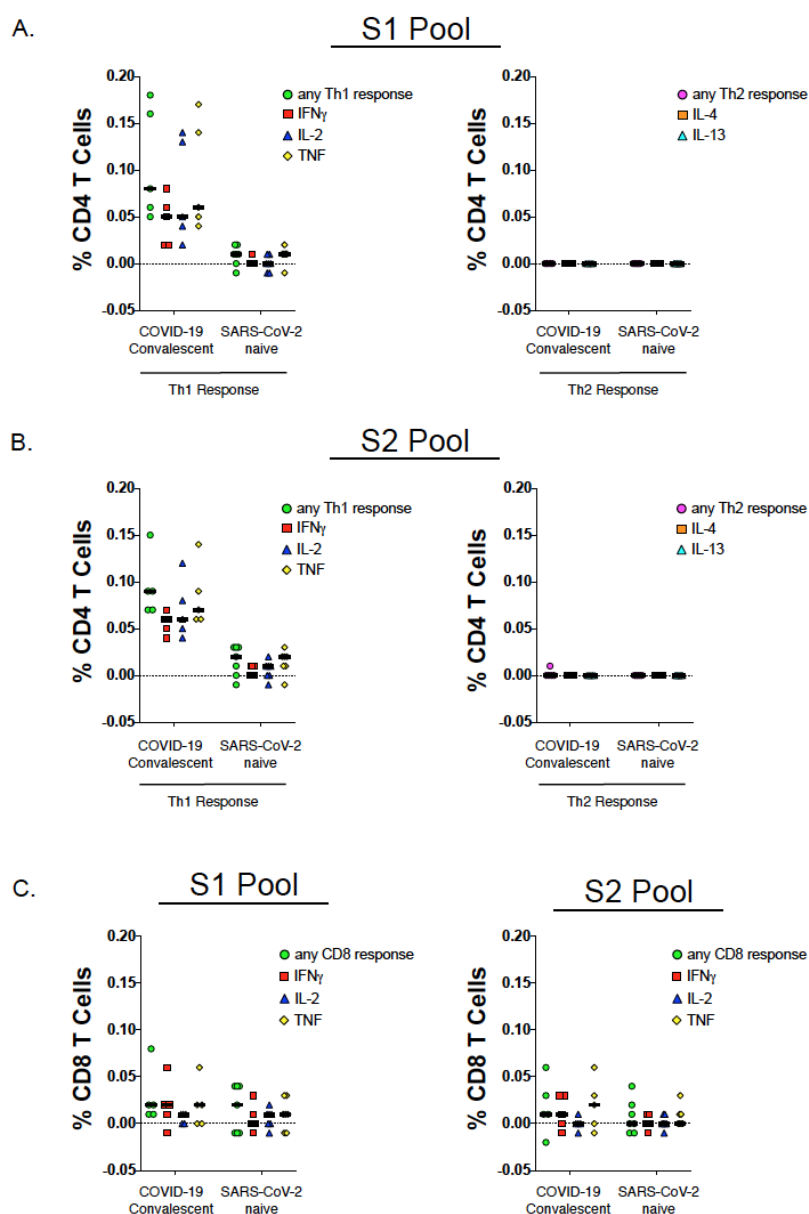


C.



**Figure 9. SARS-CoV-2-Specific T Cell Responses in COVID-19 Convalescent Patient Samples.**

PBMCs from COVID-19 convalescent patients at 1 month post onset of symptoms or SARS-CoV-2 naïve patients were stimulated with indicated SARS-CoV-2 peptide pools. (A) Frequencies of CD4<sup>+</sup> T cell Th1 (left) or Th2 (right) cytokines following stimulation with SARS-CoV-2 S1 peptide pool. (B) Frequencies of CD4<sup>+</sup> T cell Th1 (left) or Th2 (right) cytokines following stimulation with SARS-CoV-2 S2 peptide pool. (C) Frequencies of CD8<sup>+</sup> T cell cytokines following stimulation with SARS-CoV-2 S1 peptide pool (left) or SARS-CoV-2 S2 peptide pool (right). “Any response” indicates the frequencies of cells producing any combination of the individual cytokines.



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## 10. TABLES AND FIGURES

Implementation Note: There are four subjects (2 in cohort 1, 1 in cohort 3, and 1 in cohort 5) who discontinued vaccination prior to receiving the second dose yet continued to provide samples for immunogenicity assessments; each display omits the data from visits post second dose for these four subjects. Further, one subject in cohort 2 had a phone visit on Day 43 and therefore had no samples drawn.

**Table 8. Serum IgG ELISA Area Under the Curve (AUC) Geometric Mean Results with 95% Confidence Intervals by Time Point and Vaccination Group - S-2P – Age 18 -55**

Time Point	Statistic	25 µg mRNA-1273 18-55 years (N=15)	100 µg mRNA-1273 18-55 years (N=15)	250 µg mRNA-1273 18-55 years (N=15)	18-55 years (N=45)	Convalescent Sera
<b>Day 1 (Pre-Vaccination 1)</b>	n	15	15	15	45	41
	GM	1	1	1	1	14157
	95% CI	0, 1	0, 4	0, 5	0, 2	7616, 26312
<b>Day 15 (14 Days Post Vaccination 1)</b>	n	15	15	15	45	
	GM	5674	19068	30642	14911	
	95% CI	3224, 9983	12424, 29265	18029, 52078	10546, 21083	
<b>Day 29 Post Vaccination 1 (Pre-Vaccination 2)</b>	n	15	15	14	44	
	GM	8304	20525	38448	18410	
	95% CI	5221, 13209	14234, 29595	22899, 64555	13550, 25012	
<b>Day 36 Post Vaccination 1 (7 Days Post Vaccination 2)</b>	n	13	15	14	42	
	GM	94988	213076	315723	189172	
	95% CI	64997, 138817	165185, 274852	255688, 389853	152607, 234499	
<b>Day 43 Post Vaccination 1 (14 Days Post Vaccination 2)</b>	n	13	14	14	41	
	GM	91081	221956	254374	175319	
	95% CI	61317, 135293	182108, 270524	200737, 322342	142582, 215572	
<b>Day 57 Post Vaccination 1 (28 Days Post Vaccination 2)</b>	n	13	14	14	41	
	GM	77904	147332	217813	137571	
	95% CI	56717, 107006	113898, 190580	170240, 278681	113039, 167427	

Note: N=Number of Subjects.  
n=Number of subjects with results available at time point.

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**Table 9. Serum IgG ELISA Area Under the Curve (AUC) Geometric Mean Results with 95% Confidence Intervals by Time Point and Vaccination Group - S-2P – Age 56-70**

Time Point	Statistic	25 µg mRNA-1273 56-70 years (N=10)	100 µg mRNA-1273 56-70 years (N=10)	56-70 years (N=20)	Convalescent Sera
<b>Day 1 (Pre-Vaccination 1)</b>	n	10	10	20	41
	GM	2	9	4	14157
	95% CI	0, 5	1, 37	1, 10	7616, 26312
<b>Day 15 (14 Days Post Vaccination 1)</b>	n	10	10	20	
	GM	702	9822	2626	
	95% CI	103, 4751	6539, 14753	887, 7767	
<b>Day 29 Post Vaccination 1 (Pre-Vaccination 2)</b>	n	10	10	20	
	GM	2037	20493	6462	
	95% CI	496, 8355	14413, 29137	2740, 15238	
<b>Day 36 Post Vaccination 1 (7 Days Post Vaccination 2)</b>	n	10	9	19	
	GM	45869	1070250	203941	
	95% CI	23165, 90823	224760, 5096239	70177, 592666	
<b>Day 43 Post Vaccination 1 (14 Days Post Vaccination 2)</b>	n	10	9	19	
	GM	64533	277751	128836	
	95% CI	34146, 121959	115183, 669765	70850, 234281	
<b>Day 57 Post Vaccination 1 (28 Days Post Vaccination 2)</b>	n	10	9	19	
	GM	49990	266183	110387	
	95% CI	27060, 92349	94155, 752518	56642, 215129	
Note: N=Number of Subjects. n=Number of subjects with results available at time point. NE=Not Estimable					

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**Table 10. Serum IgG ELISA Area Under the Curve (AUC) Geometric Mean Results with 95% Confidence Intervals by Time Point and Vaccination Group - S-2P – Age ≥ 71**

Time Point	Statistic	25 µg mRNA-1273 ≥71 years (N=10)	100 µg mRNA-1273 ≥71 years (N=10)	≥71 years (N=20)	Convalescent Sera
<b>Day 1 (Pre-Vaccination 1)</b>	n	10	10	20	41
	GM	1	15	5	14157
	95% CI	0, 3	6, 39	2, 11	7616, 26312
<b>Day 15 (14 Days Post Vaccination 1)</b>	n	10	10	20	
	GM	1664	16174	5189	
	95% CI	679, 4076	3350, 78072	1944, 13845	
<b>Day 29 Post Vaccination 1 (Pre-Vaccination 2)</b>	n	10	10	20	
	GM	5949	23933	11932	
	95% CI	2934, 12061	10375, 55204	6578, 21644	
<b>Day 36 Post Vaccination 1 (7 Days Post Vaccination 2)</b>	n	10	10	20	
	GM	95566	557510	230823	
	95% CI	57468, 158922	191748, 1620960	116913, 455715	
<b>Day 43 Post Vaccination 1 (14 Days Post Vaccination 2)</b>	n	10	10	20	
	GM	70620	1273343	299874	
	95% CI	41797, 119320	403930, 4014062	122247, 735593	
<b>Day 57 Post Vaccination 1 (28 Days Post Vaccination 2)</b>	n	10	10	20	
	GM	142653	523632	273309	
	95% CI	66931, 304041	167243, 1639475	136927, 545530	
Note: N=Number of Subjects. n=Number of subjects with results available at time point. NE=Not Estimable					

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**Table 11. Serum IgG ELISA Area Under the Curve (AUC) Geometric Mean Fold Rise (GMFR) and 4-Fold Rise Results by Time Point and Vaccination Group - S-2P – Age 18-55**

Time Point	Statistic	25 µg mRNA-1273 18-55 years (N=15)	100 µg mRNA-1273 18-55 years (N=15)	250 µg mRNA-1273 18-55 years (N=15)	18-55 years (N=45)
<b>Day 15 (14 Days Post Vaccination 1)</b>	n	15	15	15	45
	GMFR <sup>a</sup>	13517.3	28300.6	39579.8	24739.2
	95% CI	4705.476, 38830.697	8319.721, 96267.799	11551.751, 135612.504	13089.324, 46757.881
	4-Fold Rise <sup>b</sup>	15/15 (100%)	15/15 (100%)	15/15 (100%)	45/45 (100%)
	95% CI	78.2%, 100%	78.2%, 100%	78.2%, 100%	92.1%, 100%
<b>Day 29 Post Vaccination 1 (Pre-Vaccination 2)</b>	n	15	15	14	44
	GMFR <sup>a</sup>	19786.2	30463	53290.8	31416.8
	95% CI	7164.525, 54643.201	9185.964, 101023.082	14486.651, 196036.104	16693.351, 59126.374
	4-Fold Rise <sup>b</sup>	15/15 (100%)	15/15 (100%)	14/14 (100%)	44/44 (100%)
	95% CI	78.2%, 100%	78.2%, 100%	76.8%, 100%	92%, 100%
<b>Day 36 Post Vaccination 1 (7 Days Post Vaccination 2)</b>	n	13	15	14	42
	GMFR <sup>a</sup>	197551.8	316250.4	437609.9	304648.1
	95% CI	76518.696, 510028.44	95307.907, 1049380.846	116316.547, 1646389.964	162125.044, 572462.343
	4-Fold Rise <sup>b</sup>	13/13 (100%)	15/15 (100%)	14/14 (100%)	42/42 (100%)
	95% CI	75.3%, 100%	78.2%, 100%	76.8%, 100%	91.6%, 100%
<b>Day 43 Post Vaccination 1 (14 Days Post Vaccination 2)</b>	n	13	14	14	41
	GMFR <sup>a</sup>	189426.3	348444.2	352576.7	288373
	95% CI	73319.816, 489394.379	104253.422, 1164598.06	89054.744, 1395886.778	152314.931, 545967.355
	4-Fold Rise <sup>b</sup>	13/13 (100%)	14/14 (100%)	14/14 (100%)	41/41 (100%)
	95% CI	75.3%, 100%	76.8%, 100%	76.8%, 100%	91.4%, 100%
<b>Day 57 Post Vaccination 1 (28 Days Post Vaccination 2)</b>	n	13	14	14	41
	GMFR <sup>a</sup>	162021.8	231292.3	301901.8	226284.3
	95% CI	65611.312, 400099.793	71428.076, 748950.815	72359.981, 1259601.233	119684.008, 427831.507

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Time Point	Statistic	25 µg mRNA-1273 18-55 years (N=15)	100 µg mRNA-1273 18-55 years (N=15)	250 µg mRNA-1273 18-55 years (N=15)	18-55 years (N=45)
	4-Fold Rise <sup>b</sup>	13/13 (100%)	14/14 (100%)	14/14 (100%)	41/41 (100%)
	95% CI	75.3%, 100%	76.8%, 100%	76.8%, 100%	91.4%, 100%

Note: N=Number of Subjects.

<sup>a</sup>GMFR represents the geometric mean fold rise in AUC compared to pre-dose 1

<sup>b</sup>4-Fold Rise represents the percentage of subjects with at least a 4-Fold Rise in AUC compared to pre-dose 1

AUC results reported as 0 were imputed to the lowest non-zero reported value for the purposes of fold-rise calculations.

**Table 12. Serum IgG ELISA Area Under the Curve (AUC) Geometric Mean Fold Rise (GMFR) and 4-Fold Rise Results by Time Point and Vaccination Group - S-2P – Age 56-70**

Time Point	Statistic	25 µg mRNA-1273 56-70 years (N=10)	100 µg mRNA-1273 56-70 years (N=10)	56-70 years (N=20)
<b>Day 15 (14 Days Post Vaccination 1)</b>	n	10	10	20
	GMFR <sup>a</sup>	646.1	1554.2	1002.1
	95% CI	60.428, 6908.027	294.228, 8209.33	267.486, 3753.955
	4-Fold Rise <sup>b</sup>	10/10 (100%)	10/10 (100%)	20/20 (100%)
	95% CI	69.2%, 100%	69.2%, 100%	83.2%, 100%
<b>Day 29 Post Vaccination 1 (Pre-Vaccination 2)</b>	n	10	10	20
	GMFR <sup>a</sup>	1901.4	3242.6	2483
	95% CI	254.995, 14177.838	510.697, 20588.28	721.487, 8545.43
	4-Fold Rise <sup>b</sup>	10/10 (100%)	10/10 (100%)	20/20 (100%)
	95% CI	69.2%, 100%	69.2%, 100%	83.2%, 100%
<b>Day 36 Post Vaccination 1 (7 Days Post Vaccination 2)</b>	n	10	9	19
	GMFR <sup>a</sup>	42875.4	201812	89304.6
	95% CI	9113.733, 201706.45	11404.31, 3571288.573	20724.931, 384817.347
	4-Fold Rise <sup>b</sup>	10/10 (100%)	9/9 (100%)	19/19 (100%)
	95% CI	69.2%, 100%	66.4%, 100%	82.4%, 100%
<b>Day 43 Post Vaccination 1 (14 Days Post Vaccination 2)</b>	n	10	9	19
	GMFR <sup>a</sup>	60321.7	52374.3	56417.1
	95% CI	13316.359, 273250.697	4541.146, 604048.204	16153.581, 197039.057
	4-Fold Rise <sup>b</sup>	10/10 (100%)	9/9 (100%)	19/19 (100%)
	95% CI	69.2%, 100%	66.4%, 100%	82.4%, 100%
<b>Day 57 Post Vaccination 1 (28 Days Post Vaccination 2)</b>	n	10	9	19
	GMFR <sup>a</sup>	46727.4	50193	48338.1
	95% CI	9097.671, 240000.904	3790.03, 664726.375	12757.963, 183146.09

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Time Point	Statistic	25 µg mRNA-1273 56-70 years (N=10)	100 µg mRNA-1273 56-70 years (N=10)	56-70 years (N=20)
	4-Fold Rise <sup>b</sup>	10/10 (100%)	9/9 (100%)	19/19 (100%)
	95% CI	69.2%, 100%	66.4%, 100%	82.4%, 100%

Note: N=Number of Subjects.

<sup>a</sup>GMFR represents the geometric mean fold rise in AUC compared to pre-dose 1

<sup>b</sup>4-Fold Rise represents the percentage of subjects with at least a 4-Fold Rise in AUC compared to pre-dose 1

AUC results reported as 0 were imputed to the lowest non-zero reported value for the purposes of fold-rise calculations.

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**Table 13. Serum IgG ELISA Area Under the Curve (AUC) Geometric Mean Fold Rise (GMFR) and 4-Fold Rise Results by Time Point and Vaccination Group - S-2P – Age ≥ 71**

Time Point	Statistic	25 µg mRNA-1273 ≥71 years (N=10)	100 µg mRNA-1273 ≥71 years (N=10)	≥71 years (N=20)
<b>Day 15 (14 Days Post Vaccination 1)</b>	n	10	10	20
	GMFR <sup>a</sup>	2675.4	1099.6	1715.2
	95% CI	703.62, 10172.812	276.216, 4377.487	703.516, 4181.701
	4-Fold Rise <sup>b</sup>	10/10 (100%)	10/10 (100%)	20/20 (100%)
	95% CI	69.2%, 100%	69.2%, 100%	83.2%, 100%
<b>Day 29 Post Vaccination 1 (Pre-Vaccination 2)</b>	n	10	10	20
	GMFR <sup>a</sup>	9566.4	1627.2	3945.4
	95% CI	1889.759, 48427.363	674.532, 3925.353	1551.282, 10034.566
	4-Fold Rise <sup>b</sup>	10/10 (100%)	10/10 (100%)	20/20 (100%)
	95% CI	69.2%, 100%	69.2%, 100%	83.2%, 100%
<b>Day 36 Post Vaccination 1 (7 Days Post Vaccination 2)</b>	n	10	10	20
	GMFR <sup>a</sup>	153704.3	37906.4	76330.7
	95% CI	32850.917, 719158.116	8871.888, 161960.176	27756.985, 209906.456
	4-Fold Rise <sup>b</sup>	10/10 (100%)	10/10 (100%)	20/20 (100%)
	95% CI	69.2%, 100%	69.2%, 100%	83.2%, 100%
<b>Day 43 Post Vaccination 1 (14 Days Post Vaccination 2)</b>	n	10	10	20
	GMFR <sup>a</sup>	113582.3	86577.5	99164.9
	95% CI	22921.287, 562836.24	17699.503, 423496.07	35861.112, 274215.493
	4-Fold Rise <sup>b</sup>	10/10 (100%)	10/10 (100%)	20/20 (100%)
	95% CI	69.2%, 100%	69.2%, 100%	83.2%, 100%
<b>Day 57 Post Vaccination 1 (28 Days Post Vaccination 2)</b>	n	10	10	20
	GMFR <sup>a</sup>	229435.8	35602.9	90380.3
	95% CI	44400.689, 1185585.328	9408.664, 134723.639	31573.768, 258714.478

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Time Point	Statistic	25 µg mRNA-1273 ≥71 years (N=10)	100 µg mRNA-1273 ≥71 years (N=10)	≥71 years (N=20)
	4-Fold Rise <sup>b</sup>	10/10 (100%)	10/10 (100%)	20/20 (100%)
	95% CI	69.2%, 100%	69.2%, 100%	83.2%, 100%

Note: N=Number of Subjects.

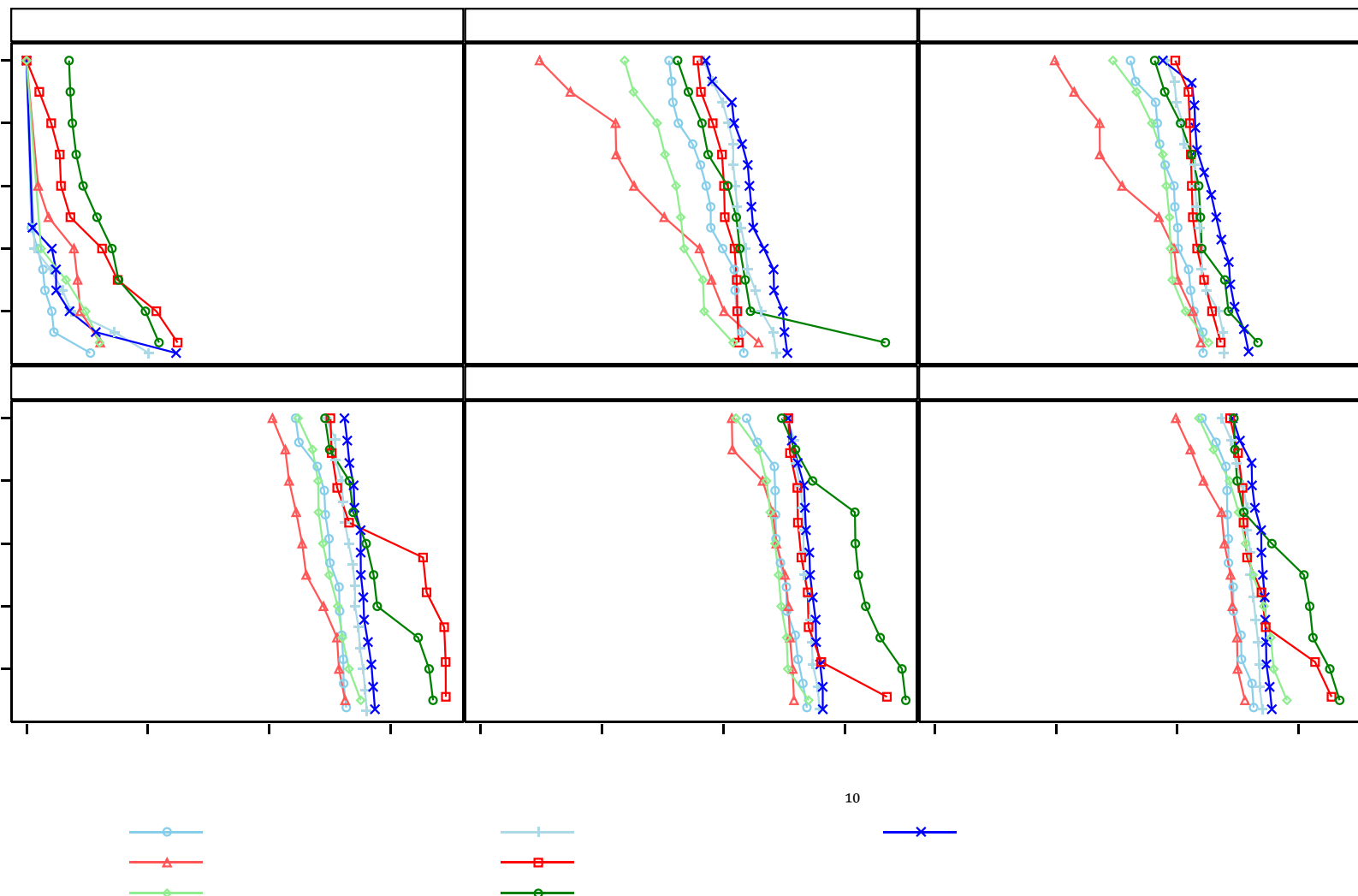
<sup>a</sup>GMFR represents the geometric mean fold rise in AUC compared to pre-dose 1

<sup>b</sup>4-Fold Rise represents the percentage of subjects with at least a 4-Fold Rise in AUC compared to pre-dose 1

AUC results reported as 0 were imputed to the lowest non-zero reported value for the purposes of fold-rise calculations.

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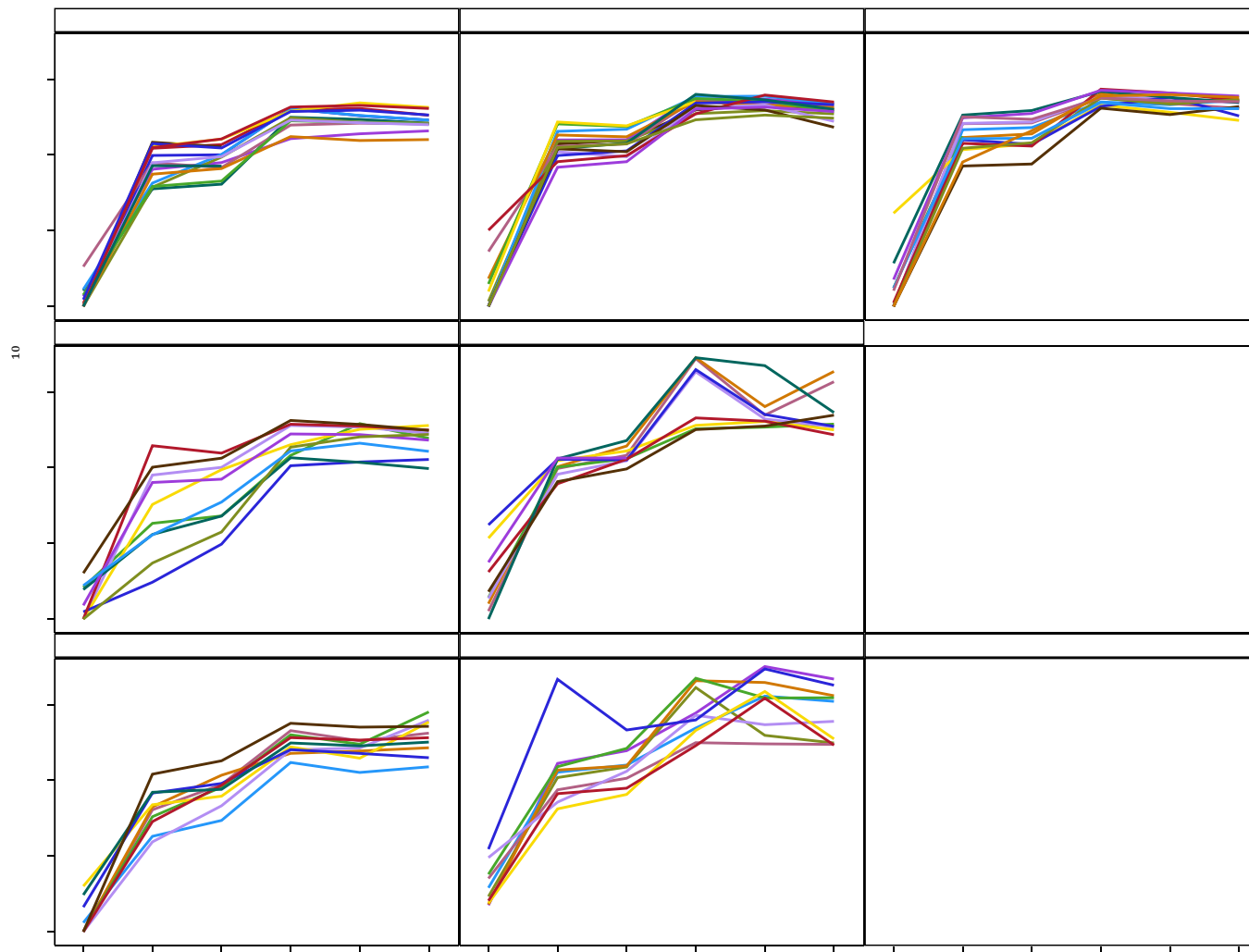
**Figure 10. Reverse Cumulative Distribution of Serum IgG ELISA Area Under the Curve (AUC) Values by Time Point and Vaccination Group - S-2P**



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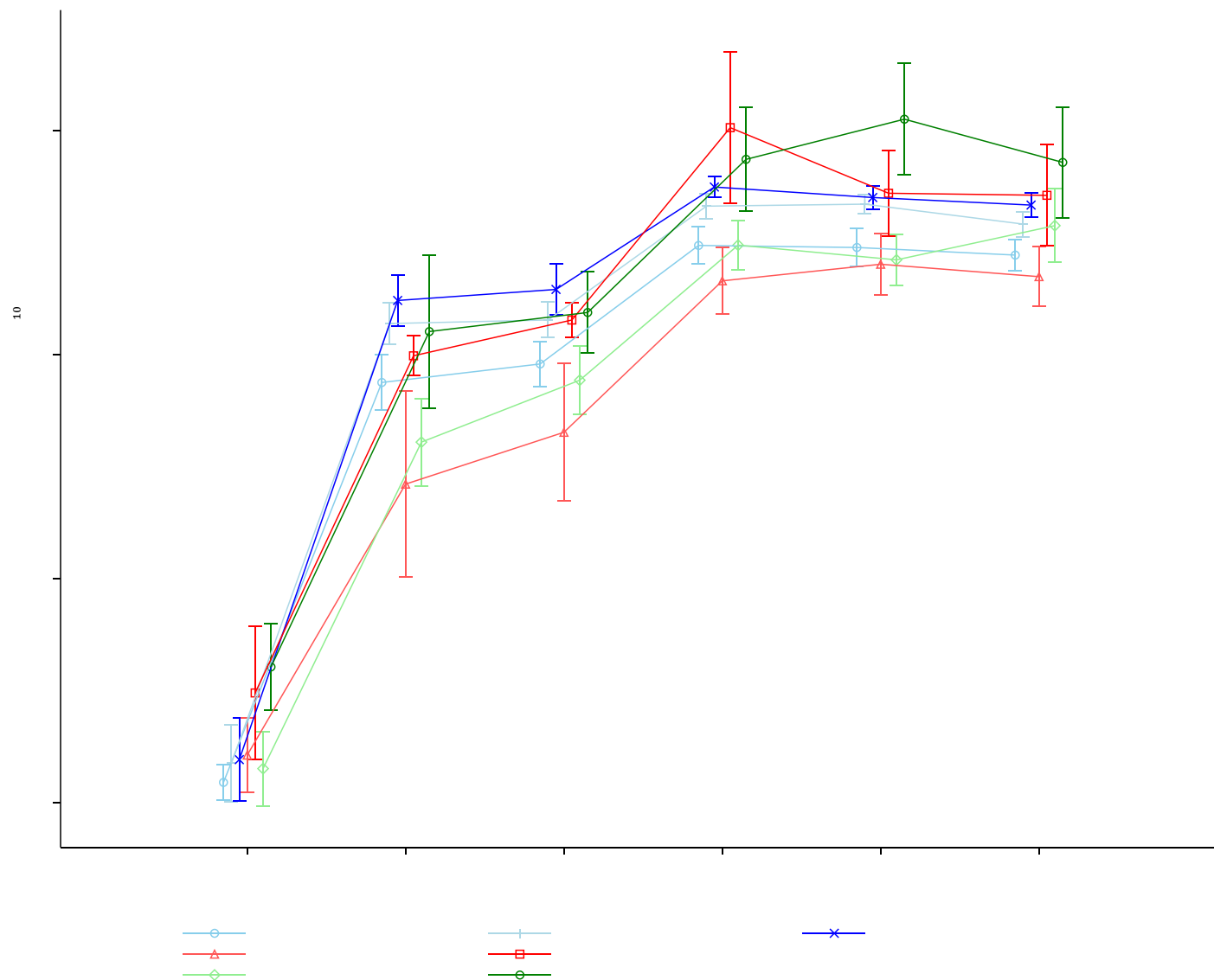
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**Figure 11. Serum IgG ELISA Area Under the Curve (AUC) Values by Time Point and Vaccination Group - S-2P**



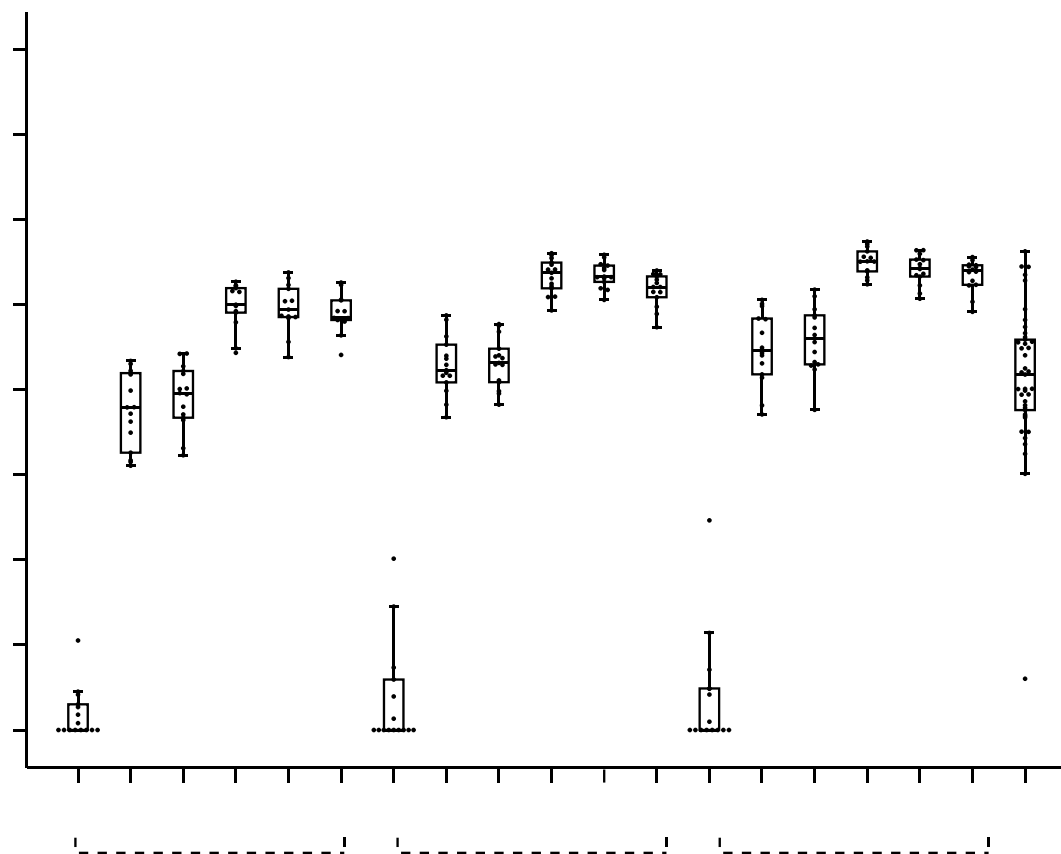
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**Figure 12. Geometric Mean Area Under the Curve (AUC) Values by Time Point and Vaccination Group - S-2P**



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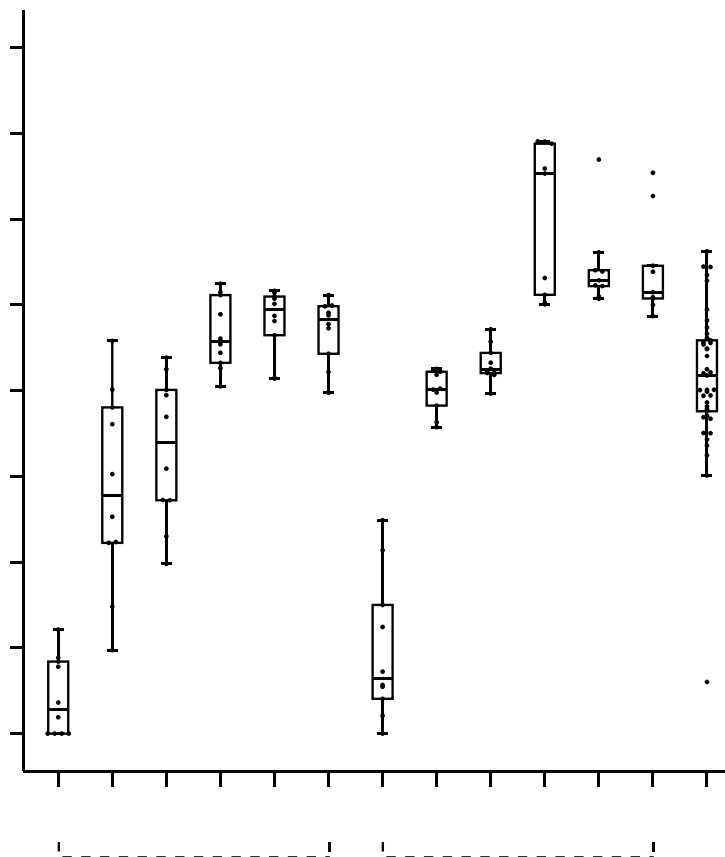
**Figure 13. Serum IgG Area Under the Curve (AUC) Distribution by Time Point and Treatment Group - S-2P – Age 18-55**



Note: Boxes and horizontal bars denote interquartile range (IQR) and median AUC, respectively. Whisker endpoints are equal to the maximum and minimum values below or above the median  $\pm 1.5 \times$  IQR. The convalescent sera panel includes specimens from 41 individuals.

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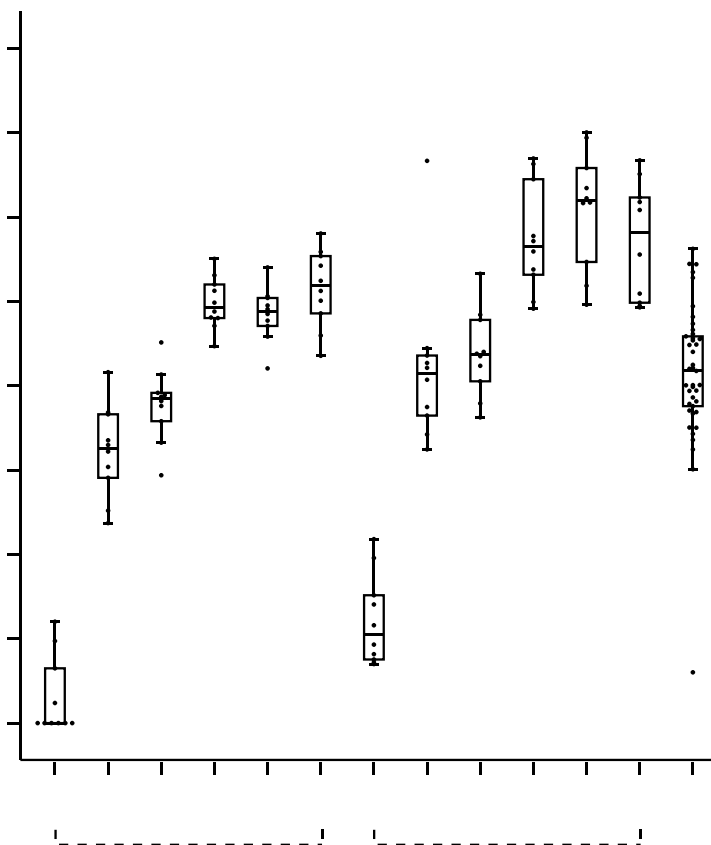
**Figure 14. Serum IgG Area Under the Curve (AUC) Distribution by Time Point and Treatment Group - S-2P – Age 56-70**



Note: Boxes and horizontal bars denote interquartile range (IQR) and median AUC, respectively. Whisker endpoints are equal to the maximum and minimum values below or above the median  $\pm 1.5 \times$  IQR. The convalescent sera panel includes specimens from 41 individuals.

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**Figure 15. Serum IgG Area Under the Curve (AUC) Distribution by Time Point and Treatment Group - S-2P – Age  $\geq 71$**



Note: Boxes and horizontal bars denote interquartile range (IQR) and median AUC, respectively. Whisker endpoints are equal to the maximum and minimum values below or above the median  $\pm 1.5 \times$  IQR. The convalescent sera panel includes specimens from 41 individuals.

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**Table 14. Serum IgG ELISA Area Under the Curve (AUC) Geometric Mean Results with 95% Confidence Intervals by Time Point and Vaccination Group - RBD – Age 18-55**

Time Point	Statistic	25 µg mRNA-1273 18-55 years (N=15)	100 µg mRNA-1273 18-55 years (N=15)	250 µg mRNA-1273 18-55 years (N=15)	18-55 years (N=45)	Convalescent Sera
<b>Day 1 (Pre-Vaccination 1)</b>	n	15	15	15	45	41
	GM	0	2	14	2	4222
	95% CI	0, 0	0, 4	6, 33	1, 4	2021, 8819
<b>Day 15 (14 Days Post Vaccination 1)</b>	n	15	15	15	45	
	GM	596	5642	15337	3724	
	95% CI	258, 1376	3130, 10170	9094, 25866	2166, 6403	
<b>Day 29 Post Vaccination 1 (Pre-Vaccination 2)</b>	n	15	15	14	44	
	GM	2110	12130	17556	7516	
	95% CI	1130, 3939	8447, 17418	10869, 28358	5093, 11092	
<b>Day 36 Post Vaccination 1 (7 Days Post Vaccination 2)</b>	n	13	15	14	42	
	GM	43973	126250	200639	106296	
	95% CI	30848, 62681	91696, 173824	160276, 251167	82550, 136872	
<b>Day 43 Post Vaccination 1 (14 Days Post Vaccination 2)</b>	n	13	14	14	41	
	GM	45792	141713	170112	105423	
	95% CI	30246, 69327	110096, 182410	133715, 216415	82612, 134531	
<b>Day 57 Post Vaccination 1 (28 Days Post Vaccination 2)</b>	n	13	14	14	41	
	GM	55071	106248	113627	88265	
	95% CI	36135, 83930	76429, 147701	82246, 156983	71252, 109340	
Note: N=Number of Subjects. n=Number of subjects with results available at time point. NE=Not Estimable						

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Data Cutoff Date: 20 August 2020

**Table 15. Serum IgG ELISA Area Under the Curve (AUC) Geometric Mean Results with 95% Confidence Intervals by Time Point and Vaccination Group - RBD – Age 56-70**

Time Point	Statistic	25 µg mRNA-1273 56-70 years (N=10)	100 µg mRNA-1273 56-70 years (N=10)	56-70 years (N=20)	Convalescent Sera
<b>Day 1 (Pre-Vaccination 1)</b>	n	10	10	20	41
	GM	2	3	2	4222
	95% CI	1, 5	0, 10	1, 5	2021, 8819
<b>Day 15 (14 Days Post Vaccination 1)</b>	n	10	10	20	
	GM	161	3817	785	
	95% CI	18, 1341	2303, 6327	226, 2712	
<b>Day 29 Post Vaccination 1 (Pre-Vaccination 2)</b>	n	10	10	20	
	GM	522	10045	2291	
	95% CI	91, 2970	5718, 17645	772, 6790	
<b>Day 36 Post Vaccination 1 (7 Days Post Vaccination 2)</b>	n	10	9	19	
	GM	31501	301411	91820	
	95% CI	14520, 68343	101394, 895996	40865, 206311	
<b>Day 43 Post Vaccination 1 (14 Days Post Vaccination 2)</b>	n	10	9	19	
	GM	41848	248702	97345	
	95% CI	21034, 83258	109350, 565638	50933, 186047	
<b>Day 57 Post Vaccination 1 (28 Days Post Vaccination 2)</b>	n	10	9	19	
	GM	24347	109975	49732	
	95% CI	13051, 45416	66446, 182018	29533, 83746	
Note: N=Number of Subjects. n=Number of subjects with results available at time point. NE=Not Estimable					

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**Table 16. Serum IgG ELISA Area Under the Curve (AUC) Geometric Mean Results with 95% Confidence Intervals by Time Point and Vaccination Group - RBD – Age ≥ 71**

Time Point	Statistic	25 µg mRNA-1273 ≥71 years (N=10)	100 µg mRNA-1273 ≥71 years (N=10)	≥71 years (N=20)	Convalescent Sera
<b>Day 1 (Pre-Vaccination 1)</b>	n	10	10	20	41
	GM	1	6	3	4222
	95% CI	0, 5	1, 24	1, 7	2021, 8819
<b>Day 15 (14 Days Post Vaccination 1)</b>	n	10	10	20	
	GM	317	3007	977	
	95% CI	122, 825	1219, 7417	438, 2177	
<b>Day 29 Post Vaccination 1 (Pre-Vaccination 2)</b>	n	10	10	20	
	GM	2354	8229	4402	
	95% CI	935, 5927	4332, 15630	2443, 7930	
<b>Day 36 Post Vaccination 1 (7 Days Post Vaccination 2)</b>	n	10	10	20	
	GM	44554	153562	82716	
	95% CI	24426, 81270	72220, 326519	48872, 139996	
<b>Day 43 Post Vaccination 1 (14 Days Post Vaccination 2)</b>	n	10	10	20	
	GM	48343	111806	73519	
	95% CI	26849, 87043	69029, 181092	49418, 109374	
<b>Day 57 Post Vaccination 1 (28 Days Post Vaccination 2)</b>	n	10	10	20	
	GM	41781	95909	63302	
	95% CI	23064, 75689	57611, 159664	42220, 94912	
Note: N=Number of Subjects. n=Number of subjects with results available at time point. NE=Not Estimable					

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Data Cutoff Date: 20 August 2020

**Table 17. Serum IgG ELISA Area Under the Curve (AUC) Geometric Fold Rise (GMFR) and 4-Fold Rise Results by Time Point and Vaccination Group - RBD – Age 18-55**

Time Point	Statistic	25 µg mRNA-1273 18-55 years (N=15)	100 µg mRNA-1273 18-55 years (N=15)	250 µg mRNA-1273 18-55 years (N=15)	18-55 years (N=45)
<b>Day 15 (14 Days Post Vaccination 1)</b>	n	15	15	15	45
	GMFR <sup>a</sup>	3303	6446.6	1227.7	2967.9
	95% CI	1407.253, 7752.747	2392.284, 17371.725	428.962, 3513.952	1705.998, 5163.224
	4-Fold Rise <sup>b</sup>	15/15 (100%)	15/15 (100%)	15/15 (100%)	45/45 (100%)
	95% CI	78.2%, 100%	78.2%, 100%	78.2%, 100%	92.1%, 100%
<b>Day 29 Post Vaccination 1 (Pre-Vaccination 2)</b>	n	15	15	14	44
	GMFR <sup>a</sup>	11712.5	13861.2	1530.8	6492.4
	95% CI	6299.847, 21775.67	5106.887, 37622.531	521.232, 4495.926	3669.763, 11485.994
	4-Fold Rise <sup>b</sup>	15/15 (100%)	15/15 (100%)	14/14 (100%)	44/44 (100%)
	95% CI	78.2%, 100%	78.2%, 100%	76.8%, 100%	92%, 100%
<b>Day 36 Post Vaccination 1 (7 Days Post Vaccination 2)</b>	n	13	15	14	42
	GMFR <sup>a</sup>	242797.8	144272.7	17495.1	83894.3
	95% CI	167055.334, 352881.711	57782.398, 360224.231	5949.763, 51443.577	47006.544, 149729.2
	4-Fold Rise <sup>b</sup>	13/13 (100%)	15/15 (100%)	14/14 (100%)	42/42 (100%)
	95% CI	75.3%, 100%	78.2%, 100%	76.8%, 100%	91.6%, 100%
<b>Day 43 Post Vaccination 1 (14 Days Post Vaccination 2)</b>	n	13	14	14	41
	GMFR <sup>a</sup>	252840.4	182400.6	14833.2	85875.6
	95% CI	164562.484, 388474.008	63232.542, 526152.966	5002.234, 43985.075	45483.288, 162139.013
	4-Fold Rise <sup>b</sup>	13/13 (100%)	14/14 (100%)	14/14 (100%)	41/41 (100%)
	95% CI	75.3%, 100%	76.8%, 100%	76.8%, 100%	91.4%, 100%
<b>Day 57 Post Vaccination 1 (28 Days Post Vaccination 2)</b>	n	13	14	14	41
	GMFR <sup>a</sup>	304079.9	136753.2	9907.9	71899.4
	95% CI	196663.913, 470165.358	38437.242, 486544.503	3214.987, 30534.211	35110.856, 147234.152

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Data Cutoff Date: 20 August 2020

Time Point	Statistic	25 µg mRNA-1273 18-55 years (N=15)	100 µg mRNA-1273 18-55 years (N=15)	250 µg mRNA-1273 18-55 years (N=15)	18-55 years (N=45)
	4-Fold Rise <sup>b</sup>	13/13 (100%)	14/14 (100%)	14/14 (100%)	41/41 (100%)
	95% CI	75.3%, 100%	76.8%, 100%	76.8%, 100%	91.4%, 100%

Note: N=Number of Subjects.

<sup>a</sup>GMFR represents the geometric mean fold rise in AUC compared to pre-dose 1

<sup>b</sup>4-Fold Rise represents the percentage of subjects with at least a 4-Fold Rise in AUC compared to pre-dose 1

AUC results reported as 0 were imputed to the lowest non-zero reported value for the purposes of fold-rise calculations.

**Table 18. Serum IgG ELISA Area Under the Curve (AUC) Geometric Fold Rise (GMFR) and 4-Fold Rise Results by Time Point and Vaccination Group - RBD – Age 56-70**

Time Point	Statistic	25 µg mRNA-1273 56-70 years (N=10)	100 µg mRNA-1273 56-70 years (N=10)	56-70 years (N=20)
<b>Day 15 (14 Days Post Vaccination 1)</b>	n	10	10	20
	GMFR <sup>a</sup>	89.5	2849.1	505
	95% CI	6.846, 1170.081	533.109, 15226.08	100.704, 2532.107
	4-Fold Rise <sup>b</sup>	8/10 (80%)	10/10 (100%)	18/20 (90%)
	95% CI	44.4%, 97.5%	69.2%, 100%	68.3%, 98.8%
<b>Day 29 Post Vaccination 1 (Pre-Vaccination 2)</b>	n	10	10	20
	GMFR <sup>a</sup>	347.8	7497.3	1614.7
	95% CI	37.101, 3259.692	1412.603, 39791.469	375.999, 6934.235
	4-Fold Rise <sup>b</sup>	10/10 (100%)	10/10 (100%)	20/20 (100%)
	95% CI	69.2%, 100%	69.2%, 100%	83.2%, 100%
<b>Day 36 Post Vaccination 1 (7 Days Post Vaccination 2)</b>	n	10	9	19
	GMFR <sup>a</sup>	21294.4	179249.6	58413.7
	95% CI	4211.05, 107681.108	46618.695, 689217.73	19616.868, 173939.88
	4-Fold Rise <sup>b</sup>	10/10 (100%)	9/9 (100%)	19/19 (100%)
	95% CI	69.2%, 100%	66.4%, 100%	82.4%, 100%
<b>Day 43 Post Vaccination 1 (14 Days Post Vaccination 2)</b>	n	10	9	19
	GMFR <sup>a</sup>	28288.8	147903.1	61928.7
	95% CI	6621.785, 120852.198	45858.866, 477014.403	24166.763, 158695.706
	4-Fold Rise <sup>b</sup>	10/10 (100%)	9/9 (100%)	19/19 (100%)
	95% CI	69.2%, 100%	66.4%, 100%	82.4%, 100%
<b>Day 57 Post Vaccination 1 (28 Days Post Vaccination 2)</b>	n	10	9	19
	GMFR <sup>a</sup>	16457.8	65402.2	31638.3
	95% CI	4037.599, 67083.981	14720.933, 290569.194	11918.18, 83987.674

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Data Cutoff Date: 20 August 2020

Time Point	Statistic	25 µg mRNA-1273 56-70 years (N=10)	100 µg mRNA-1273 56-70 years (N=10)	56-70 years (N=20)
	4-Fold Rise <sup>b</sup>	10/10 (100%)	9/9 (100%)	19/19 (100%)
	95% CI	69.2%, 100%	66.4%, 100%	82.4%, 100%

Note: N=Number of Subjects.

<sup>a</sup>GMFR represents the geometric mean fold rise in AUC compared to pre-dose 1

<sup>b</sup>4-Fold Rise represents the percentage of subjects with at least a 4-Fold Rise in AUC compared to pre-dose 1

AUC results reported as 0 were imputed to the lowest non-zero reported value for the purposes of fold-rise calculations.

Report Date: 24 September 2020  
Data Cutoff Date: 20 August 2020

**Table 19. Serum IgG ELISA Area Under the Curve (AUC) Geometric Fold Rise (GMFR) and 4-Fold Rise Results by Time Point and Vaccination Group - RBD – Age ≥ 71**

Time Point	Statistic	25 µg mRNA-1273 ≥71 years (N=10)	100 µg mRNA-1273 ≥71 years (N=10)	≥71 years (N=20)
<b>Day 15 (14 Days Post Vaccination 1)</b>	n	10	10	20
	GMFR <sup>a</sup>	626.5	688.3	656.7
	95% CI	94.036, 4174.46	138.787, 3413.586	214.722, 2008.403
	4-Fold Rise <sup>b</sup>	9/10 (90%)	10/10 (100%)	19/20 (95%)
	95% CI	55.5%, 99.7%	69.2%, 100%	75.1%, 99.9%
<b>Day 29 Post Vaccination 1 (Pre-Vaccination 2)</b>	n	10	10	20
	GMFR <sup>a</sup>	4659.7	1884	2962.9
	95% CI	554.772, 39137.681	359.621, 9870.316	862.987, 10172.762
	4-Fold Rise <sup>b</sup>	10/10 (100%)	10/10 (100%)	20/20 (100%)
	95% CI	69.2%, 100%	69.2%, 100%	83.2%, 100%
<b>Day 36 Post Vaccination 1 (7 Days Post Vaccination 2)</b>	n	10	10	20
	GMFR <sup>a</sup>	88208.5	35161.6	55691.6
	95% CI	13191.21, 589843.201	7357.378, 168040.734	17990.124, 172403.18
	4-Fold Rise <sup>b</sup>	10/10 (100%)	10/10 (100%)	20/20 (100%)
	95% CI	69.2%, 100%	69.2%, 100%	83.2%, 100%
<b>Day 43 Post Vaccination 1 (14 Days Post Vaccination 2)</b>	n	10	10	20
	GMFR <sup>a</sup>	95709.6	25600.5	49499.7
	95% CI	14085.922, 650318.174	5177.369, 126586.998	15404.488, 159058.705
	4-Fold Rise <sup>b</sup>	10/10 (100%)	10/10 (100%)	20/20 (100%)
	95% CI	69.2%, 100%	69.2%, 100%	83.2%, 100%
<b>Day 57 Post Vaccination 1 (28 Days Post Vaccination 2)</b>	n	10	10	20
	GMFR <sup>a</sup>	82718.3	21960.5	42620.9
	95% CI	11765.849, 581540.787	4231.851, 113960.787	12932.76, 140460.244

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Time Point	Statistic	25 µg mRNA-1273 ≥71 years (N=10)	100 µg mRNA-1273 ≥71 years (N=10)	≥71 years (N=20)
	4-Fold Rise <sup>b</sup>	10/10 (100%)	10/10 (100%)	20/20 (100%)
	95% CI	69.2%, 100%	69.2%, 100%	83.2%, 100%

Note: N=Number of Subjects.

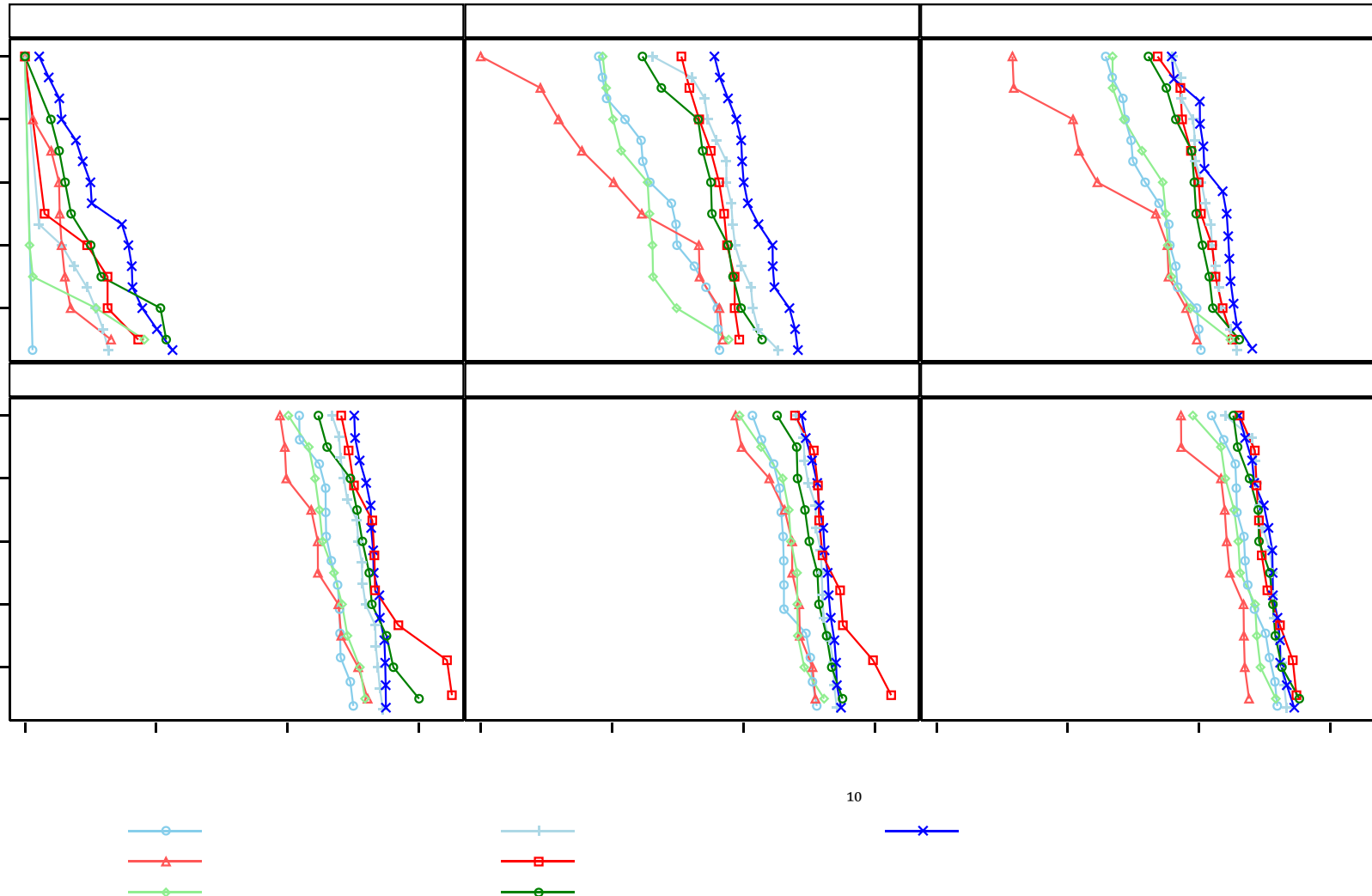
<sup>a</sup>GMFR represents the geometric mean fold rise in AUC compared to pre-dose 1

<sup>b</sup>4-Fold Rise represents the percentage of subjects with at least a 4-Fold Rise in AUC compared to pre-dose 1

AUC results reported as 0 were imputed to the lowest non-zero reported value for the purposes of fold-rise calculations.

Report Date: 24 September 2020  
Data Cutoff Date: 20 August 2020

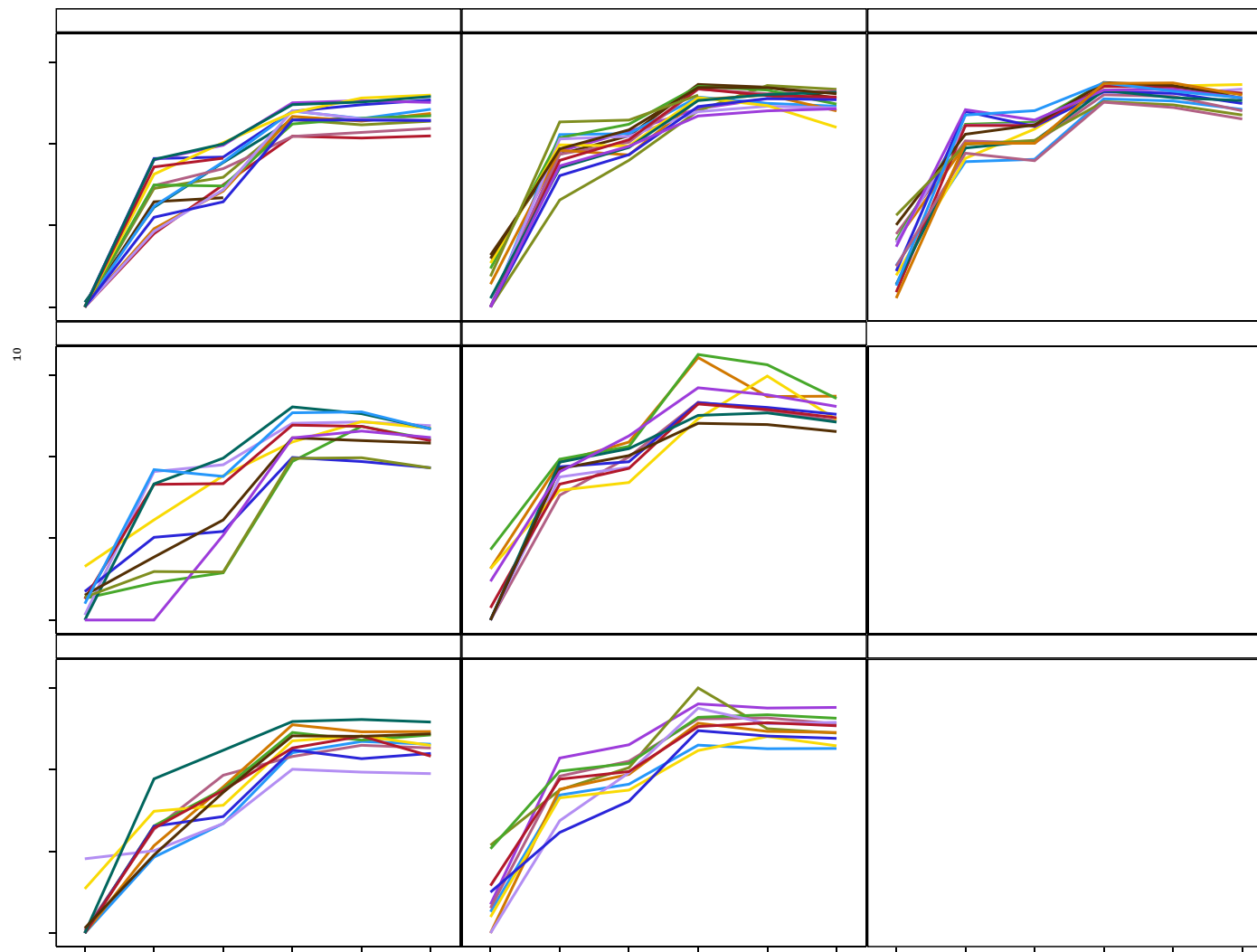
**Figure 16. Reverse Cumulative Distribution of Serum IgG ELISA Area Under the Curve (AUC) Values by Time Point and Vaccination Group – RBD**



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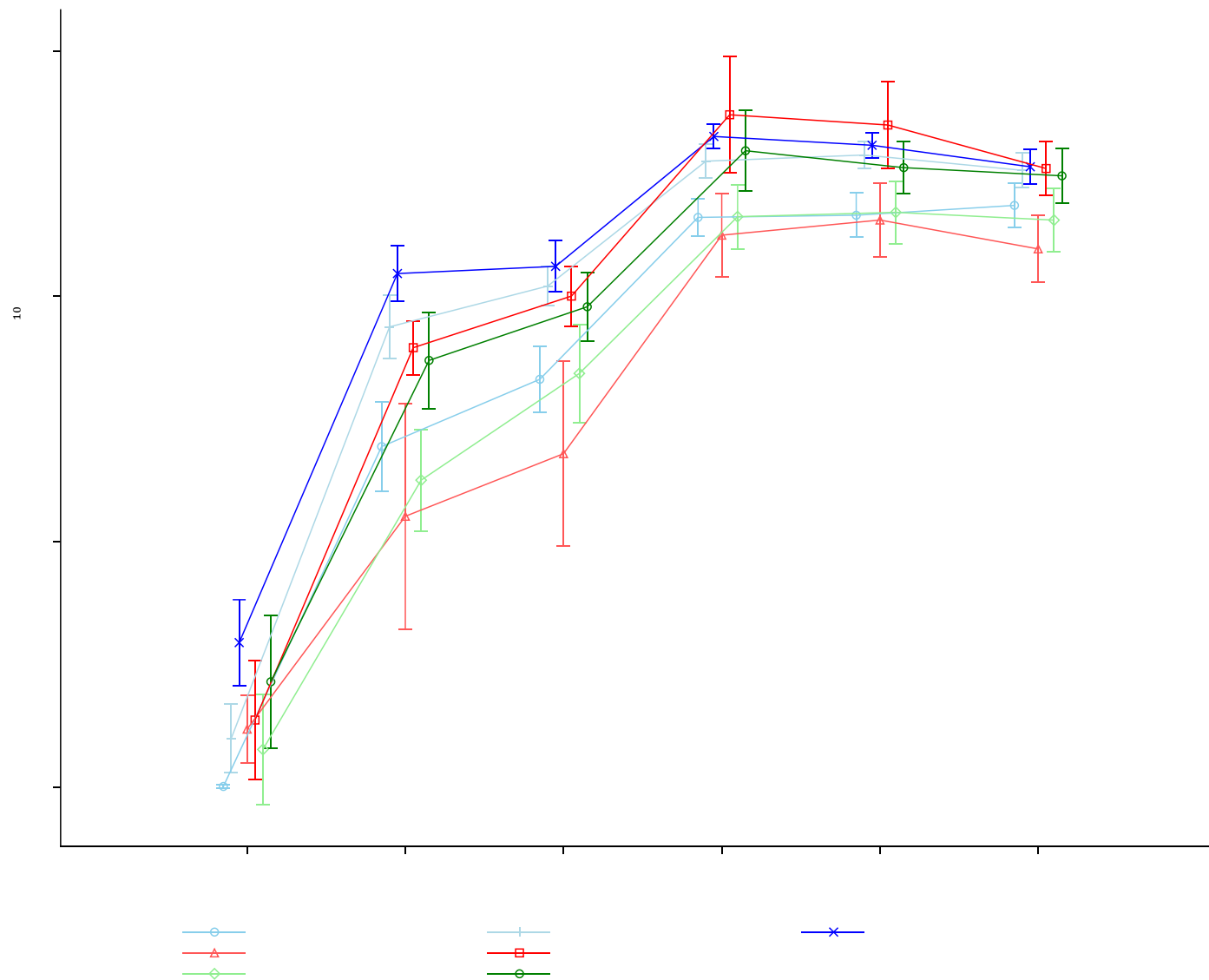
Report Date: 24 September 2020  
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**Figure 17. Serum IgG ELISA Area Under the Curve (AUC) Values by Time Point and Vaccination Group – RBD**



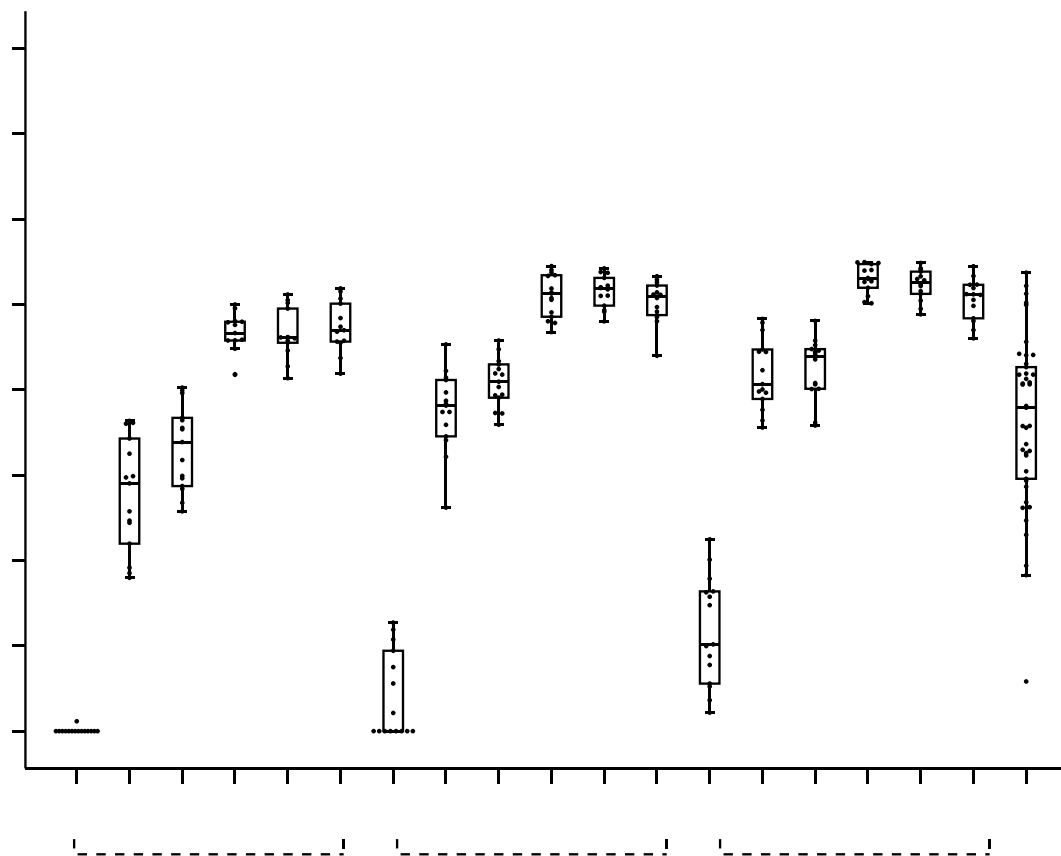
Report Date: 24 September 2020  
Data Cutoff Date: 20 August 2020

**Figure 18. Geometric Mean Area Under the Curve (AUC) Values by Time Point and Vaccination Group – RBD**



Report Date: 24 September 2020  
Data Cutoff Date: 20 August 2020

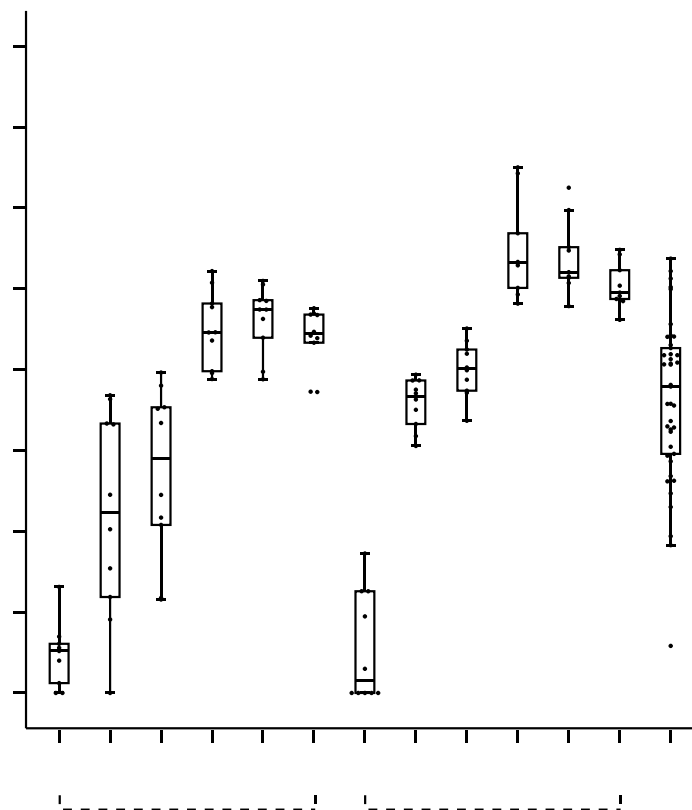
**Figure 19. Serum IgG Area Under the Curve (AUC) Distribution by Time Point and Treatment Group - RBD – Age 18-55**



Note: Boxes and horizontal bars denote interquartile range (IQR) and median AUC, respectively. Whisker endpoints are equal to the maximum and minimum values below or above the median  $\pm 1.5 \times \text{IQR}$ . The convalescent sera panel includes specimens from 41 individuals.

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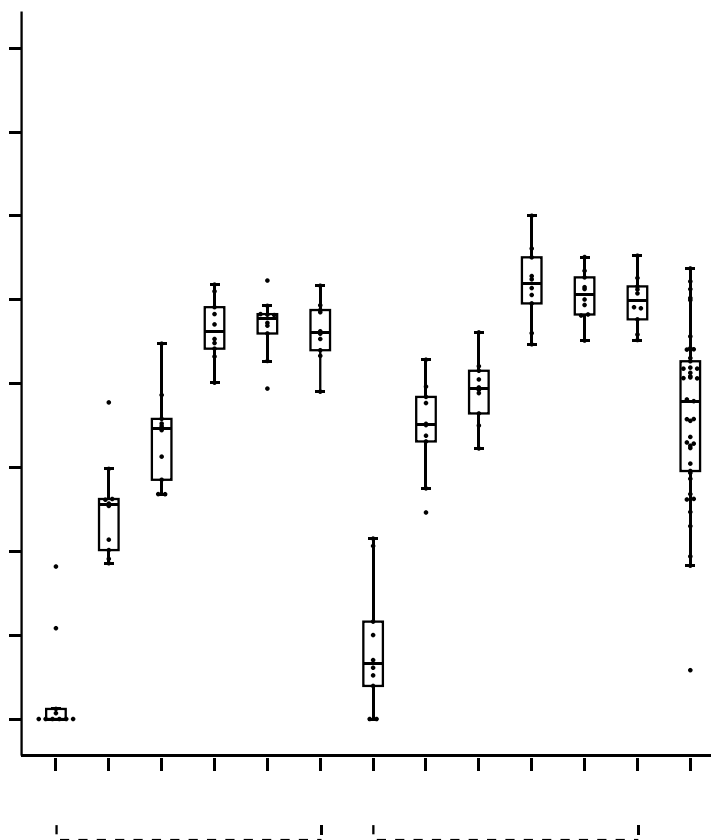
**Figure 20. Serum IgG Area Under the Curve (AUC) Distribution by Time Point and Treatment Group - RBD – Age 56-70**



Note: Boxes and horizontal bars denote interquartile range (IQR) and median AUC, respectively. Whisker endpoints are equal to the maximum and minimum values below or above the median  $\pm 1.5 \times$  IQR. The convalescent sera panel includes specimens from 41 individuals.

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**Figure 21. Serum IgG Area Under the Curve (AUC) Distribution by Time Point and Treatment Group - RBD – Age  $\geq 71$**



Note: Boxes and horizontal bars denote interquartile range (IQR) and median AUC, respectively. Whisker endpoints are equal to the maximum and minimum values below or above the median  $\pm 1.5 \times$  IQR. The convalescent sera panel includes specimens from 41 individuals..

Report Date: 24 September 2020  
Data Cutoff Date: 20 August 2020

**Table 20. Serum IgG ELISA Endpoint Titer Geometric Mean Results with 95% Confidence Intervals by Time Point and Vaccination Group - S-2P – Age 18 -55**

Time Point	Statistic	25 µg mRNA-1273 18-55 years (N=15)	100 µg mRNA-1273 18-55 years (N=15)	250 µg mRNA-1273 18-55 years (N=15)	18-55 years (N=45)	Convalescent Sera
<b>Day 1 (Pre-Vaccination 1)</b>	n	15	15	15	45	41
	GMT	116	131	178	139	138901
	95% CI	72, 187	65, 266	81, 392	97, 200	82876, 232799
<b>Day 15 (14 Days Post Vaccination 1)</b>	n	15	15	15	45	
	GMT	32261	86291	163449	76914	
	95% CI	18723, 55587	56403, 132016	102155, 261520	55501, 106589	
<b>Day 29 Post Vaccination 1 (Pre-Vaccination 2)</b>	n	15	15	14	44	
	GMT	40227	109209	213526	96171	
	95% CI	29094, 55621	79051, 150874	128832, 353896	71714, 128970	
<b>Day 36 Post Vaccination 1 (7 Days Post Vaccination 2)</b>	n	13	15	14	42	
	GMT	391018	781399	1261975	739945	
	95% CI	267402, 571780	606247, 1007156	973972, 1635140	596437, 917981	
<b>Day 43 Post Vaccination 1 (14 Days Post Vaccination 2)</b>	n	13	14	14	41	
	GMT	379764	811119	994629	683647	
	95% CI	281597, 512152	656336, 1002404	806189, 1227115	569970, 819997	
<b>Day 57 Post Vaccination 1 (28 Days Post Vaccination 2)</b>	n	13	14	14	41	
	GMT	299751	782719	1255376	678411	
	95% CI	206070, 436020	619310, 989244	969516, 1625521	532301, 864625	
Note: N=Number of Subjects. n=Number of subjects with results available at time point. NE=Not Estimable						

Report Date: 24 September 2020  
Data Cutoff Date: 20 August 2020

**Table 21. Serum IgG ELISA Endpoint Titer Geometric Mean Results with 95% Confidence Intervals by Time Point and Vaccination Group - S-2P – Age 56-70**

Time Point	Statistic	25 µg mRNA-1273 56-70 years (N=10)	100 µg mRNA-1273 56-70 years (N=10)	56-70 years (N=20)	Convalescent Sera
<b>Day 1 (Pre-Vaccination 1)</b>	n	10	10	20	41
	GMT	189	655	352	138901
	95% CI	76, 466	270, 1591	185, 669	82876, 232799
<b>Day 15 (14 Days Post Vaccination 1)</b>	n	10	10	20	
	GMT	10509	55532	24157	
	95% CI	2841, 38868	40611, 75935	11693, 49907	
<b>Day 29 Post Vaccination 1 (Pre-Vaccination 2)</b>	n	10	10	20	
	GMT	17684	115831	45259	
	95% CI	5300, 59001	73288, 183069	21699, 94400	
<b>Day 36 Post Vaccination 1 (7 Days Post Vaccination 2)</b>	n	10	9	19	
	GMT	313720	5033017	1168065	
	95% CI	160451, 613395	1113760, 22743909	436154, 3128199	
<b>Day 43 Post Vaccination 1 (14 Days Post Vaccination 2)</b>	n	10	9	19	
	GMT	476136	1305996	767899	
	95% CI	263956, 858874	581138, 2934971	463073, 1273383	
<b>Day 57 Post Vaccination 1 (28 Days Post Vaccination 2)</b>	n	10	9	19	
	GMT	323945	1183066	598324	
	95% CI	182202, 575958	379698, 3686201	317020, 1129240	

Note: N=Number of Subjects.  
n=Number of subjects with results available at time point.  
NE=Not Estimable

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Data Cutoff Date: 20 August 2020

**Table 22. Serum IgG ELISA Geometric Mean Titer (GMT) Results with 95% Confidence Intervals by Time Point and Vaccination Group - S-2P - ≥71 Years**

Time Point	Statistic	25 µg mRNA-1273 ≥71 years (N=10)	100 µg mRNA-1273 ≥71 years (N=10)	≥71 years (N=20)	Convalescent Sera
<b>Day 1 (Pre-Vaccination 1)</b>	n	10	10	20	41
	GMT	111	953	325	138901
	95% CI	55, 222	493, 1842	166, 637	82876, 232799
<b>Day 15 (14 Days Post Vaccination 1)</b>	n	10	10	20	
	GMT	14837	104909	39453	
	95% CI	6925, 31787	22445, 490343	15949, 97595	
<b>Day 29 Post Vaccination 1 (Pre-Vaccination 2)</b>	n	10	10	20	
	GMT	57986	203365	108592	
	95% CI	31452, 106905	97384, 424686	64181, 183735	
<b>Day 36 Post Vaccination 1 (7 Days Post Vaccination 2)</b>	n	10	10	20	
	GMT	460094	2636979	1101480	
	95% CI	272951, 775548	1072782, 6481893	587531, 2065013	
<b>Day 43 Post Vaccination 1 (14 Days Post Vaccination 2)</b>	n	10	10	20	
	GMT	303630	8091439	1567419	
	95% CI	167743, 549597	2546249, 25712881	587315, 4183113	
<b>Day 57 Post Vaccination 1 (28 Days Post Vaccination 2)</b>	n	10	10	20	
	GMT	1128391	3638522	2026246	
	95% CI	636087, 2001717	1316233, 10058130	1116452, 3677432	
Note: N=Number of Subjects. n=Number of subjects with results available at time point. NE=Not Estimable					

Report Date: 24 September 2020  
Data Cutoff Date: 20 August 2020

**Table 23. Serum IgG ELISA Geometric Mean Fold Rise (GMFR) and 4-Fold Rise Results by Time Point and Vaccination Group - Vaccination Group - S-2P – Age 18-55**

Time Point	Statistic	25 µg mRNA-1273 18-55 years (N=15)	100 µg mRNA-1273 18-55 years (N=15)	250 µg mRNA-1273 18-55 years (N=15)	18-55 years (N=45)
<b>Day 15 (14 Days Post Vaccination 1)</b>	n	15	15	15	45
	GMFR <sup>a</sup>	278.9	656.6	915.8	551.4
	95% CI	120.712, 644.309	327.061, 1318.056	418.821, 2002.329	355.95, 854.284
	4-Fold Rise <sup>b</sup>	15/15 (100%)	15/15 (100%)	15/15 (100%)	45/45 (100%)
	95% CI	78.2%, 100%	78.2%, 100%	78.2%, 100%	92.1%, 100%
<b>Day 29 Post Vaccination 1 (Pre-Vaccination 2)</b>	n	15	15	14	44
	GMFR <sup>a</sup>	347.7	831	1259.5	704.8
	95% CI	170.898, 707.61	379.435, 1819.776	533.04, 2975.799	451.213, 1100.94
	4-Fold Rise <sup>b</sup>	15/15 (100%)	15/15 (100%)	14/14 (100%)	44/44 (100%)
	95% CI	78.2%, 100%	78.2%, 100%	76.8%, 100%	92%, 100%
<b>Day 36 Post Vaccination 1 (7 Days Post Vaccination 2)</b>	n	13	15	14	42
	GMFR <sup>a</sup>	2971	5945.5	7443.6	5169.7
	95% CI	1440.586, 6127.2	2824.739, 12514.226	3258.379, 17004.433	3389.28, 7885.372
	4-Fold Rise <sup>b</sup>	13/13 (100%)	15/15 (100%)	14/14 (100%)	42/42 (100%)
	95% CI	75.3%, 100%	78.2%, 100%	76.8%, 100%	91.6%, 100%
<b>Day 43 Post Vaccination 1 (14 Days Post Vaccination 2)</b>	n	13	14	14	41
	GMFR <sup>a</sup>	2885.5	6381.4	5866.7	4821.1
	95% CI	1489.891, 5588.303	2845.746, 14310.027	2489.211, 13826.839	3142.765, 7395.869
	4-Fold Rise <sup>b</sup>	13/13 (100%)	14/14 (100%)	14/14 (100%)	41/41 (100%)
	95% CI	75.3%, 100%	76.8%, 100%	76.8%, 100%	91.4%, 100%
<b>Day 57 Post Vaccination 1 (28 Days Post Vaccination 2)</b>	n	13	14	14	41
	GMFR <sup>a</sup>	2277.5	6158	7404.7	4784.2
	95% CI	1061.856, 4884.982	3200.137, 11849.779	2850.706, 19233.461	3043.863, 7519.641

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Data Cutoff Date: 20 August 2020

Time Point	Statistic	25 µg mRNA-1273 18-55 years (N=15)	100 µg mRNA-1273 18-55 years (N=15)	250 µg mRNA-1273 18-55 years (N=15)	18-55 years (N=45)
	4-Fold Rise <sup>b</sup>	13/13 (100%)	14/14 (100%)	14/14 (100%)	41/41 (100%)
	95% CI	75.3%, 100%	76.8%, 100%	76.8%, 100%	91.4%, 100%

Note: N=Number of Subjects.

<sup>a</sup>GMFR represents the geometric mean fold rise in AUC compared to pre-dose 1

<sup>b</sup>4-Fold Rise represents the percentage of subjects with at least a 4-Fold Rise in AUC compared to pre-dose 1

AUC results reported as 0 were imputed to the lowest non-zero reported value for the purposes of fold-rise calculations.

**Table 24. Serum IgG ELISA Geometric Mean Fold Rise (GMFR) and 4-Fold Rise Results by Time Point and Vaccination Group - Vaccination Group - S-2P – Age 56-70**

Time Point	Statistic	25 µg mRNA-1273 56-70 years (N=10)	100 µg mRNA-1273 56-70 years (N=10)	56-70 years (N=20)
<b>Day 15 (14 Days Post Vaccination 1)</b>	n	10	10	20
	GMFR <sup>a</sup>	55.7	84.7	68.7
	95% CI	9.591, 323.362	33.769, 212.561	27.943, 168.855
	4-Fold Rise <sup>b</sup>	9/10 (90%)	10/10 (100%)	19/20 (95%)
	95% CI	55.5%, 99.7%	69.2%, 100%	75.1%, 99.9%
<b>Day 29 Post Vaccination 1 (Pre-Vaccination 2)</b>	n	10	10	20
	GMFR <sup>a</sup>	93.7	176.7	128.7
	95% CI	16.087, 545.965	61.08, 511.281	50.321, 329.111
	4-Fold Rise <sup>b</sup>	10/10 (100%)	10/10 (100%)	20/20 (100%)
	95% CI	69.2%, 100%	69.2%, 100%	83.2%, 100%
<b>Day 36 Post Vaccination 1 (7 Days Post Vaccination 2)</b>	n	10	9	19
	GMFR <sup>a</sup>	1662.5	7919.9	3482.6
	95% CI	445.872, 6199.194	960.785, 65284.929	1104.094, 10985.112
	4-Fold Rise <sup>b</sup>	10/10 (100%)	9/9 (100%)	19/19 (100%)
	95% CI	69.2%, 100%	66.4%, 100%	82.4%, 100%
<b>Day 43 Post Vaccination 1 (14 Days Post Vaccination 2)</b>	n	10	9	19
	GMFR <sup>a</sup>	2523.3	2055.1	2289.5
	95% CI	856.026, 7437.66	391.227, 10795.348	963.767, 5438.929
	4-Fold Rise <sup>b</sup>	10/10 (100%)	9/9 (100%)	19/19 (100%)
	95% CI	69.2%, 100%	66.4%, 100%	82.4%, 100%
<b>Day 57 Post Vaccination 1 (28 Days Post Vaccination 2)</b>	n	10	9	19
	GMFR <sup>a</sup>	1716.7	1861.7	1783.9
	95% CI	428.352, 6880.259	306.421, 11310.5	654.076, 4865.439

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Time Point	Statistic	25 µg mRNA-1273 56-70 years (N=10)	100 µg mRNA-1273 56-70 years (N=10)	56-70 years (N=20)
	4-Fold Rise <sup>b</sup>	10/10 (100%)	9/9 (100%)	19/19 (100%)
	95% CI	69.2%, 100%	66.4%, 100%	82.4%, 100%

Note: N=Number of Subjects.

<sup>a</sup>GMFR represents the geometric mean fold rise in AUC compared to pre-dose 1

<sup>b</sup>4-Fold Rise represents the percentage of subjects with at least a 4-Fold Rise in AUC compared to pre-dose 1

AUC results reported as 0 were imputed to the lowest non-zero reported value for the purposes of fold-rise calculations.

Report Date: 24 September 2020  
Data Cutoff Date: 20 August 2020

**Table 25. Serum IgG ELISA Geometric Mean Fold Rise (GMFR) and 4-Fold Rise Results by Time Point and Vaccination Group - Vaccination Group - S-2P - ≥71 Years**

Time Point	Statistic	25 µg mRNA-1273 ≥71 years (N=10)	100 µg mRNA-1273 ≥71 years (N=10)	≥71 years (N=20)
<b>Day 15 (14 Days Post Vaccination 1)</b>	n	10	10	20
	GMFR <sup>a</sup>	133.7	110	121.3
	95% CI	54.367, 328.996	31.725, 381.607	60.671, 242.545
	4-Fold Rise <sup>b</sup>	10/10 (100%)	10/10 (100%)	20/20 (100%)
	95% CI	69.2%, 100%	69.2%, 100%	83.2%, 100%
<b>Day 29 Post Vaccination 1 (Pre-Vaccination 2)</b>	n	10	10	20
	GMFR <sup>a</sup>	522.7	213.3	333.9
	95% CI	177.45, 1539.595	102.234, 444.994	178.442, 624.768
	4-Fold Rise <sup>b</sup>	10/10 (100%)	10/10 (100%)	20/20 (100%)
	95% CI	69.2%, 100%	69.2%, 100%	83.2%, 100%
<b>Day 36 Post Vaccination 1 (7 Days Post Vaccination 2)</b>	n	10	10	20
	GMFR <sup>a</sup>	4147.3	2765.7	3386.8
	95% CI	1610.973, 10676.865	796.806, 9599.661	1664.328, 6891.78
	4-Fold Rise <sup>b</sup>	10/10 (100%)	10/10 (100%)	20/20 (100%)
	95% CI	69.2%, 100%	69.2%, 100%	83.2%, 100%
<b>Day 43 Post Vaccination 1 (14 Days Post Vaccination 2)</b>	n	10	10	20
	GMFR <sup>a</sup>	2736.9	8486.4	4819.4
	95% CI	913.801, 8197.41	2252.854, 31967.873	2119.994, 10956.024
	4-Fold Rise <sup>b</sup>	10/10 (100%)	10/10 (100%)	20/20 (100%)
	95% CI	69.2%, 100%	69.2%, 100%	83.2%, 100%
<b>Day 57 Post Vaccination 1 (28 Days Post Vaccination 2)</b>	n	10	10	20
	GMFR <sup>a</sup>	10171.4	3816.1	6230.2
	95% CI	3722.344, 27793.388	1263.313, 11527.479	3054.526, 12707.435

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Time Point	Statistic	25 µg mRNA-1273 ≥71 years (N=10)	100 µg mRNA-1273 ≥71 years (N=10)	≥71 years (N=20)
	4-Fold Rise <sup>b</sup>	10/10 (100%)	10/10 (100%)	20/20 (100%)
	95% CI	69.2%, 100%	69.2%, 100%	83.2%, 100%

Note: N=Number of Subjects.

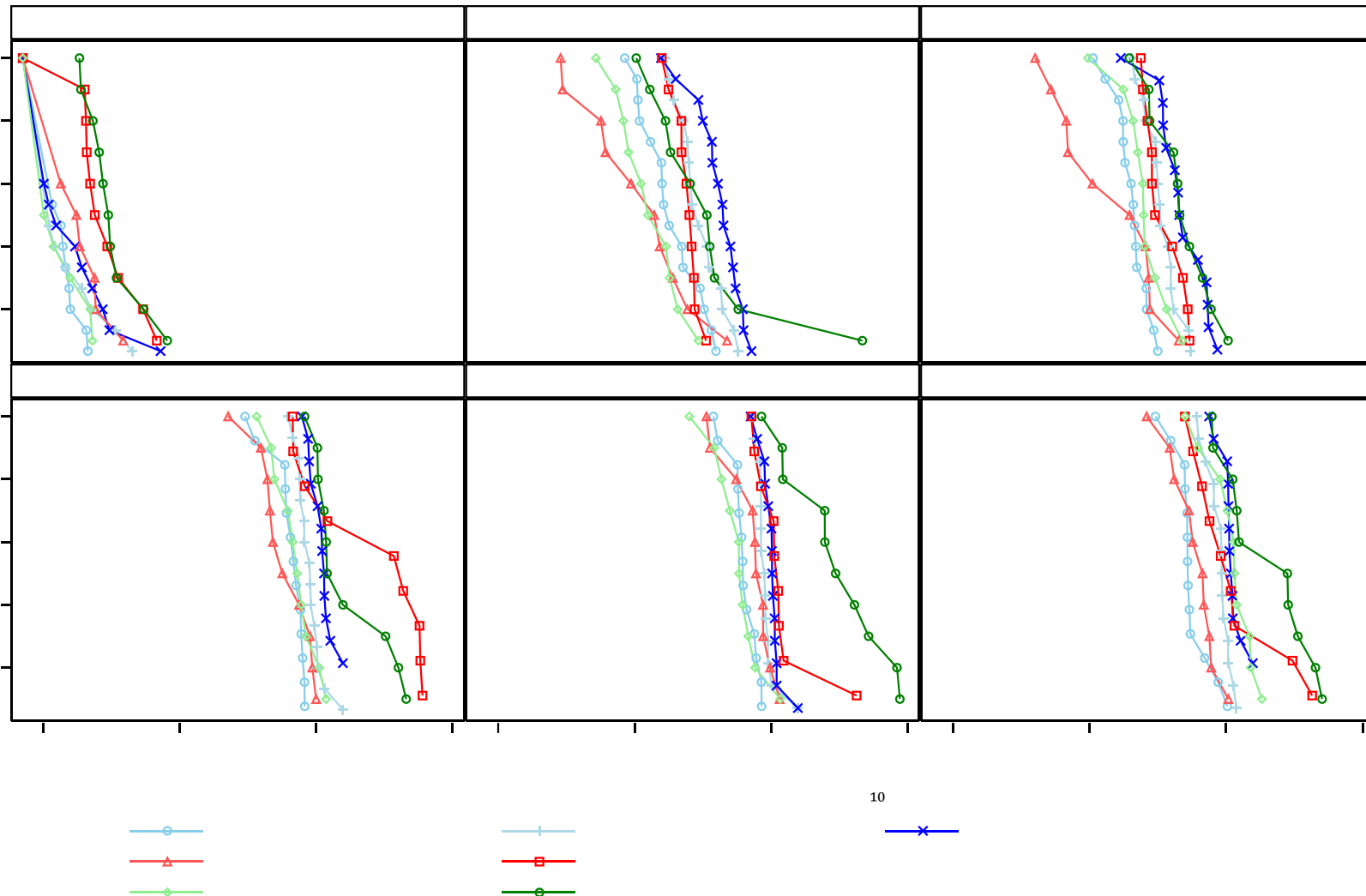
<sup>a</sup>GMFR represents the geometric mean fold rise in AUC compared to pre-dose 1

<sup>b</sup>4-Fold Rise represents the percentage of subjects with at least a 4-Fold Rise in AUC compared to pre-dose 1

AUC results reported as 0 were imputed to the lowest non-zero reported value for the purposes of fold-rise calculations.

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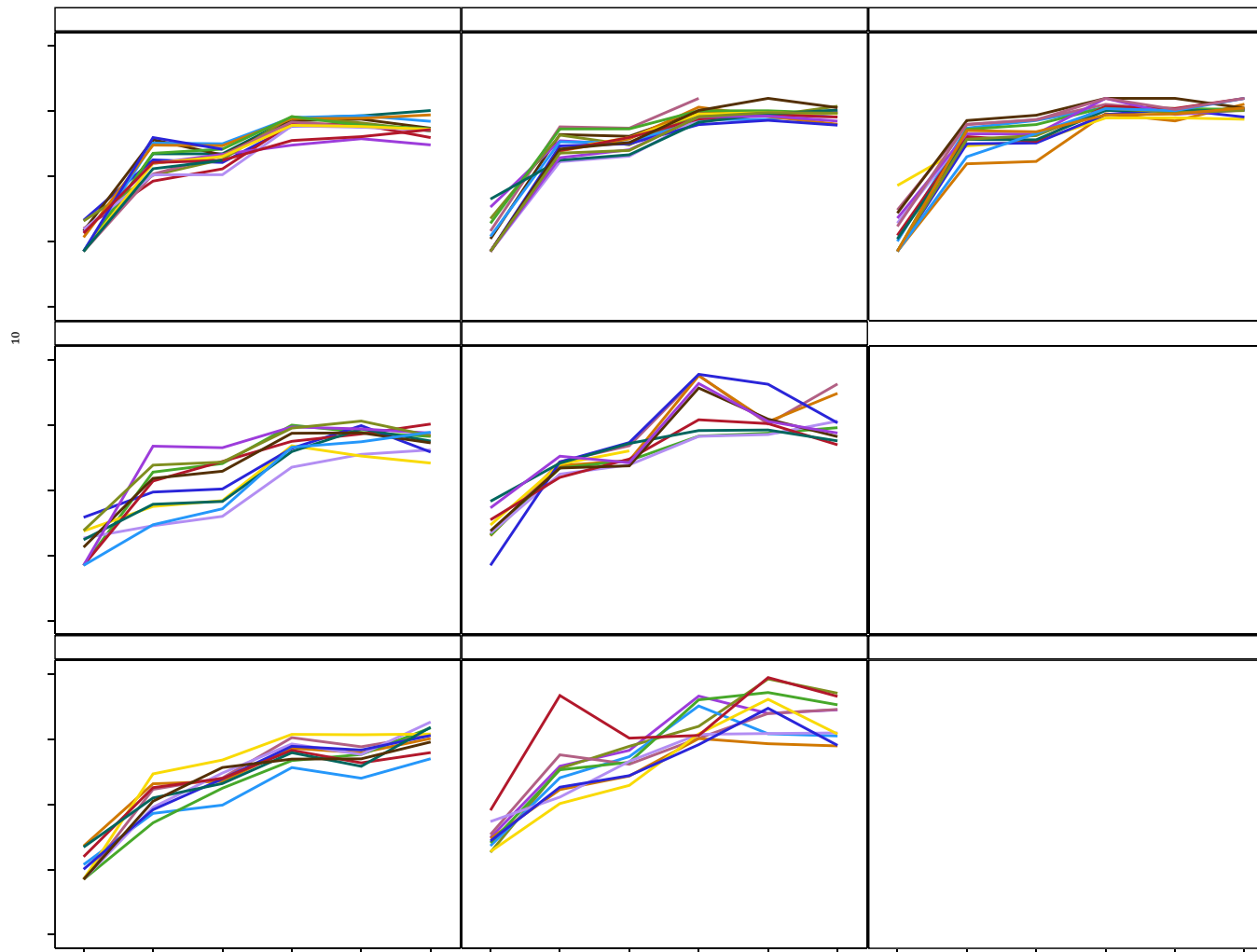
**Figure 22. Reverse Cumulative Distribution of Serum IgG ELISA Endpoint Titer Values by Time Point and Vaccination Group - S-2P**



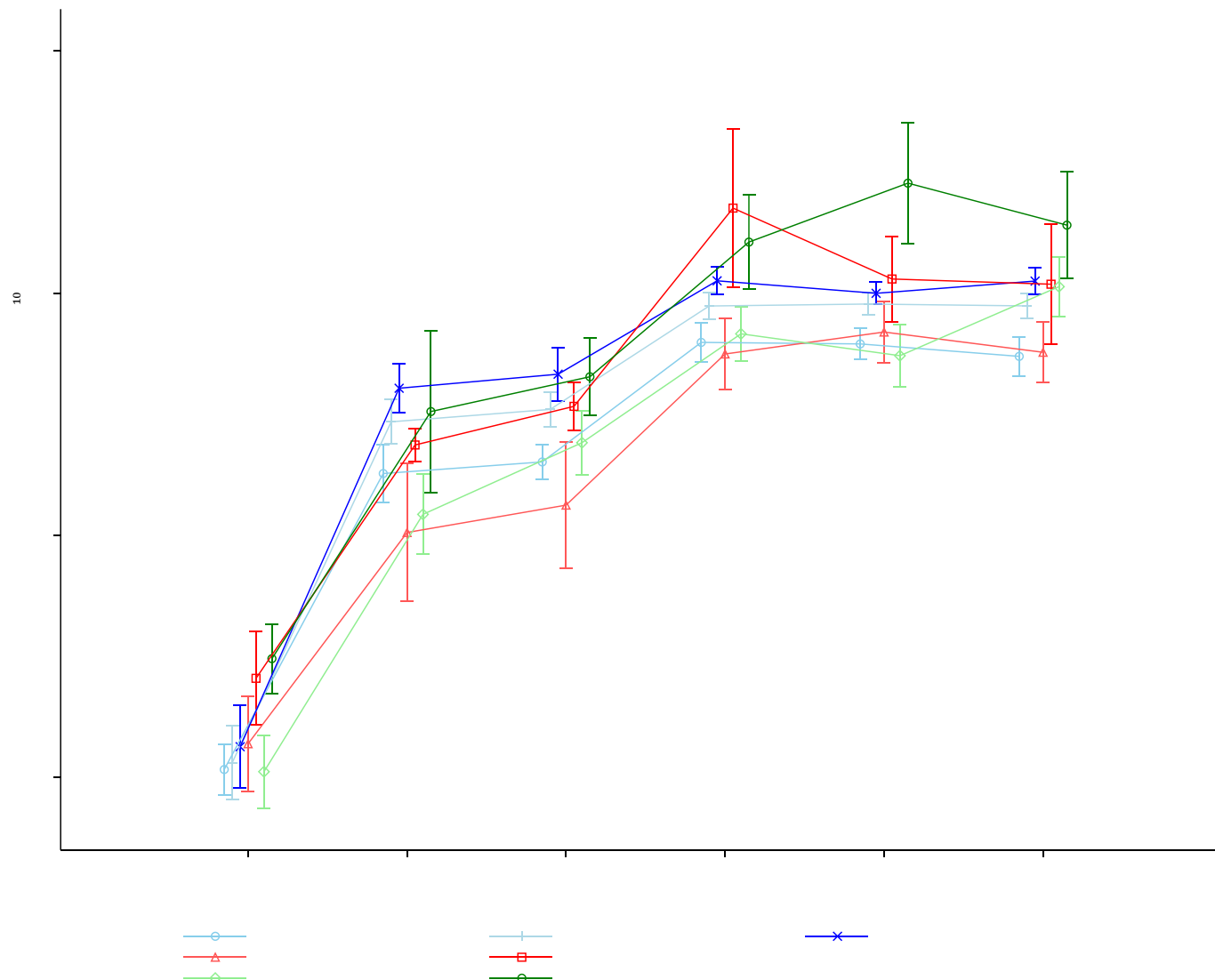
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**Figure 23. Serum IgG ELISA Endpoint Titer Values by Time Point and Vaccination Group - S-2P**

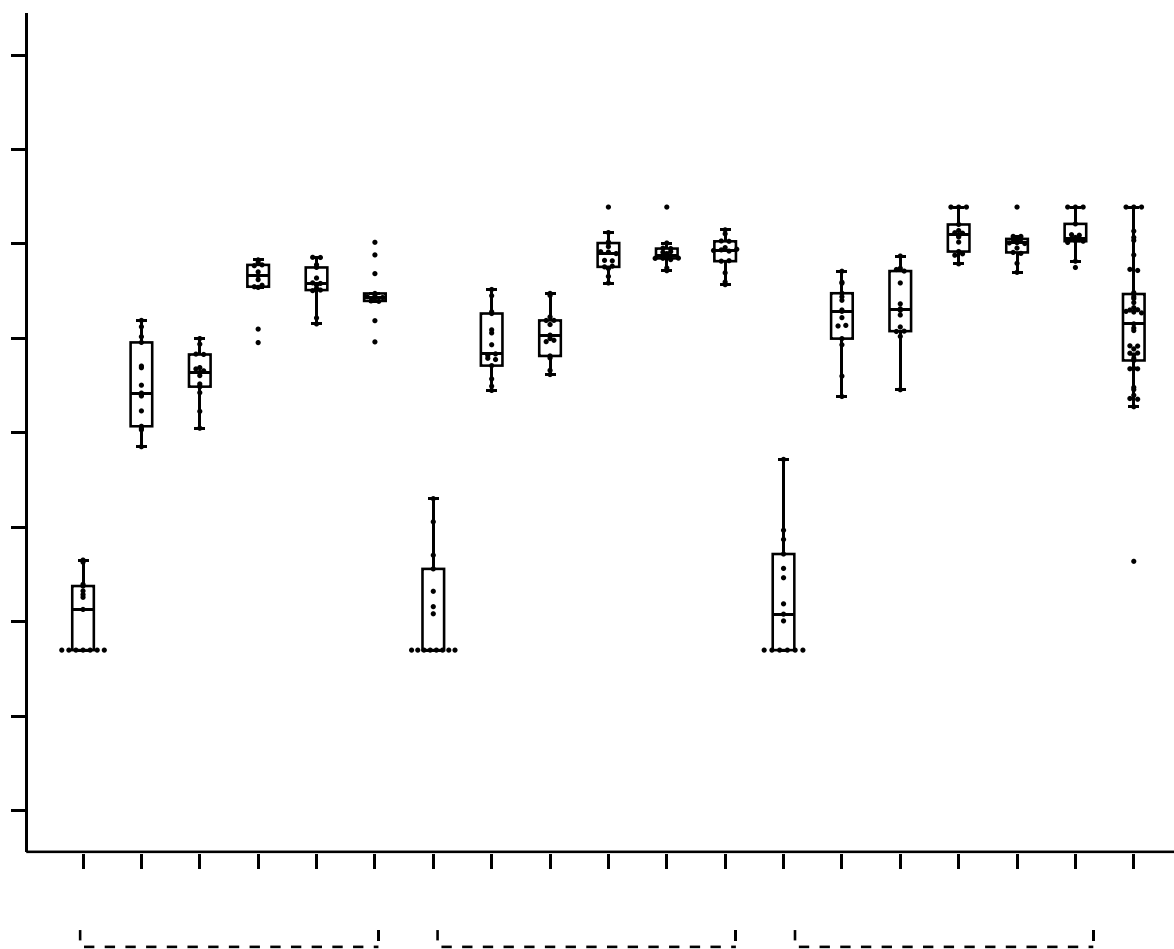


**Figure 24. Geometric Mean Endpoint Titer Values by Time Point and Vaccination Group - S-2P**



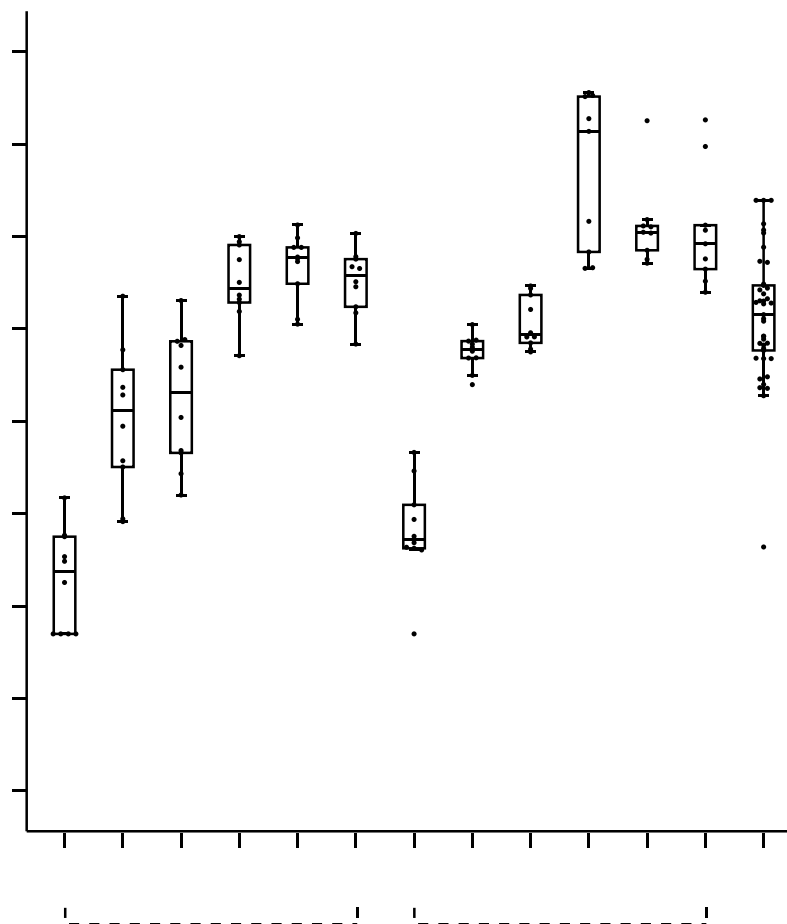
Report Date: 24 September 2020  
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**Figure 25. Serum IgG ELISA Endpoint Titer Distribution by Time Point and Treatment Group - S-2P – Age 18-55**



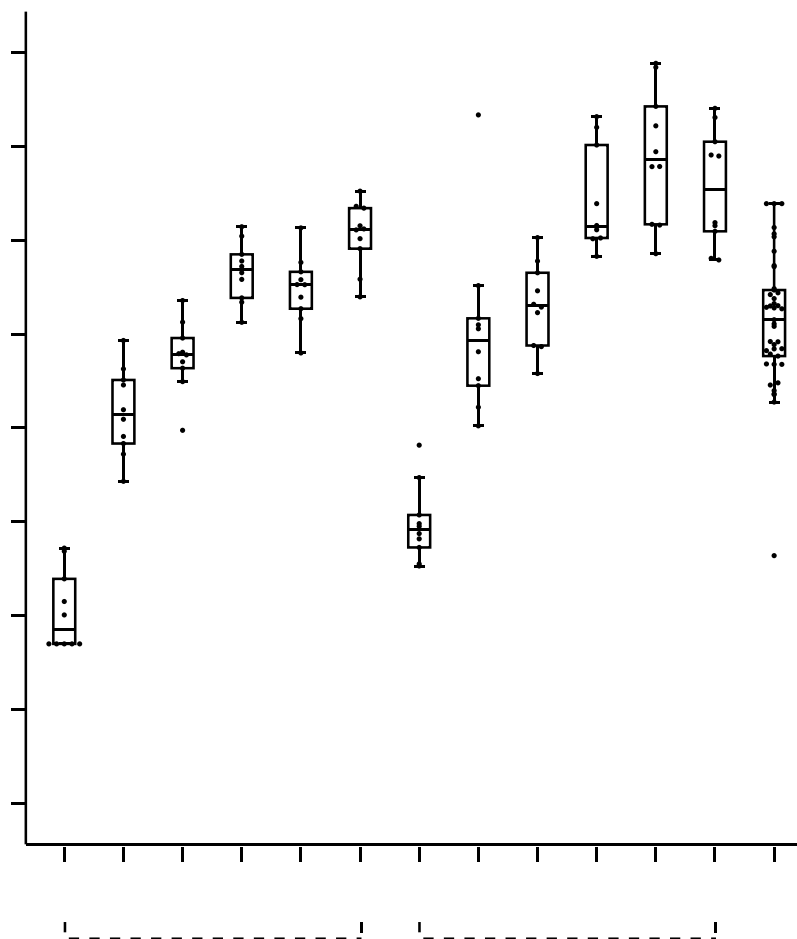
Report Date: 24 September 2020  
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**Figure 26. Serum IgG ELISA Endpoint Titer Distribution by Time Point and Treatment Group - S-2P – Age 56-70**



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Data Cutoff Date: 20 August 2020

**Figure 27. Serum IgG ELISA Endpoint Titer Distribution by Time Point and Treatment Group - S-2P -  $\geq 71$  Years**



Report Date: 24 September 2020  
Data Cutoff Date: 20 August 2020

**Table 26. Serum IgG ELISA Endpoint Titer Geometric Mean Results with 95% Confidence Intervals by Time Point and Vaccination Group - RBD – Age 18-55**

Time Point	Statistic	25 µg mRNA-1273 18-55 years (N=15)	100 µg mRNA-1273 18-55 years (N=15)	250 µg mRNA-1273 18-55 years (N=15)	18-55 years (N=45)	Convalescent Sera
<b>Day 1 (Pre-Vaccination 1)</b>	n	15	15	15	45	41
	GMT	56	166	576	174	37244
	95% CI	44, 70	82, 337	349, 949	117, 260	20170, 68771
<b>Day 15 (14 Days Post Vaccination 1)</b>	n	15	15	15	45	
	GMT	6567	34073	87480	26950	
	95% CI	3651, 11813	21688, 53531	51868, 147544	17577, 41322	
<b>Day 29 Post Vaccination 1 (Pre-Vaccination 2)</b>	n	15	15	14	44	
	GMT	18149	93231	120088	57844	
	95% CI	11091, 29700	59895, 145123	71013, 203077	40174, 83285	
<b>Day 36 Post Vaccination 1 (7 Days Post Vaccination 2)</b>	n	13	15	14	42	
	GMT	208652	499539	720907	430841	
	95% CI	142803, 304864	400950, 622370	591860, 878090	347866, 533608	
<b>Day 43 Post Vaccination 1 (14 Days Post Vaccination 2)</b>	n	13	14	14	41	
	GMT	233264	558905	644395	444753	
	95% CI	164756, 330259	462908, 674810	495808, 837510	364027, 543382	
<b>Day 57 Post Vaccination 1 (28 Days Post Vaccination 2)</b>	n	13	14	14	41	
	GMT	183652	371271	564241	342635	
	95% CI	122763, 274741	266721, 516804	396948, 802039	269634, 435401	
Note: N=Number of Subjects. n=Number of subjects with results available at time point. NE=Not Estimable						

Report Date: 24 September 2020  
Data Cutoff Date: 20 August 2020

**Table 27. Serum IgG ELISA Endpoint Titer Geometric Mean Results with 95% Confidence Intervals by Time Point and Vaccination Group - RBD – Age 56-70**

Time Point	Statistic	25 µg mRNA-1273 56-70 years (N=10)	100 µg mRNA-1273 56-70 years (N=10)	56-70 years (N=20)	Convalescent Sera
<b>Day 1 (Pre-Vaccination 1)</b>	n	10	10	20	41
	GMT	204	223	213	37244
	95% CI	114, 365	64, 775	115, 396	20170, 68771
<b>Day 15 (14 Days Post Vaccination 1)</b>	n	10	10	20	
	GMT	2924	30981	9518	
	95% CI	576, 14833	15901, 60362	3599, 25173	
<b>Day 29 Post Vaccination 1 (Pre-Vaccination 2)</b>	n	10	10	20	
	GMT	4841	45690	14872	
	95% CI	1531, 15304	26314, 79330	6764, 32701	
<b>Day 36 Post Vaccination 1 (7 Days Post Vaccination 2)</b>	n	10	9	19	
	GMT	198643	1471882	512960	
	95% CI	98719, 399707	560108, 3867893	249526, 1054511	
<b>Day 43 Post Vaccination 1 (14 Days Post Vaccination 2)</b>	n	10	9	19	
	GMT	201496	1005639	431500	
	95% CI	115918, 350251	445521, 2269948	240191, 775186	
<b>Day 57 Post Vaccination 1 (28 Days Post Vaccination 2)</b>	n	10	9	19	
	GMT	78045	506364	189249	
	95% CI	42847, 142159	235654, 1088051	100734, 355540	

Note: N=Number of Subjects.  
n=Number of subjects with results available at time point.  
NE=Not Estimable

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**Table 28. Serum IgG ELISA Geometric Mean Titer (GMT) Results with 95% Confidence Intervals by Time Point and Vaccination Group - RBD – ≥71 Years**

Time Point	Statistic	25 µg mRNA-1273 ≥71 years (N=10)	100 µg mRNA-1273 ≥71 years (N=10)	≥71 years (N=20)	Convalescent Sera
<b>Day 1 (Pre-Vaccination 1)</b>	n	10	10	20	41
	GMT	111	503	237	37244
	95% CI	46, 270	174, 1455	115, 486	20170, 68771
<b>Day 15 (14 Days Post Vaccination 1)</b>	n	10	10	20	
	GMT	4676	25670	10956	
	95% CI	2236, 9777	12394, 53168	5891, 20375	
<b>Day 29 Post Vaccination 1 (Pre-Vaccination 2)</b>	n	10	10	20	
	GMT	15338	56343	29397	
	95% CI	7085, 33203	35052, 90567	17583, 49151	
<b>Day 36 Post Vaccination 1 (7 Days Post Vaccination 2)</b>	n	10	10	20	
	GMT	160591	711752	338084	
	95% CI	82611, 312177	368657, 1374153	194597, 587372	
<b>Day 43 Post Vaccination 1 (14 Days Post Vaccination 2)</b>	n	10	10	20	
	GMT	295194	694471	452773	
	95% CI	167293, 520878	465032, 1037111	311369, 658393	
<b>Day 57 Post Vaccination 1 (28 Days Post Vaccination 2)</b>	n	10	10	20	
	GMT	218268	453506	314620	
	95% CI	106743, 446314	255624, 804573	200901, 492711	

Note: N=Number of Subjects.  
n=Number of subjects with results available at time point.  
NE=Not Estimable

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**Table 29. Serum IgG ELISA Endpoint Titer Geometric Fold Rise (GMFR) and 4-Fold Rise Results by Time Point and Vaccination Group - RBD – Age 18-55**

Time Point	Statistic	25 µg mRNA-1273 18-55 years (N=15)	100 µg mRNA-1273 18-55 years (N=15)	250 µg mRNA-1273 18-55 years (N=15)	18-55 years (N=45)
<b>Day 15 (14 Days Post Vaccination 1)</b>	n	15	15	15	45
	GMFR <sup>a</sup>	118.2	205.2	152	154.5
	95% CI	60.898, 229.597	105.889, 397.681	74.295, 310.933	107.01, 223.068
	4-Fold Rise <sup>b</sup>	15/15 (100%)	15/15 (100%)	15/15 (100%)	45/45 (100%)
	95% CI	78.2%, 100%	78.2%, 100%	78.2%, 100%	92.1%, 100%
<b>Day 29 Post Vaccination 1 (Pre-Vaccination 2)</b>	n	15	15	14	44
	GMFR <sup>a</sup>	326.8	561.5	222.1	347.6
	95% CI	194.534, 549.007	264.941, 1189.944	107.021, 461.001	239.079, 505.33
	4-Fold Rise <sup>b</sup>	15/15 (100%)	15/15 (100%)	14/14 (100%)	44/44 (100%)
	95% CI	78.2%, 100%	78.2%, 100%	76.8%, 100%	92%, 100%
<b>Day 36 Post Vaccination 1 (7 Days Post Vaccination 2)</b>	n	13	15	14	42
	GMFR <sup>a</sup>	3696.8	3008.5	1333.4	2444.8
	95% CI	2273.806, 6010.434	1610.699, 5619.25	768.976, 2312.173	1761.253, 3393.741
	4-Fold Rise <sup>b</sup>	13/13 (100%)	15/15 (100%)	14/14 (100%)	42/42 (100%)
	95% CI	75.3%, 100%	78.2%, 100%	76.8%, 100%	91.6%, 100%
<b>Day 43 Post Vaccination 1 (14 Days Post Vaccination 2)</b>	n	13	14	14	41
	GMFR <sup>a</sup>	4132.9	3527.7	1191.9	2560.8
	95% CI	2714.982, 6291.356	1637.818, 7598.401	640.566, 2217.76	1760.384, 3725.228
	4-Fold Rise <sup>b</sup>	13/13 (100%)	14/14 (100%)	14/14 (100%)	41/41 (100%)
	95% CI	75.3%, 100%	76.8%, 100%	76.8%, 100%	91.4%, 100%
<b>Day 57 Post Vaccination 1 (28 Days Post Vaccination 2)</b>	n	13	14	14	41
	GMFR <sup>a</sup>	3253.9	2343.4	1043.6	1972.8
	95% CI	1989.818, 5320.999	963.92, 5697.1	494.474, 2202.725	1300.101, 2993.71

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Time Point	Statistic	25 µg mRNA-1273 18-55 years (N=15)	100 µg mRNA-1273 18-55 years (N=15)	250 µg mRNA-1273 18-55 years (N=15)	18-55 years (N=45)
	4-Fold Rise <sup>b</sup>	13/13 (100%)	14/14 (100%)	14/14 (100%)	41/41 (100%)
	95% CI	75.3%, 100%	76.8%, 100%	76.8%, 100%	91.4%, 100%

Note: N=Number of Subjects.

<sup>a</sup>GMFR represents the geometric mean fold rise in AUC compared to pre-dose 1

<sup>b</sup>4-Fold Rise represents the percentage of subjects with at least a 4-Fold Rise in AUC compared to pre-dose 1

AUC results reported as 0 were imputed to the lowest non-zero reported value for the purposes of fold-rise calculations.

**Table 30. Serum IgG ELISA Geometric Mean Fold Rise (GMFR) and 4-Fold Rise Results by Time Point and Vaccination Group - RBD – Age 56-70**

Time Point	Statistic	25 µg mRNA-1273 56-70 years (N=10)	100 µg mRNA-1273 56-70 years (N=10)	56-70 years (N=20)
<b>Day 15 (14 Days Post Vaccination 1)</b>	n	10	10	20
	GMFR <sup>a</sup>	14.4	138.9	44.7
	95% CI	2.731, 75.518	47.299, 407.876	15.718, 126.911
	4-Fold Rise <sup>b</sup>	6/10 (60%)	10/10 (100%)	16/20 (80%)
	95% CI	26.2%, 87.8%	69.2%, 100%	56.3%, 94.3%
<b>Day 29 Post Vaccination 1 (Pre-Vaccination 2)</b>	n	10	10	20
	GMFR <sup>a</sup>	23.8	204.8	69.8
	95% CI	5.815, 97.222	54.657, 767.682	25.378, 191.916
	4-Fold Rise <sup>b</sup>	8/10 (80%)	9/10 (90%)	17/20 (85%)
	95% CI	44.4%, 97.5%	55.5%, 99.7%	62.1%, 96.8%
<b>Day 36 Post Vaccination 1 (7 Days Post Vaccination 2)</b>	n	10	9	19
	GMFR <sup>a</sup>	975.7	5588.7	2230.3
	95% CI	330.172, 2883.052	2486.983, 12558.802	1050.166, 4736.453
	4-Fold Rise <sup>b</sup>	10/10 (100%)	9/9 (100%)	19/19 (100%)
	95% CI	69.2%, 100%	66.4%, 100%	82.4%, 100%
<b>Day 43 Post Vaccination 1 (14 Days Post Vaccination 2)</b>	n	10	9	19
	GMFR <sup>a</sup>	989.7	3818.4	1876.1
	95% CI	411.217, 2381.821	2065.08, 7060.283	1036.067, 3397.182
	4-Fold Rise <sup>b</sup>	10/10 (100%)	9/9 (100%)	19/19 (100%)
	95% CI	69.2%, 100%	66.4%, 100%	82.4%, 100%
<b>Day 57 Post Vaccination 1 (28 Days Post Vaccination 2)</b>	n	10	9	19
	GMFR <sup>a</sup>	383.3	1922.6	822.8
	95% CI	156.909, 936.467	379.042, 9752.418	336.247, 2013.501

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Time Point	Statistic	25 µg mRNA-1273 56-70 years (N=10)	100 µg mRNA-1273 56-70 years (N=10)	56-70 years (N=20)
	4-Fold Rise <sup>b</sup>	10/10 (100%)	9/9 (100%)	19/19 (100%)
	95% CI	69.2%, 100%	66.4%, 100%	82.4%, 100%

Note: N=Number of Subjects.

<sup>a</sup>GMFR represents the geometric mean fold rise in AUC compared to pre-dose 1

<sup>b</sup>4-Fold Rise represents the percentage of subjects with at least a 4-Fold Rise in AUC compared to pre-dose 1

AUC results reported as 0 were imputed to the lowest non-zero reported value for the purposes of fold-rise calculations.

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**Table 31. Serum IgG ELISA Geometric Mean Fold Rise (GMFR) and 4-Fold Rise Results by Time Point and Vaccination Group - RBD -  $\geq 71$  Years**

Time Point	Statistic	25 $\mu$ g mRNA-1273 $\geq 71$ years (N=10)	100 $\mu$ g mRNA-1273 $\geq 71$ years (N=10)	$\geq 71$ years (N=20)
<b>Day 15 (14 Days Post Vaccination 1)</b>	n	10	10	20
	GMFR <sup>a</sup>	42	51	46.3
	95% CI	14.344, 123.269	17.028, 152.836	23.152, 92.654
	4-Fold Rise <sup>b</sup>	9/10 (90%)	9/10 (90%)	18/20 (90%)
	95% CI	55.5%, 99.7%	55.5%, 99.7%	68.3%, 98.8%
<b>Day 29 Post Vaccination 1 (Pre-Vaccination 2)</b>	n	10	10	20
	GMFR <sup>a</sup>	137.9	112	124.3
	95% CI	37.219, 511.138	39.4, 318.233	58.35, 264.685
	4-Fold Rise <sup>b</sup>	10/10 (100%)	10/10 (100%)	20/20 (100%)
	95% CI	69.2%, 100%	69.2%, 100%	83.2%, 100%
<b>Day 36 Post Vaccination 1 (7 Days Post Vaccination 2)</b>	n	10	10	20
	GMFR <sup>a</sup>	1444.1	1414.5	1429.2
	95% CI	386.702, 5392.916	487.842, 4101.419	666.573, 3064.498
	4-Fold Rise <sup>b</sup>	10/10 (100%)	10/10 (100%)	20/20 (100%)
	95% CI	69.2%, 100%	69.2%, 100%	83.2%, 100%
<b>Day 43 Post Vaccination 1 (14 Days Post Vaccination 2)</b>	n	10	10	20
	GMFR <sup>a</sup>	2654.5	1380.2	1914.1
	95% CI	760.064, 9270.938	475.685, 4004.465	898.566, 4077.261
	4-Fold Rise <sup>b</sup>	10/10 (100%)	10/10 (100%)	20/20 (100%)
	95% CI	69.2%, 100%	69.2%, 100%	83.2%, 100%
<b>Day 57 Post Vaccination 1 (28 Days Post Vaccination 2)</b>	n	10	10	20
	GMFR <sup>a</sup>	1962.8	901.3	1330
	95% CI	480.831, 8012.1	270.671, 3001.108	566.169, 3124.532

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Time Point	Statistic	25 µg mRNA-1273 ≥71 years (N=10)	100 µg mRNA-1273 ≥71 years (N=10)	≥71 years (N=20)
	4-Fold Rise <sup>b</sup>	10/10 (100%)	10/10 (100%)	20/20 (100%)
	95% CI	69.2%, 100%	69.2%, 100%	83.2%, 100%

Note: N=Number of Subjects.

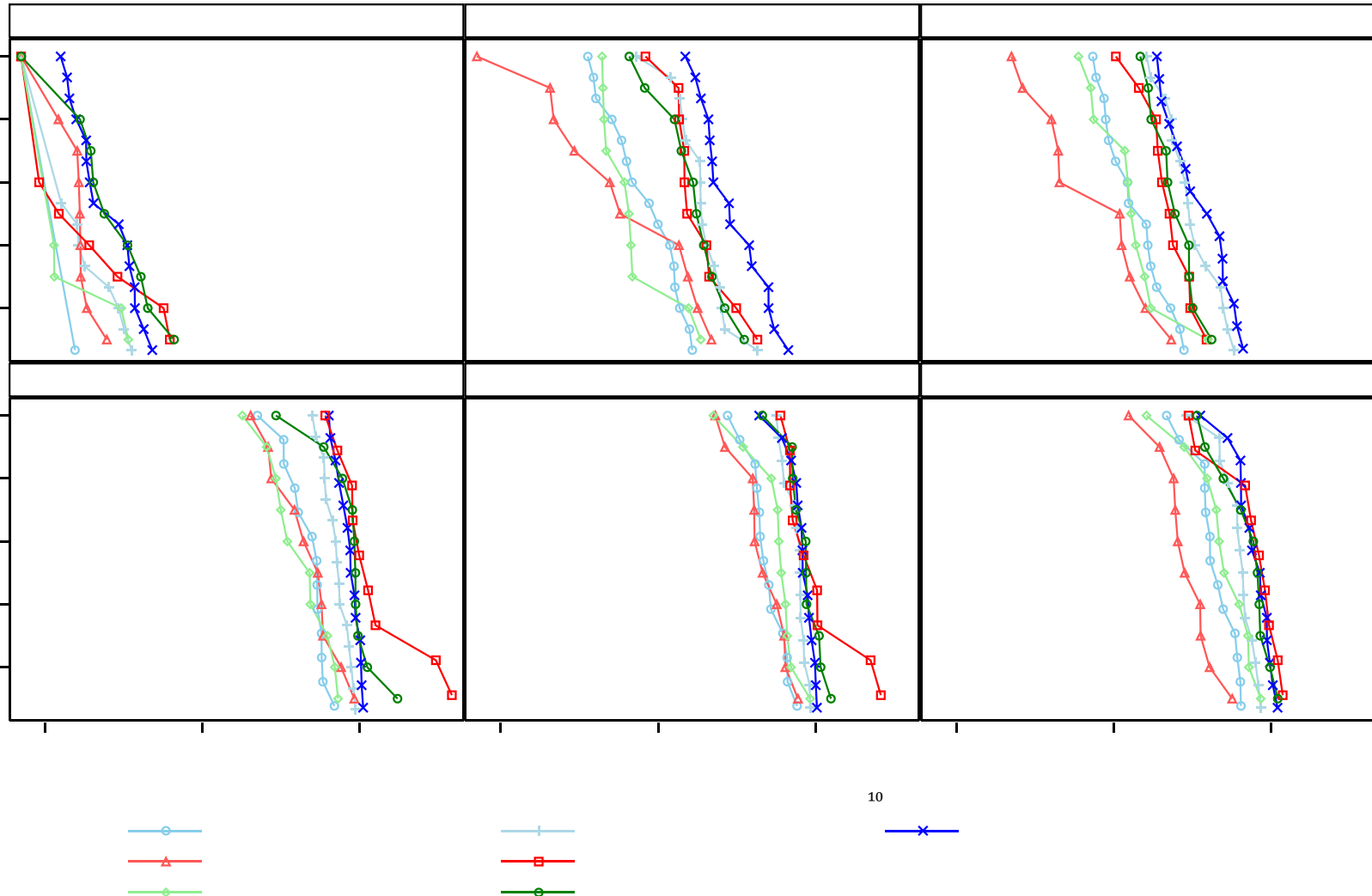
<sup>a</sup>GMFR represents the geometric mean fold rise in AUC compared to pre-dose 1

<sup>b</sup>4-Fold Rise represents the percentage of subjects with at least a 4-Fold Rise in AUC compared to pre-dose 1

AUC results reported as 0 were imputed to the lowest non-zero reported value for the purposes of fold-rise calculations.

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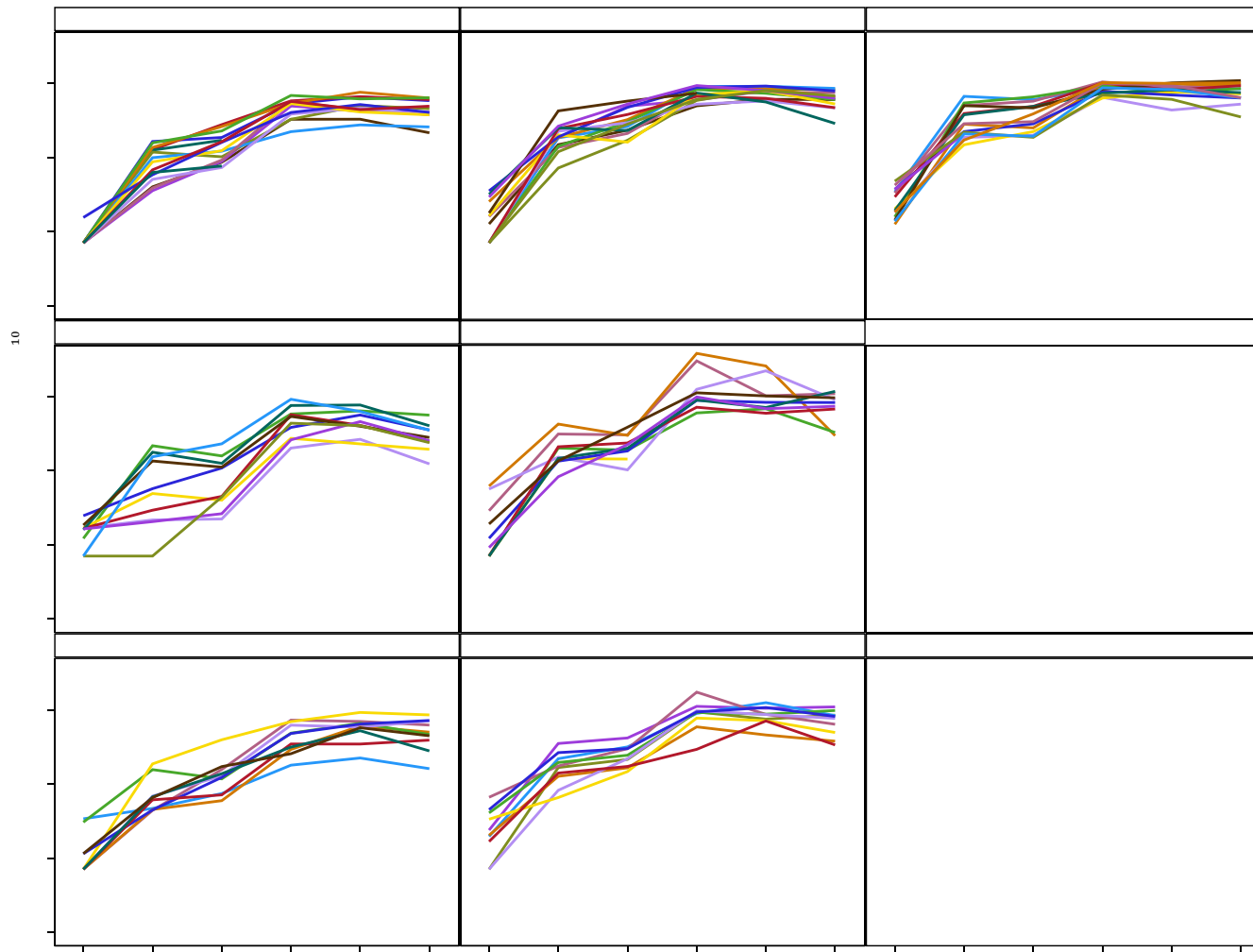
**Figure 28. Reverse Cumulative Distribution of Serum IgG ELISA Endpoint Titer Values by Time Point and Vaccination Group - RBD**



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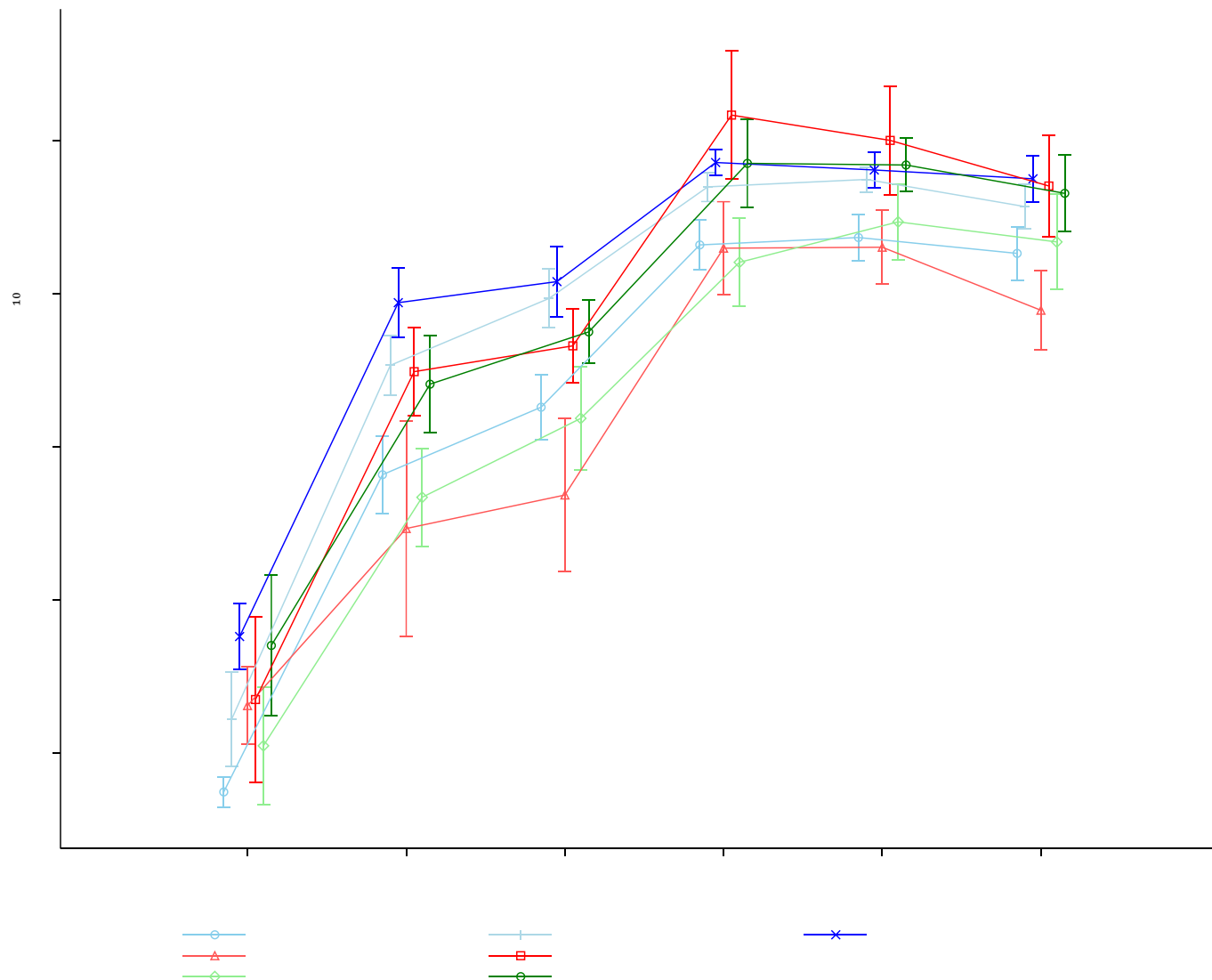
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**Figure 29. Serum IgG ELISA Endpoint Titer Values by Time Point and Vaccination Group – RBD**



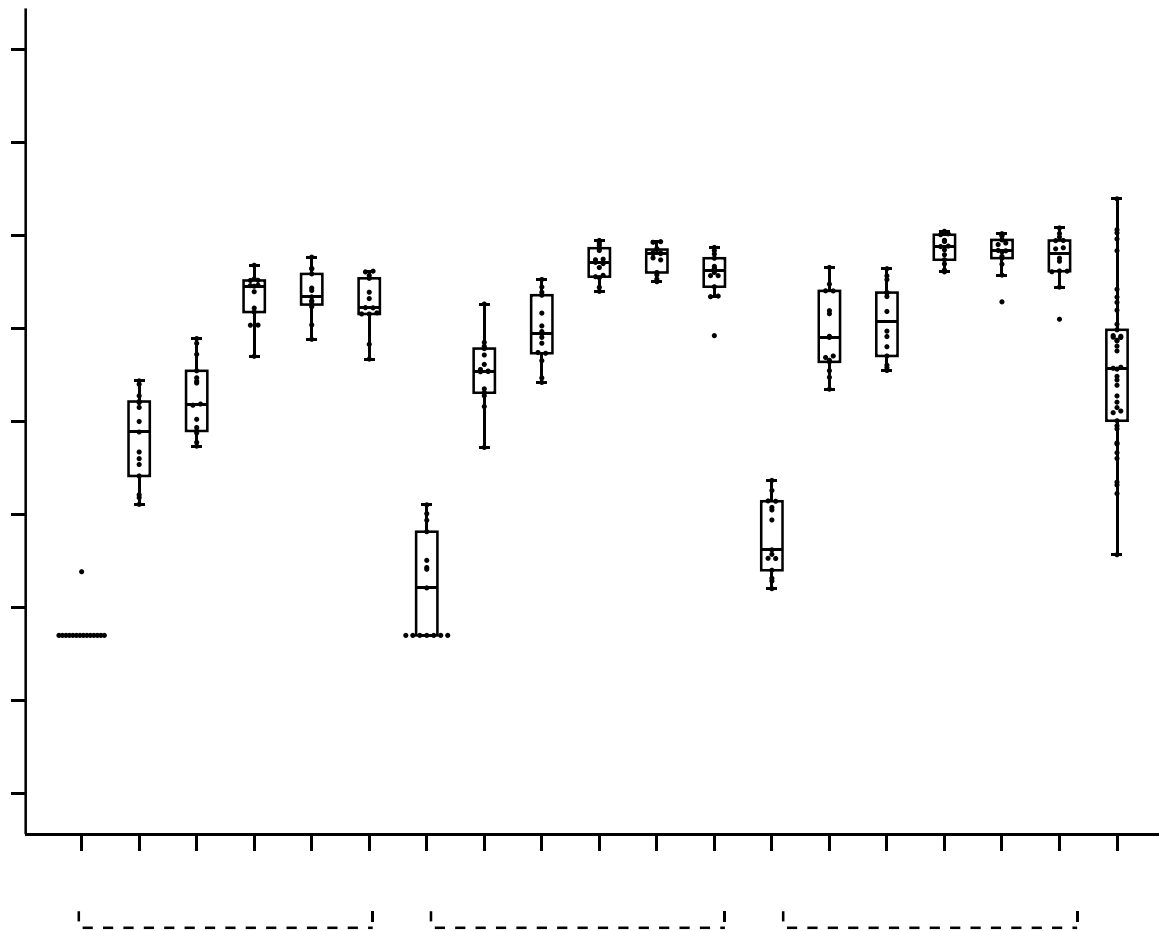
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**Figure 30. Serum IgG ELISA Geometric Mean Endpoint Titer Values by Time Point and Vaccination Group – RBD**



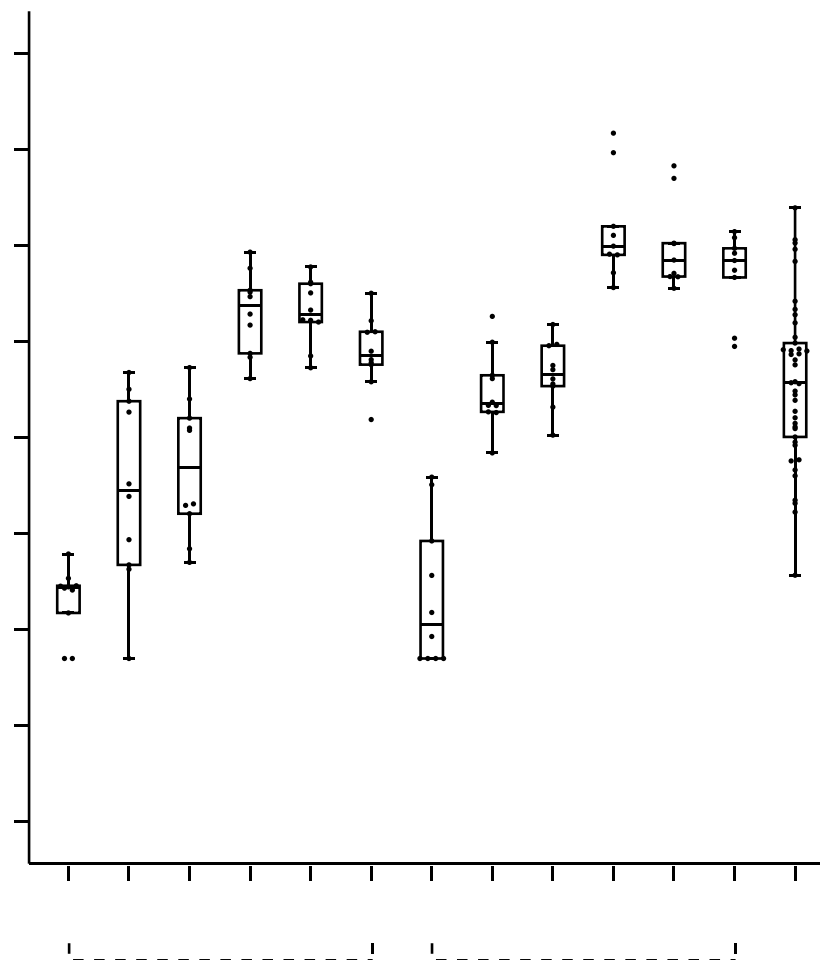
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**Figure 31. Serum IgG ELISA Endpoint Titer Distribution by Time Point and Treatment Group - RBD – Age 18-55**



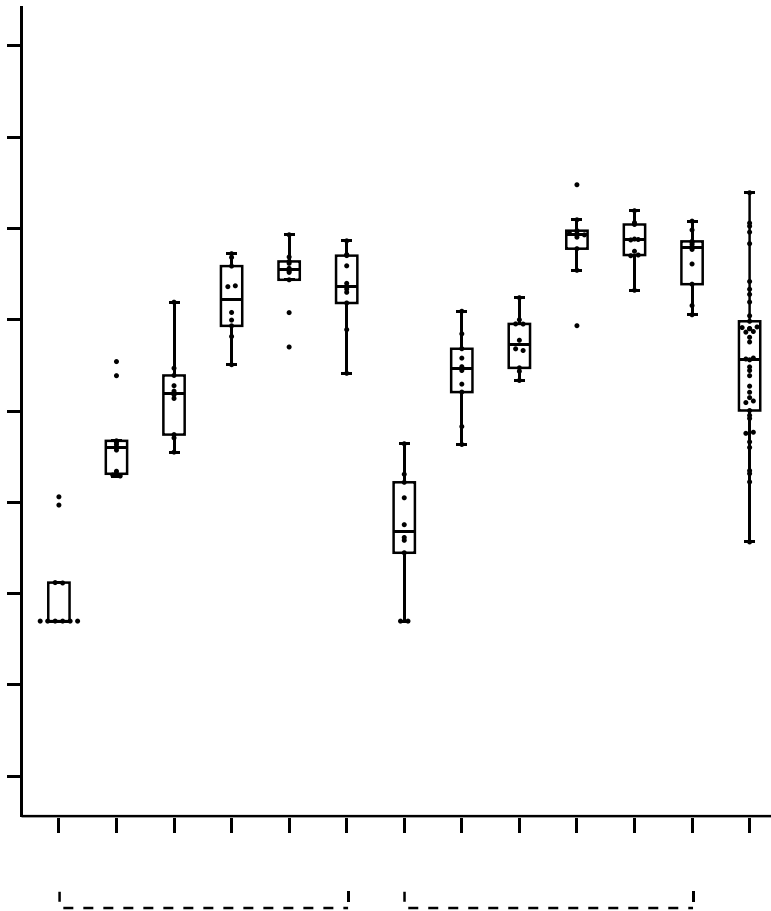
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**Figure 32. Serum IgG ELISA Endpoint Titer Distribution by Time Point and Treatment Group - RBD – Age 56-70**



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**Figure 33. Serum IgG Endpoint Titer Distribution by Time Point and Treatment Group - RBD -  $\geq 71$  Years**



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**Table 32. Pseudovirus Neutralization Assay Geometric Mean (GM) Results with 95% Confidence Intervals by Time Point and Vaccination Group - ID<sub>50</sub> – Age 18-55**

Time Point	Statistic	25 µg mRNA-1273 18-55 years (N=15)	100 µg mRNA-1273 18-55 years (N=15)	250 µg mRNA-1273 18-55 years (N=15)	18-55 years (N=45)	Convalescent Sera
<b>Day 1 (Pre-Vaccination 1)</b>	n	15	15	15	45	41
	GM	10	10	10	10	106
	95% CI	NE	NE	NE	NE	60, 189
<b>Day 15 (14 Days Post Vaccination 1)</b>	n	15	15	15	45	
	GM	14	24	26	21	
	95% CI	10, 21	13, 42	14, 48	15, 28	
<b>Day 29 Post Vaccination 1 (Pre-Vaccination 2)</b>	n	15	15	14	44	
	GM	12	18	21	16	
	95% CI	10, 14	12, 27	13, 32	13, 20	
<b>Day 36 Post Vaccination 1 (7 Days Post Vaccination 2)</b>	n	13	15	14	42	
	GM	106	263	378	224	
	95% CI	70, 160	188, 368	306, 468	176, 285	
<b>Day 43 Post Vaccination 1 (14 Days Post Vaccination 2)</b>	n	13	14	14	41	
	GM	112	360	342	245	
	95% CI	71, 177	273, 476	267, 438	192, 312	
<b>Day 57 Post Vaccination 1 (28 Days Post Vaccination 2)</b>	n	13	14	14	41	
	GM	90	267	270	190	
	95% CI	57, 143	186, 385	221, 330	149, 243	
Note: N=Number of Subjects. n=Number of subjects with results available at time point. NE=Not Estimable						

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**Table 33. Pseudovirus Neutralization Assay Geometric Mean (GM) Results with 95% Confidence Intervals by Time Point and Vaccination Group - ID<sub>50</sub> – Age 56-70**

Time Point	Statistic	25 µg mRNA-1273 56-70 years (N=10)	100 µg mRNA-1273 56-70 years (N=10)	56-70 years (N=20)	Convalescent Sera
<b>Day 1 (Pre-Vaccination 1)</b>	n	10	10	20	41
	GM	10	10	10	106
	95% CI	NE	NE	NE	60, 189
<b>Day 15 (14 Days Post Vaccination 1)</b>	n	10	10	20	
	GM	10	11	10	
	95% CI	NE	9, 13	10, 12	
<b>Day 29 Post Vaccination 1 (Pre-Vaccination 2)</b>	n	10	10	20	
	GM	10	10	10	
	95% CI	NE	NE	NE	
<b>Day 36 Post Vaccination 1 (7 Days Post Vaccination 2)</b>	n	10	9	19	
	GM	79	289	146	
	95% CI	47, 135	164, 507	91, 234	
<b>Day 43 Post Vaccination 1 (14 Days Post Vaccination 2)</b>	n	10	9	19	
	GM	116	402	209	
	95% CI	66, 205	289, 560	136, 322	
<b>Day 57 Post Vaccination 1 (28 Days Post Vaccination 2)</b>	n	10	9	19	
	GM	92	324	167	
	95% CI	45, 188	212, 496	102, 274	

Note: N=Number of Subjects.  
n=Number of subjects with results available at time point.  
NE=Not Estimable

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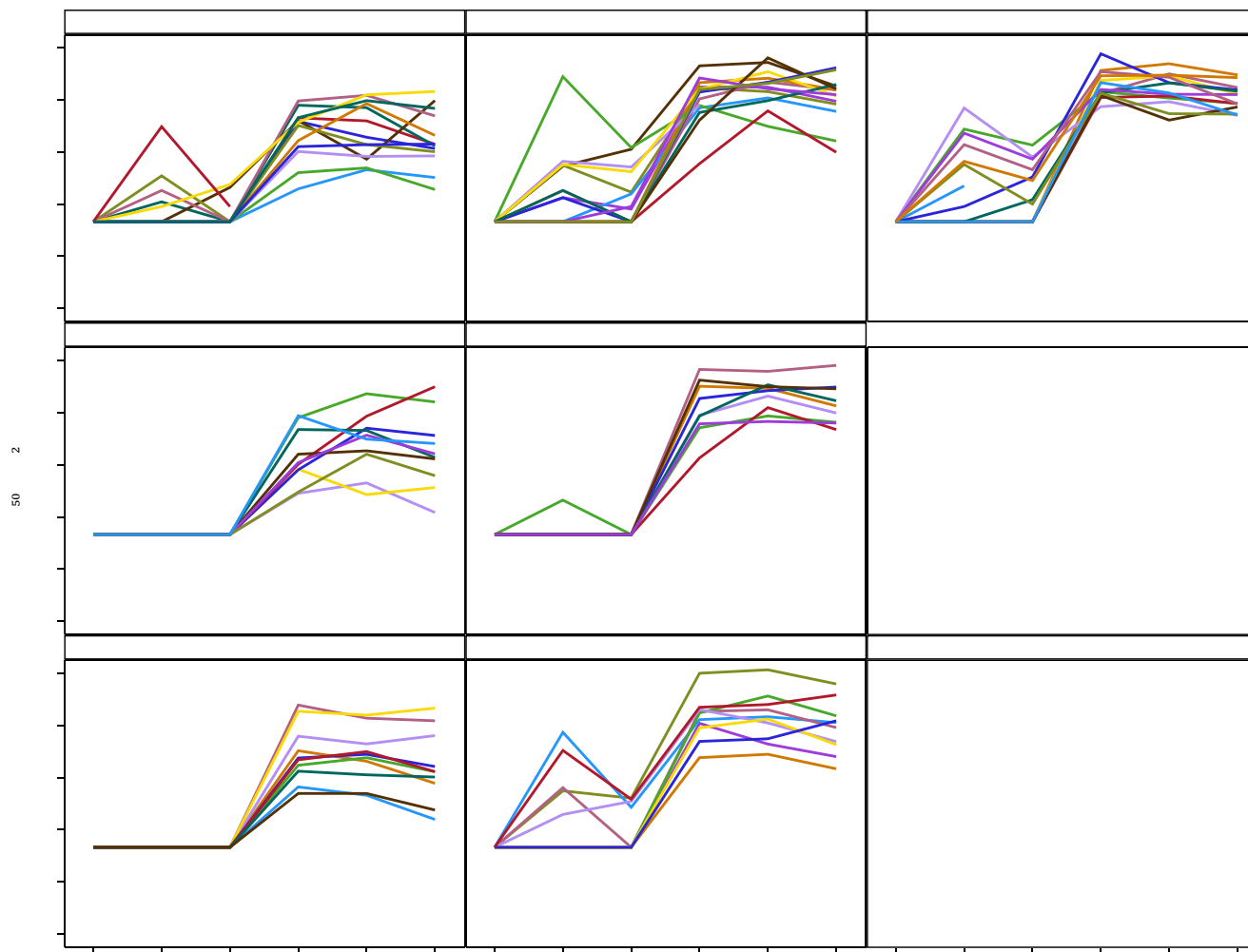
**Table 34. Pseudovirus Neutralization Assay Geometric Mean (GM) Results with 95% Confidence Intervals by Time Point and Vaccination Group - ID<sub>50</sub> – Age ≥ 71**

Time Point	Statistic	25 µg mRNA-1273 ≥71 years (N=10)	100 µg mRNA-1273 ≥71 years (N=10)	≥71 years (N=20)	Convalescent Sera
<b>Day 1 (Pre-Vaccination 1)</b>	n	10	10	20	41
	GM	10	10	10	106
	95% CI	NE	NE	NE	60, 189
<b>Day 15 (14 Days Post Vaccination 1)</b>	n	10	10	20	
	GM	10	26	16	
	95% CI	NE	11, 60	10, 25	
<b>Day 29 Post Vaccination 1 (Pre-Vaccination 2)</b>	n	10	10	20	
	GM	10	16	13	
	95% CI	NE	10, 26	10, 16	
<b>Day 36 Post Vaccination 1 (7 Days Post Vaccination 2)</b>	n	10	10	20	
	GM	121	310	193	
	95% CI	69, 211	202, 475	131, 285	
<b>Day 43 Post Vaccination 1 (14 Days Post Vaccination 2)</b>	n	10	10	20	
	GM	112	317	188	
	95% CI	67, 188	198, 508	126, 282	
<b>Day 57 Post Vaccination 1 (28 Days Post Vaccination 2)</b>	n	10	10	20	
	GM	86	242	144	
	95% CI	44, 171	147, 399	92, 228	

Note: N=Number of Subjects.  
n=Number of subjects with results available at time point.  
NE=Not Estimable

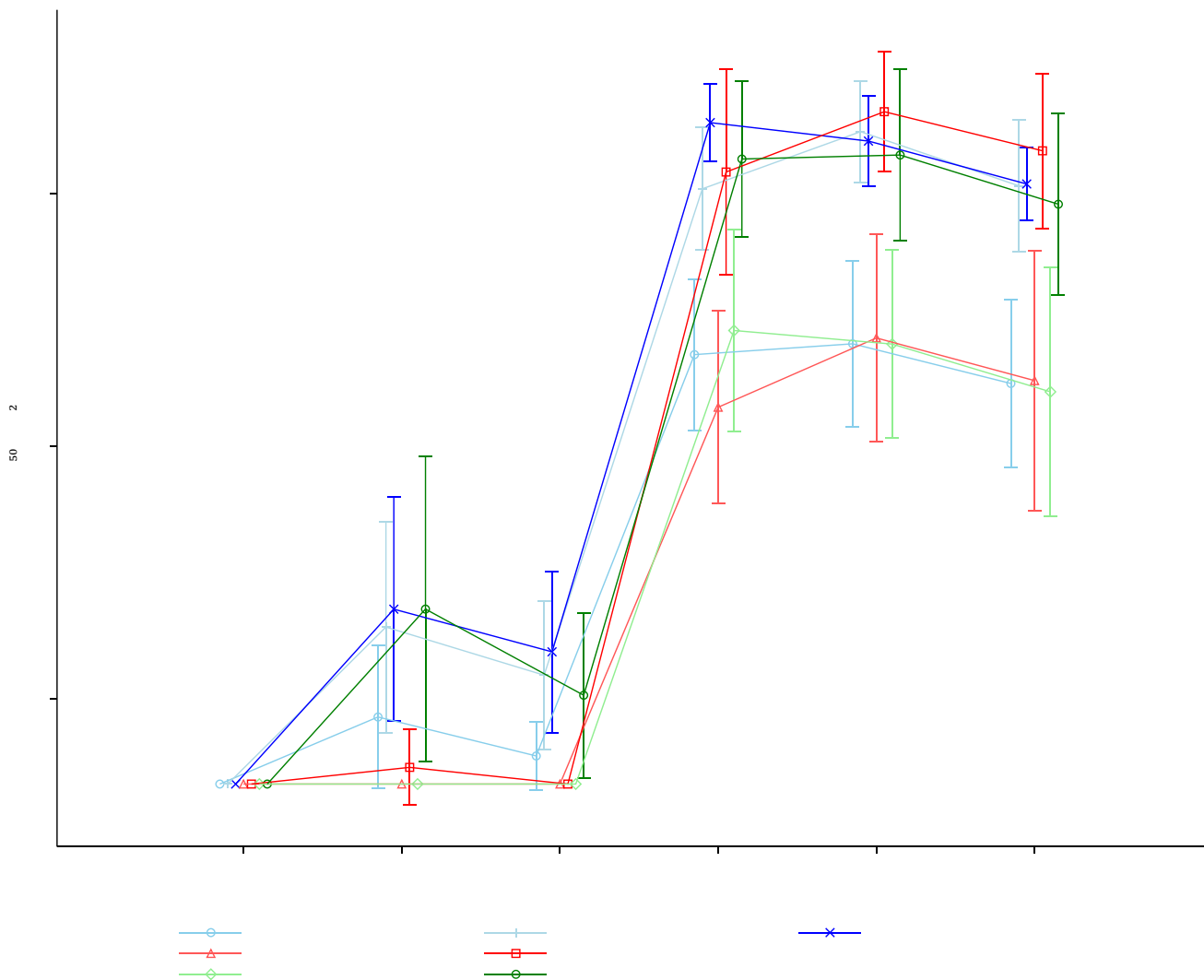
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**Figure 34. Pseudovirus Neutralization Assay Titers by Time Point and Vaccination Group - ID<sub>50</sub>**



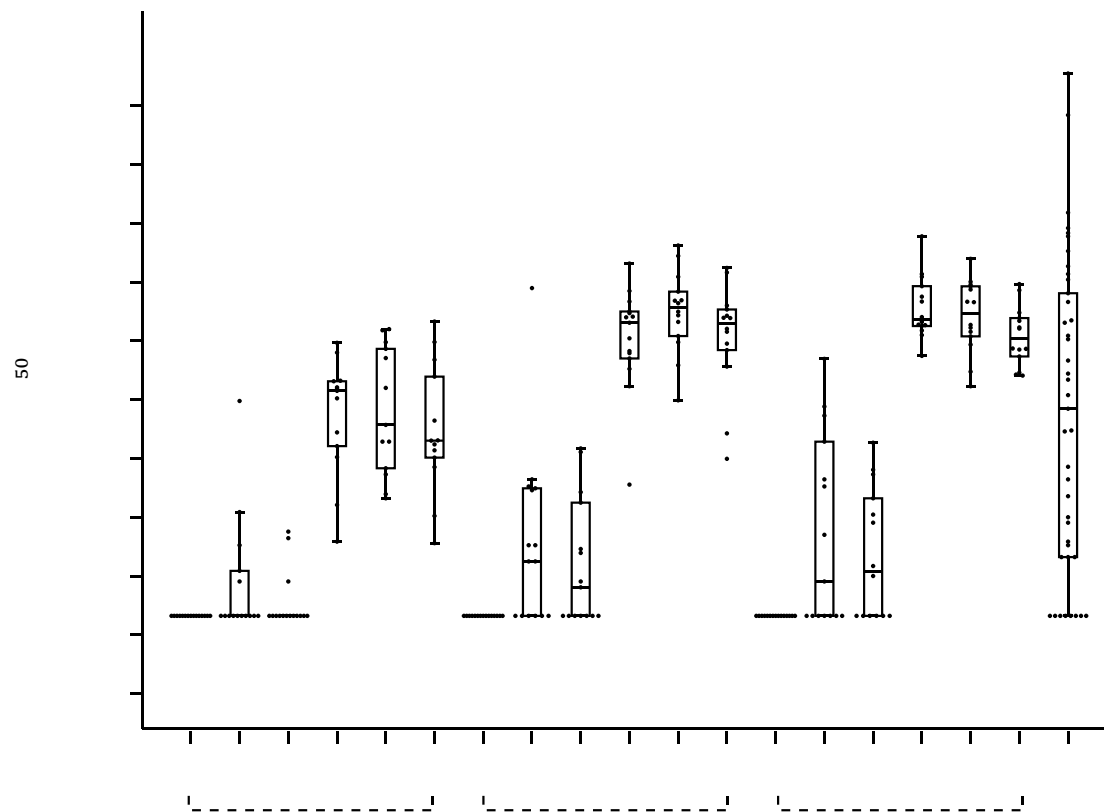
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**Figure 35. Pseudovirus Neutralization Assay GM by Time Point and Treatment Group - ID<sub>50</sub>**



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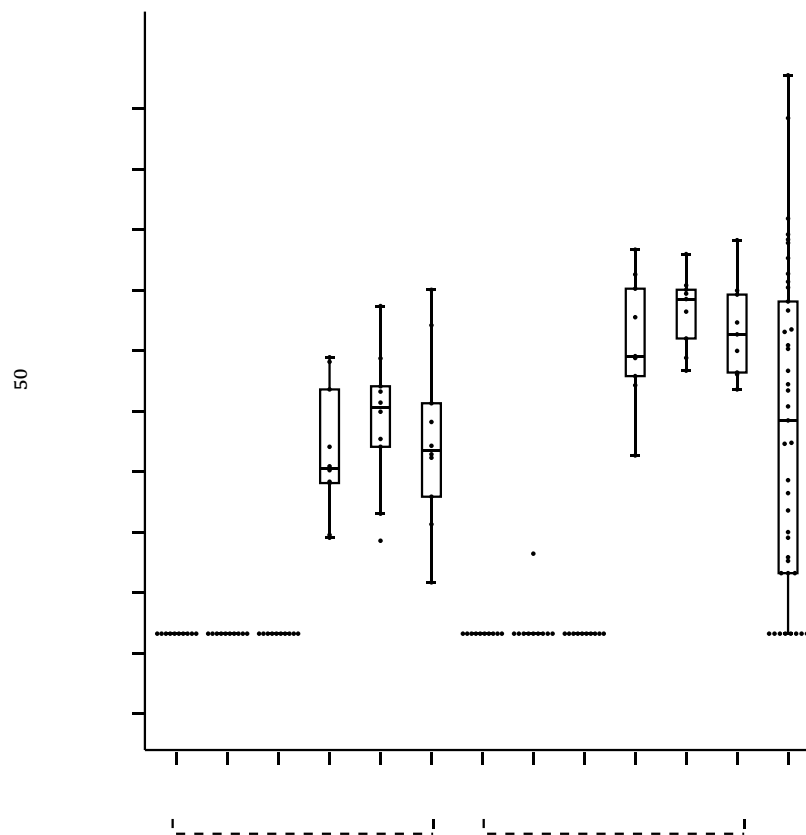
**Figure 36. Pseudovirus Neutralization Assay Titers Distribution by Time Point and Treatment Group - ID<sub>50</sub> – Age 18-55**



Note: Boxes and horizontal bars denote interquartile range (IQR) and median ID<sub>50</sub>, respectively. Whisker endpoints are equal to the maximum and minimum values below or above the median  $\pm 1.5 \times$  IQR. The convalescent sera panel includes specimens from 41 individuals.

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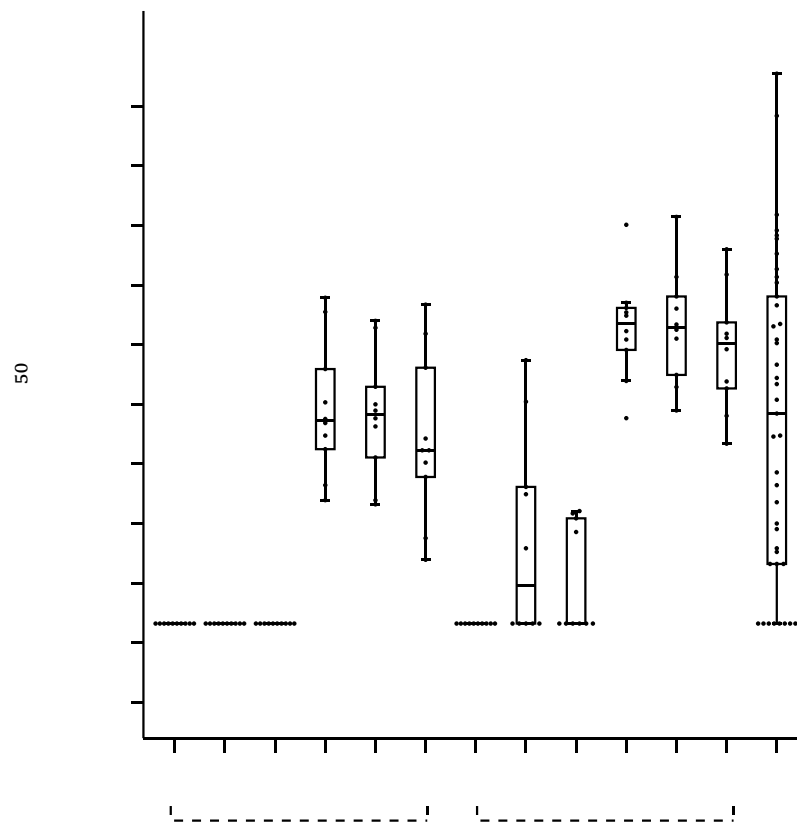
**Figure 37. Pseudovirus Neutralization Assay Titers Distribution by Time Point and Treatment Group - ID<sub>50</sub> – Age 56-70**



Note: Boxes and horizontal bars denote interquartile range (IQR) and median ID<sub>50</sub>, respectively. Whisker endpoints are equal to the maximum and minimum values below or above the median  $\pm 1.5 \times$  IQR. The convalescent sera panel includes specimens from 41 individuals.

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**Figure 38. Pseudovirus Neutralization Assay Titers Distribution by Time Point and Treatment Group - ID<sub>50</sub> - Age ≥ 71**



Note: Boxes and horizontal bars denote interquartile range (IQR) and median ID<sub>50</sub>, respectively. Whisker endpoints are equal to the maximum and minimum values below or above the median  $\pm 1.5 \times$  IQR. The convalescent sera panel includes specimens from 41 individuals.

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**Table 35. Pseudovirus Neutralization Assay Geometric Mean (GM) Results with 95% Confidence Intervals by Time Point and Vaccination Group - ID<sub>80</sub> – Age 18-55**

Time Point	Statistic	25 µg mRNA-1273 18-55 years (N=15)	100 µg mRNA-1273 18-55 years (N=15)	250 µg mRNA-1273 18-55 years (N=15)	18-55 years (N=45)	Convalescent Sera
<b>Day 1 (Pre-Vaccination 1)</b>	n	15	15	15	45	41
	GM	10	10	10	10	41
	95% CI	NE	NE	NE	NE	26, 66
<b>Day 15 (14 Days Post Vaccination 1)</b>	n	15	15	15	45	
	GM	11	13	13	12	
	95% CI	9, 13	8, 19	10, 18	10, 15	
<b>Day 29 Post Vaccination 1 (Pre-Vaccination 2)</b>	n	15	15	14	44	
	GM	10	10	12	11	
	95% CI	NE	10, 11	10, 16	10, 12	
<b>Day 36 Post Vaccination 1 (7 Days Post Vaccination 2)</b>	n	13	15	14	42	
	GM	53	134	158	106	
	95% CI	34, 83	96, 188	131, 190	85, 134	
<b>Day 43 Post Vaccination 1 (14 Days Post Vaccination 2)</b>	n	13	14	14	41	
	GM	60	164	153	116	
	95% CI	37, 96	122, 219	122, 193	93, 146	
<b>Day 57 Post Vaccination 1 (28 Days Post Vaccination 2)</b>	n	13	14	14	41	
	GM	52	141	121	98	
	95% CI	31, 87	97, 204	93, 157	76, 125	

<b>Time Point</b>	<b>Statistic</b>	<b>25 µg mRNA-1273 18-55 years (N=15)</b>	<b>100 µg mRNA-1273 18-55 years (N=15)</b>	<b>250 µg mRNA-1273 18-55 years (N=15)</b>	<b>18-55 years (N=45)</b>	<b>Convalescent Sera</b>
Note: N=Number of Subjects. n=Number of subjects with results available at time point. NE=Not Estimable						

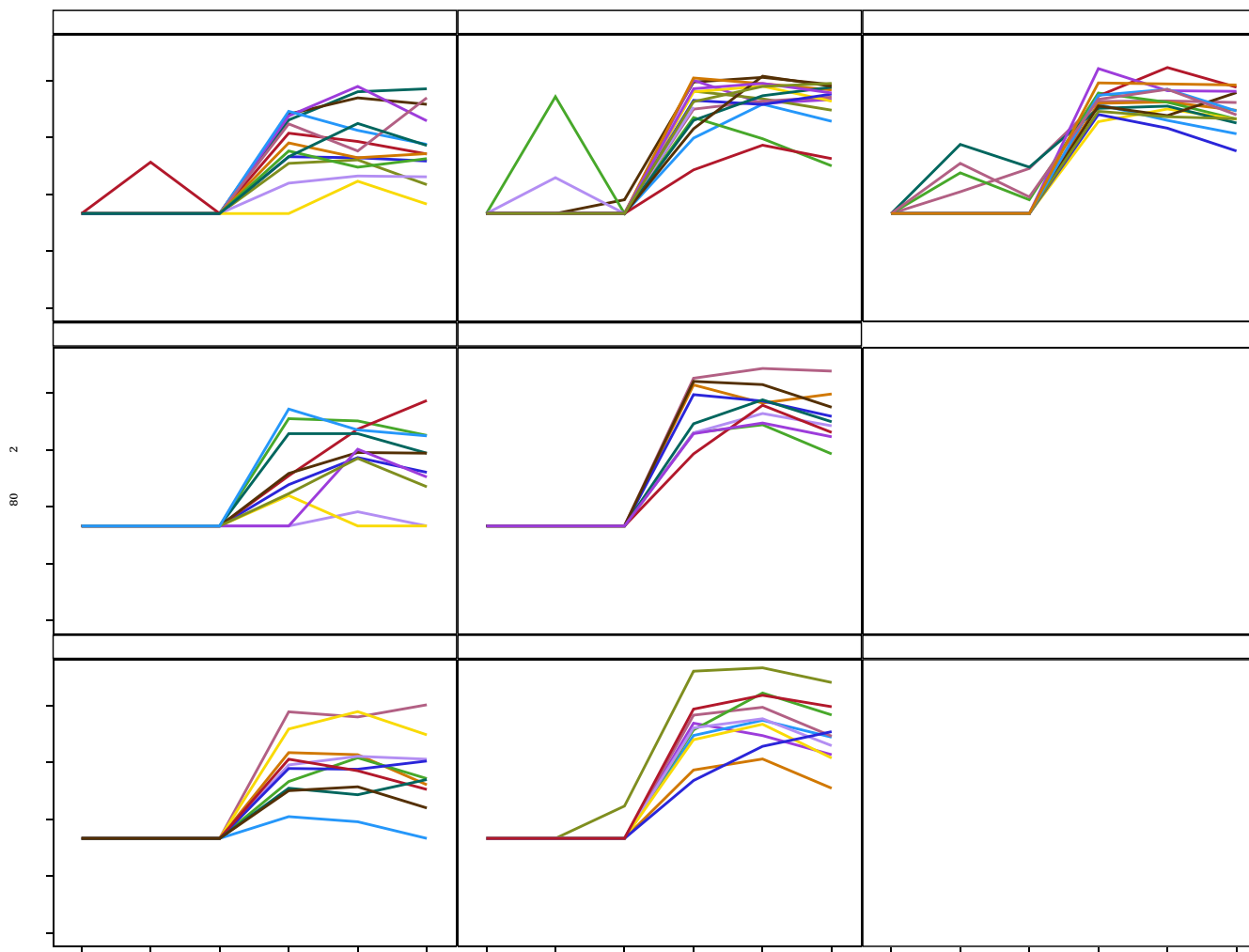
**Table 36. Pseudovirus Neutralization Assay Geometric Mean (GM) Results with 95% Confidence Intervals by Time Point and Vaccination Group - ID<sub>80</sub> – Age 56-70**

Time Point	Statistic	25 µg mRNA-1273 56-70 years (N=10)	100 µg mRNA-1273 56-70 years (N=10)	56-70 years (N=20)	Convalescent Sera
<b>Day 1 (Pre-Vaccination 1)</b>	n	10	10	20	41
	GM	10	10	10	41
	95% CI	NE	NE	NE	26, 66
<b>Day 15 (14 Days Post Vaccination 1)</b>	n	10	10	20	
	GM	10	10	10	
	95% CI	NE	NE	NE	
<b>Day 29 Post Vaccination 1 (Pre-Vaccination 2)</b>	n	10	10	20	
	GM	10	10	10	
	95% CI	NE	NE	NE	
<b>Day 36 Post Vaccination 1 (7 Days Post Vaccination 2)</b>	n	10	9	19	
	GM	36	158	72	
	95% CI	17, 74	93, 267	42, 125	
<b>Day 43 Post Vaccination 1 (14 Days Post Vaccination 2)</b>	n	10	9	19	
	GM	54	203	101	
	95% CI	29, 100	145, 283	64, 160	
<b>Day 57 Post Vaccination 1 (28 Days Post Vaccination 2)</b>	n	10	9	19	
	GM	43	140	75	
	95% CI	21, 85	89, 222	46, 121	
Note: N=Number of Subjects. n=Number of subjects with results available at time point. NE=Not Estimable					

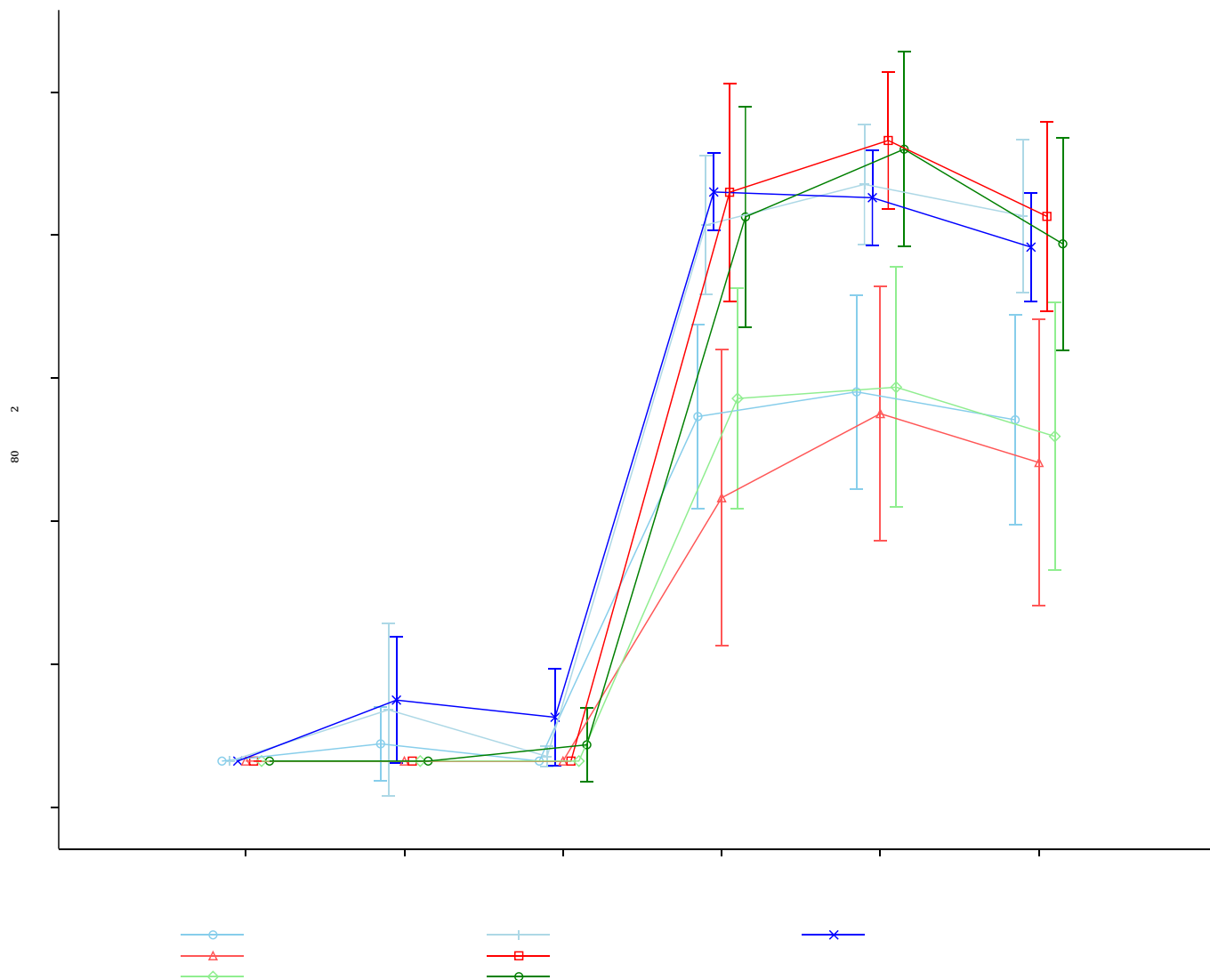
**Table 37. Pseudovirus Neutralization Assay Geometric Mean (GM) Results with 95% Confidence Intervals by Time Point and Vaccination Group - ID<sub>80</sub> – Age ≥ 71**

Time Point	Statistic	25 µg mRNA-1273 ≥71 years (N=10)	100 µg mRNA-1273 ≥71 years (N=10)	≥71 years (N=20)	Convalescent Sera
<b>Day 1 (Pre-Vaccination 1)</b>	n	10	10	20	41
	GM	10	10	10	41
	95% CI	NE	NE	NE	26, 66
<b>Day 15 (14 Days Post Vaccination 1)</b>	n	10	10	20	
	GM	10	10	10	
	95% CI	NE	NE	NE	
<b>Day 29 Post Vaccination 1 (Pre-Vaccination 2)</b>	n	10	10	20	
	GM	10	11	10	
	95% CI	NE	9, 13	10, 11	
<b>Day 36 Post Vaccination 1 (7 Days Post Vaccination 2)</b>	n	10	10	20	
	GM	58	140	90	
	95% CI	34, 99	82, 239	60, 134	
<b>Day 43 Post Vaccination 1 (14 Days Post Vaccination 2)</b>	n	10	10	20	
	GM	61	194	109	
	95% CI	34, 110	121, 311	70, 169	
<b>Day 57 Post Vaccination 1 (28 Days Post Vaccination 2)</b>	n	10	10	20	
	GM	48	123	77	
	95% CI	25, 92	73, 205	50, 119	
Note: N=Number of Subjects. n=Number of subjects with results available at time point. NE=Not Estimable					

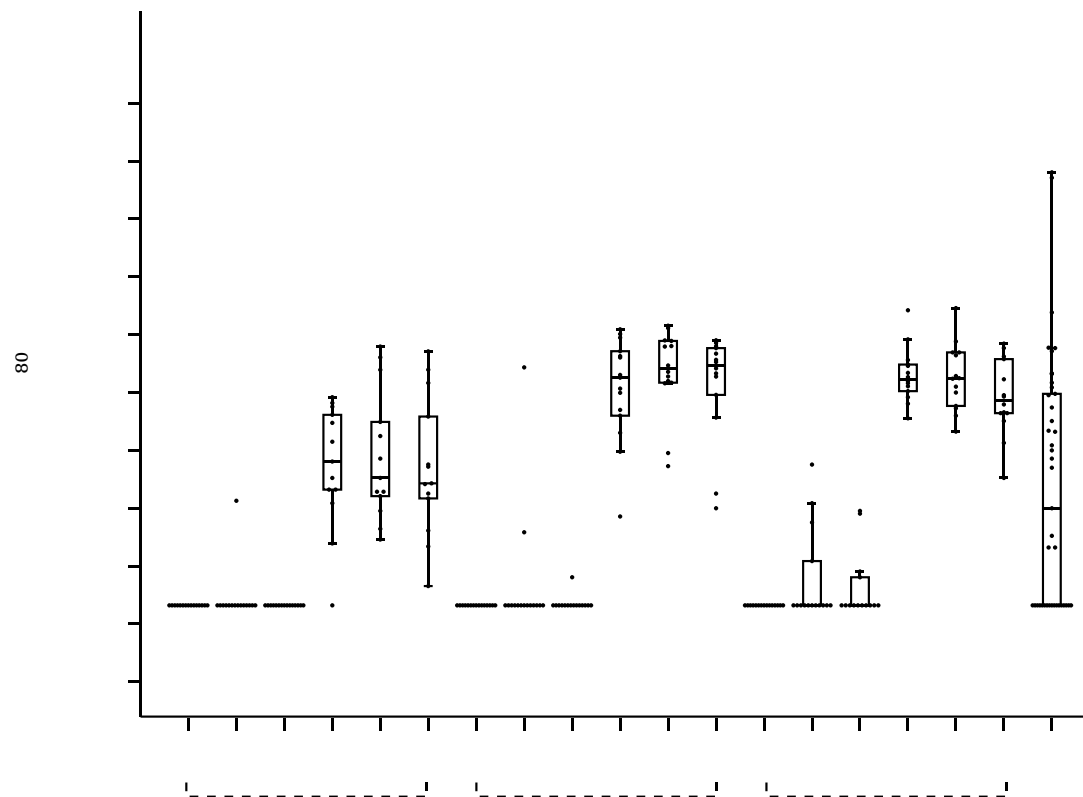
**Figure 39. Pseudovirus Neutralization Assay Titers by Time Point and Vaccination Group - ID<sub>80</sub>**



**Figure 40. Pseudovirus Neutralization Assay GM by Time Point and Treatment Group - ID<sub>80</sub>**

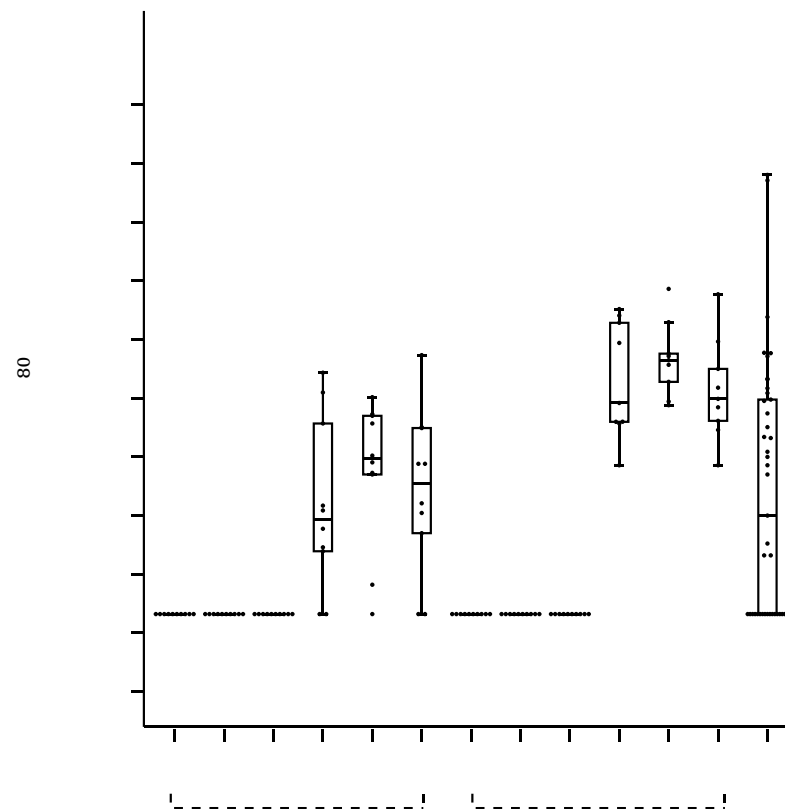


**Figure 41. Pseudovirus Neutralization Assay Titers Distribution by Time Point and Treatment Group - ID<sub>80</sub> – Age 18-55**



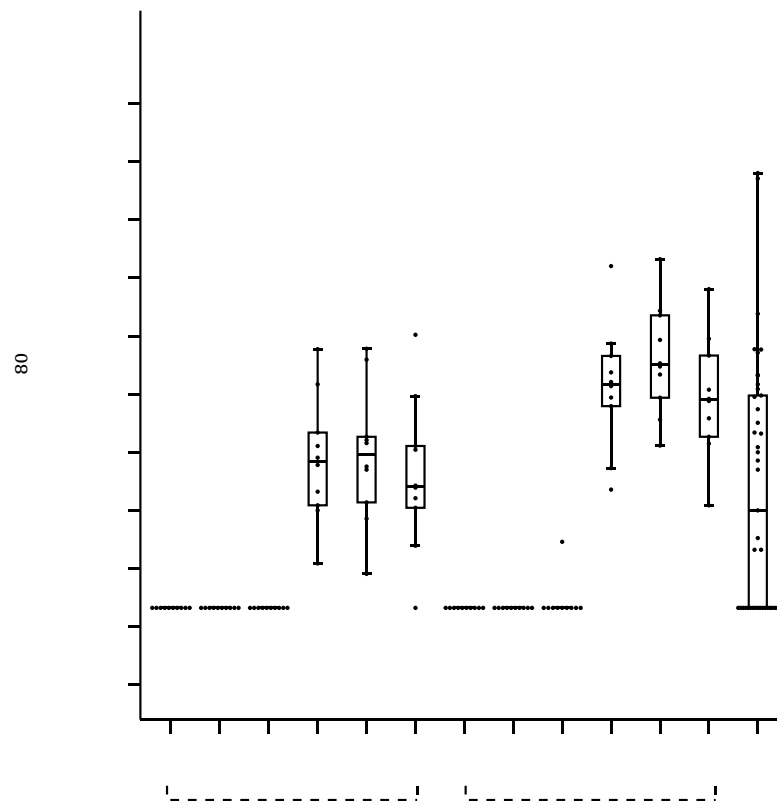
Note: Boxes and horizontal bars denote interquartile range (IQR) and median ID<sub>80</sub>, respectively. Whisker endpoints are equal to the maximum and minimum values below or above the median  $\pm 1.5 \times$  IQR. The convalescent sera panel includes specimens from 41 individuals.

**Figure 42. Pseudovirus Neutralization Assay Titers Distribution by Time Point and Treatment Group - ID<sub>80</sub> – Age 56-70**



Note: Boxes and horizontal bars denote interquartile range (IQR) and median ID<sub>80</sub>, respectively. Whisker endpoints are equal to the maximum and minimum values below or above the median  $\pm 1.5 \times$  IQR. The convalescent sera panel includes specimens from 41 individuals.

**Figure 43. Pseudovirus Neutralization Assay Titers Distribution by Time Point and Treatment Group - ID<sub>80</sub> – Age ≥ 71**



Note: Boxes and horizontal bars denote interquartile range (IQR) and median ID<sub>80</sub>, respectively. Whisker endpoints are equal to the maximum and minimum values below or above the median  $\pm 1.5 \times$  IQR. The convalescent sera panel includes specimens from 41 individuals.

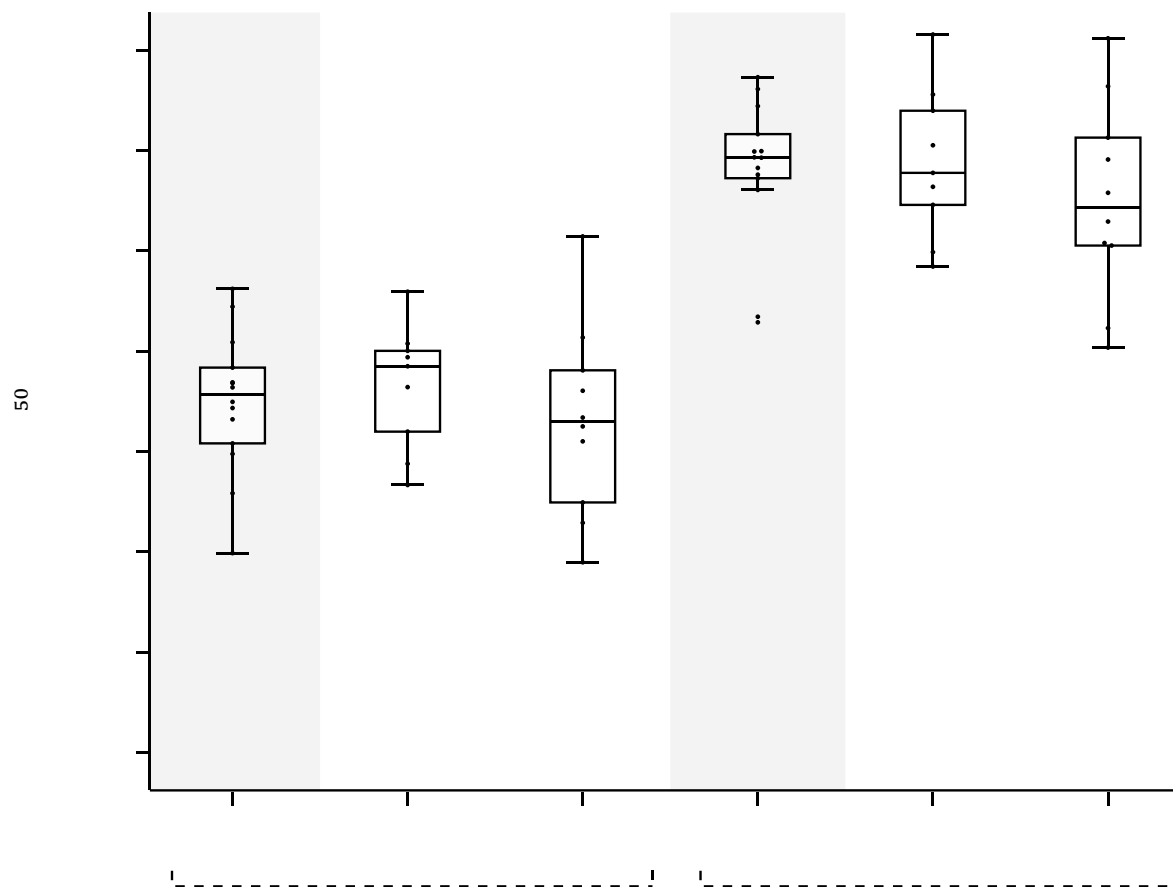
**Table 38. Pseudovirus Neutralization Assay Geometric Mean (GM) Results with 95% Confidence Intervals by Variant - ID<sub>50</sub>**

Variant	Time Point	Statistic	100 mcg mRNA-1273 18-55 years (N=15)	100 mcg mRNA-1273 56-70 years (N=10)	100 mcg mRNA-1273 ≥71 years (N=10)
614D	Day 43 Post Vaccination 1 (14 Days Post Vaccination 2)	n	14	9	10
		GM	360	402	317
		95% CI	273, 476	289, 560	198, 508
614G	Day 43 Post Vaccination 1 (14 Days Post Vaccination 2)	n	14	9	10
		GM	1796	1878	1456
		95% CI	1350, 2391	1259, 2801	895, 2368

Note: N=Number of Subjects.

n=Number of subjects with results available at time point.

**Figure 44. Pseudovirus Neutralization Assay Titers Distribution by Variant - ID<sub>50</sub>**



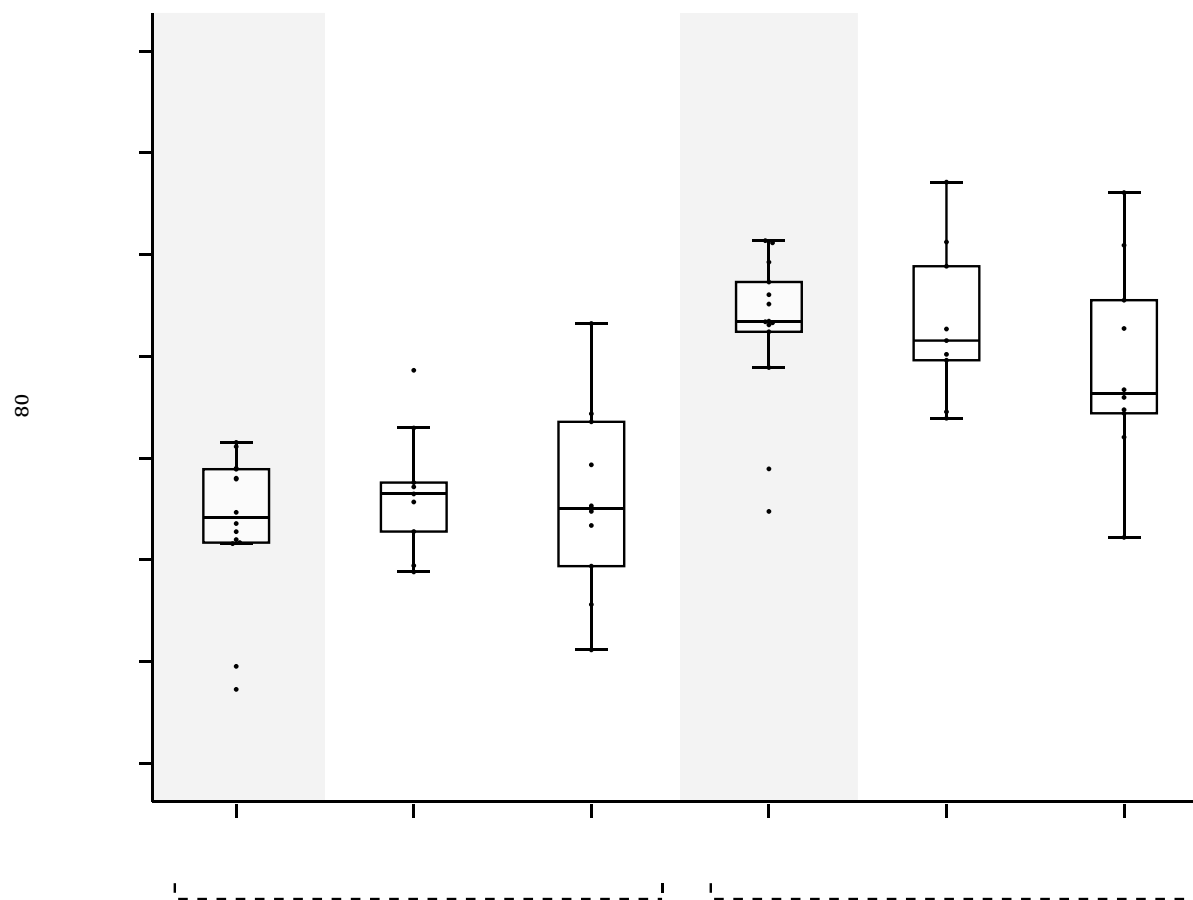
**Table 39. Pseudovirus Neutralization Assay Geometric Mean (GM) Results with 95% Confidence Intervals by Variant - ID<sub>80</sub>**

Variant	Time Point	Statistic	100 mcg mRNA-1273 18-55 years (N=15)	100 mcg mRNA-1273 56-70 years (N=10)	100 mcg mRNA-1273 ≥71 years (N=10)
614D	Day 43 Post Vaccination 1 (14 Days Post Vaccination 2)	n	14	9	10
		GM	164	203	194
		95% CI	122, 219	145, 283	121, 311
614G	Day 43 Post Vaccination 1 (14 Days Post Vaccination 2)	n	14	9	10
		GM	620	644	482
		95% CI	457, 841	427, 971	296, 787

Note: N=Number of Subjects.

n=Number of subjects with results available at time point.

**Figure 45. Pseudovirus Neutralization Assay Titers Distribution by Variant - ID<sub>80</sub>**



**Table 40.      Plaque Reduction Neutralization Test Geometric Mean (GM) Results with 95% Confidence Intervals by Time Point  
and Vaccination Group - PRNT<sub>80</sub> - Age 18-55**

Time Point	Statistic	25 µg mRNA-1273 18-55 years (N=15)	100 µg mRNA-1273 18-55 years (N=15)	18-55 years (N=30)
<b>Day 1 (Pre-Vaccination 1)</b>	n	15	15	30
	GM	4	4	4
	95% CI	NE	NE	NE
<b>Day 43 Post Vaccination 1 (14 Days Post Vaccination 2)</b>	n	13	14	27
	GM	340	654	477
	95% CI	184, 627	460, 930	337, 676

Note: N=Number of Subjects.  
n=Number of subjects with results available at time point.  
NE=Not Estimable

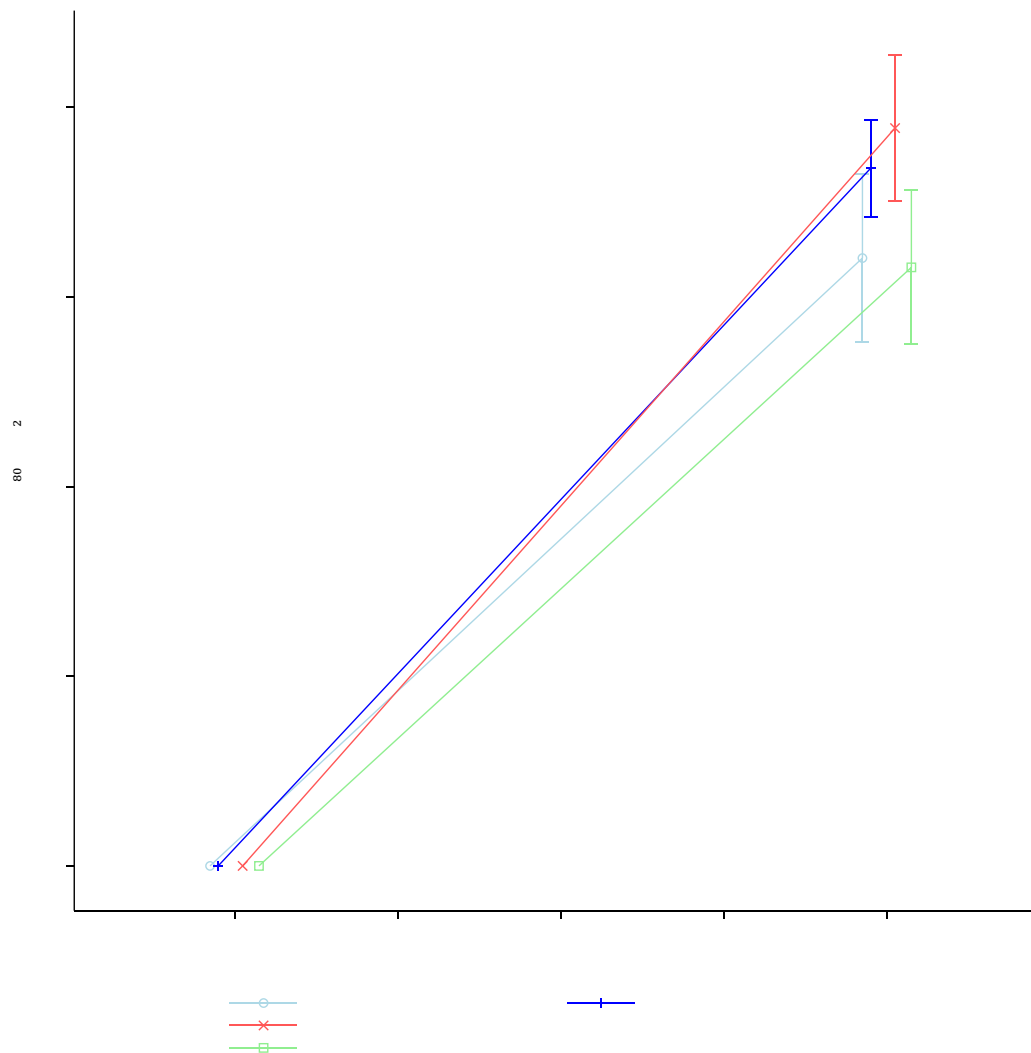
**Table 41.      Plaque Reduction Neutralization Test Geometric Mean (GM) Results with 95% Confidence Intervals by Time Point and Vaccination Group - PRNT<sub>80</sub> – Age 56-70**

Time Point	Statistic	100 µg mRNA-1273 56-70 years (N=10)
<b>Day 1 (Pre-Vaccination 1)</b>	n	10
	GM	4
	95% CI	NE
<b>Day 43 Post Vaccination 1 (14 Days Post Vaccination 2)</b>	n	9
	GM	878
	95% CI	516, 1494
Note: N=Number of Subjects. n=Number of subjects with results available at time point. NE=Not Estimable		

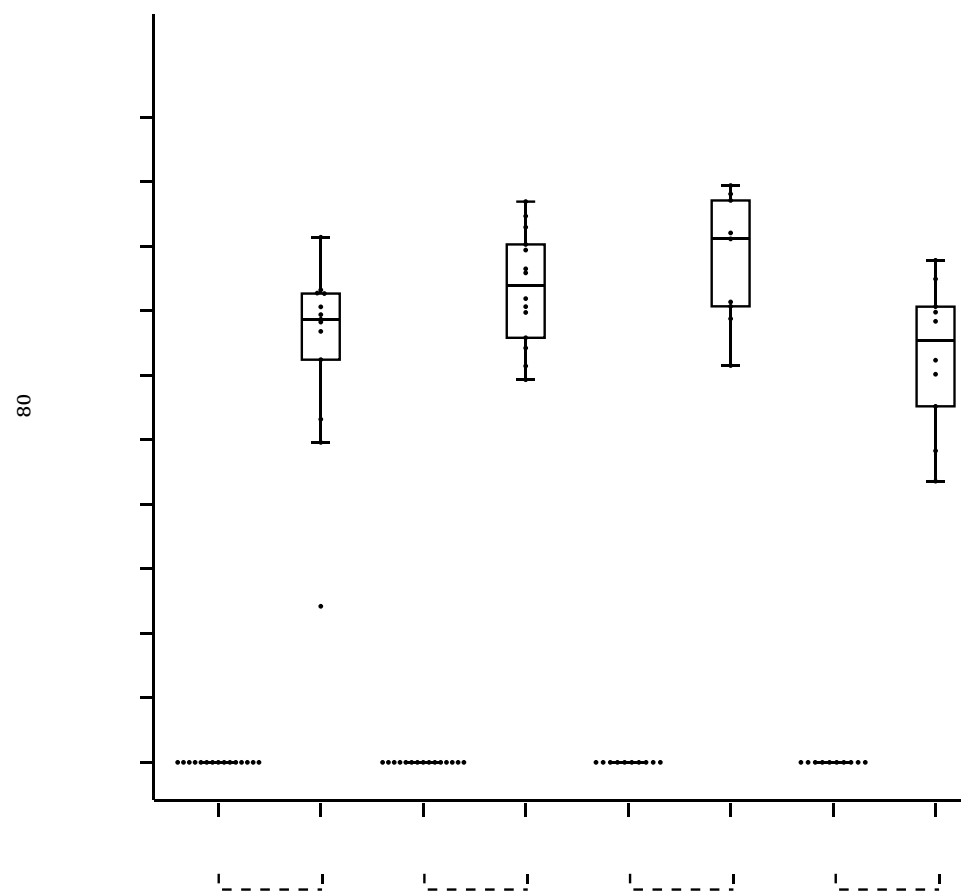
**Table 42.      Plaque Reduction Neutralization Test Geometric Mean (GM) Results with 95% Confidence Intervals by Time Point and Vaccination Group - PRNT<sub>80</sub> – Age ≥71**

Time Point	Statistic	100 µg mRNA-1273 ≥71 years (N=10)
<b>Day 1 (Pre-Vaccination 1)</b>	n	10
	GM	4
	95% CI	NE
<b>Day 43 Post Vaccination 1 (14 Days Post Vaccination 2)</b>	n	10
	GM	317
	95% CI	181, 557
Note: N=Number of Subjects. n=Number of subjects with results available at time point. NE=Not Estimable		

**Figure 46. Plaque Reduction Neutralization Test Geometric Mean by Time Point and Vaccination Group - PRNT<sub>80</sub>**



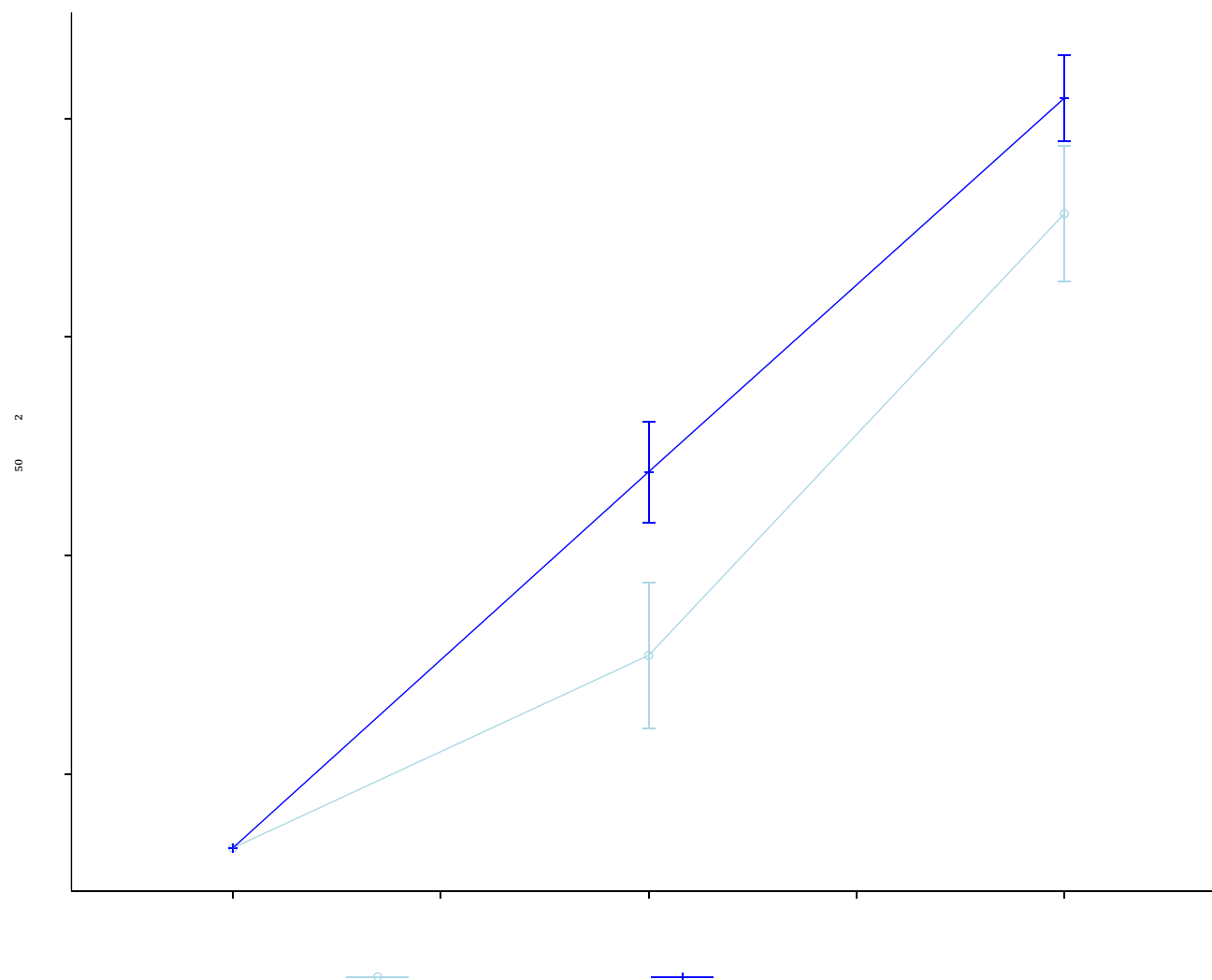
**Figure 47. Plaque Reduction Neutralization Test Titers Distribution by Time Point and Treatment Group - PRNT<sub>80</sub>**



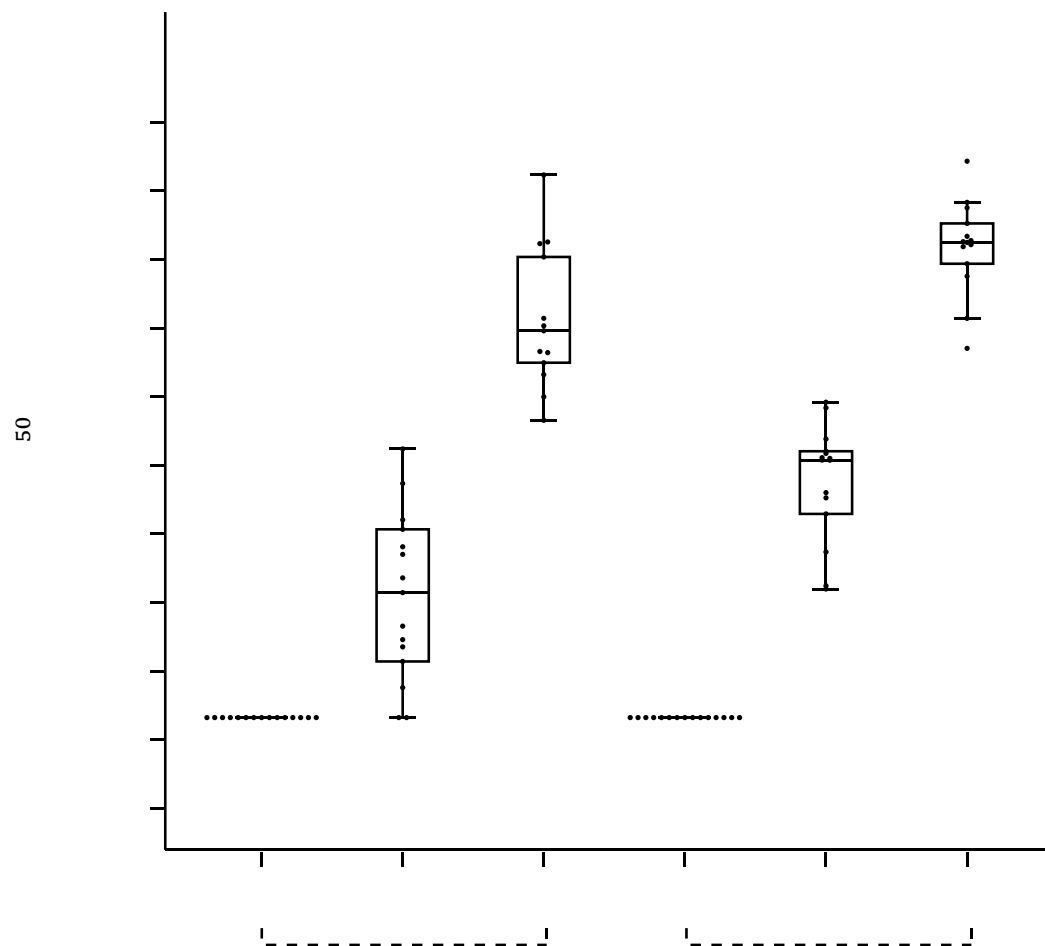
**Table 43. Focus Reduction Neutralization Test Geometric Mean (GM) Results with 95% Confidence Intervals by Time Point and Vaccination Group - ID<sub>50</sub>**

Time Point	Statistic	25 µg mRNA-1273 18-55 years (N=15)	100 µg mRNA -1273 18-55 years (N=15)	18-55 years (N=30)
<b>Day 1 (Pre-Vaccination 1)</b>	n	15	15	30
	GM	10.0	10.0	10.0
	95% CI	NE	NE	NE
<b>Day 29 Post Vaccination 1 (Pre-Vaccination 2)</b>	n	15	15	30
	GM	33.9	108.7	60.7
	95% CI	21.3, 54.0	78.9, 149.9	43.0, 85.8
<b>Day 43 Post Vaccination 1 (14 Days Post Vaccination 2)</b>	n	13	14	27
	GM	559.5	1165.4	818.5
	95% CI	363.4, 861.5	888.3, 1529.0	621.3, 1078.3
Note: N=Number of Subjects. n=Number of subjects with results available at time point. NE=Not Estimable				

**Figure 48. FRNT GM by Time Point and Treatment Group - ID<sub>50</sub>**



**Figure 49. FRNT Titers Distribution by Time Point and Treatment Group - ID<sub>50</sub>**



**Table 44. FRNT-mNG Geometric Mean (GM) Results with 95% Confidence Intervals by Time Point and Vaccination Group - ID<sub>50</sub> Age 18-55**

Time Point	Statistic	25 µg mRNA-1273 18-55 years (N=15)	100 µg mRNA-1273 18-55 years (N=15)	18-55 years (N=30)	Convalescent Sera
<b>Day 1 (Pre-Vaccination 1)</b>	n	15	15	30	15
	GM	10	10	10	109
	95% CI	NE	NE	NE	52, 229
<b>Day 29 Post Vaccination 1 (Pre-Vaccination 2)</b>	n	15	15	30	
	GM	23	69	40	
	95% CI	13, 39	46, 102	27, 58	
<b>Day 43 Post Vaccination 1 (14 Days Post Vaccination 2)</b>	n	13	14	27	
	GM	622	1388	943	
	95% CI	374, 1034	1056, 1825	693, 1283	
Note: N=Number of Subjects. n=Number of subjects with results available at time point. NE=Not Estimable					

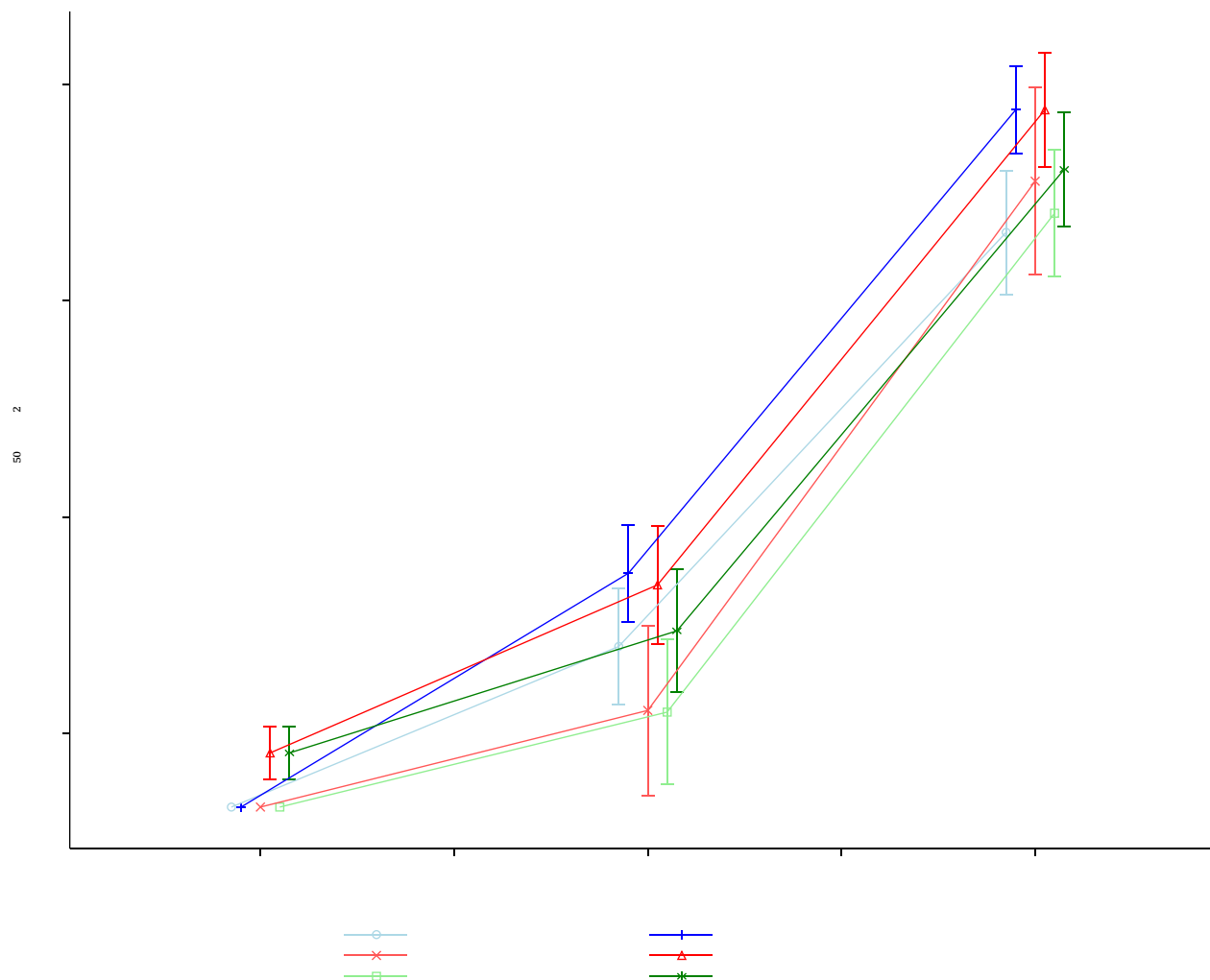
**Table 45. FRNT-mNG Geometric Mean (GM) Results with 95% Confidence Intervals by Time Point and Vaccination Group - ID<sub>50</sub> Age 56-70**

Time Point	Statistic	25 µg mRNA-1273 56-70 years (N=10)	100 µg mRNA-1273 56-70 years (N=10)	56-70 years (N=20)	Convalescent Sera
<b>Day 1 (Pre-Vaccination 1)</b>	n	10	10	20	15
	GM	10	10	10	109
	95% CI	NE	NE	NE	52, 229
<b>Day 29 Post Vaccination 1 (Pre-Vaccination 2)</b>	n	10	10	20	
	GM	19	80	39	
	95% CI	11, 32	52, 123	24, 62	
<b>Day 43 Post Vaccination 1 (14 Days Post Vaccination 2)</b>	n	10	9	19	
	GM	550	1425	863	
	95% CI	302, 1001	980, 2072	578, 1290	
Note: N=Number of Subjects. n=Number of subjects with results available at time point. NE=Not Estimable					

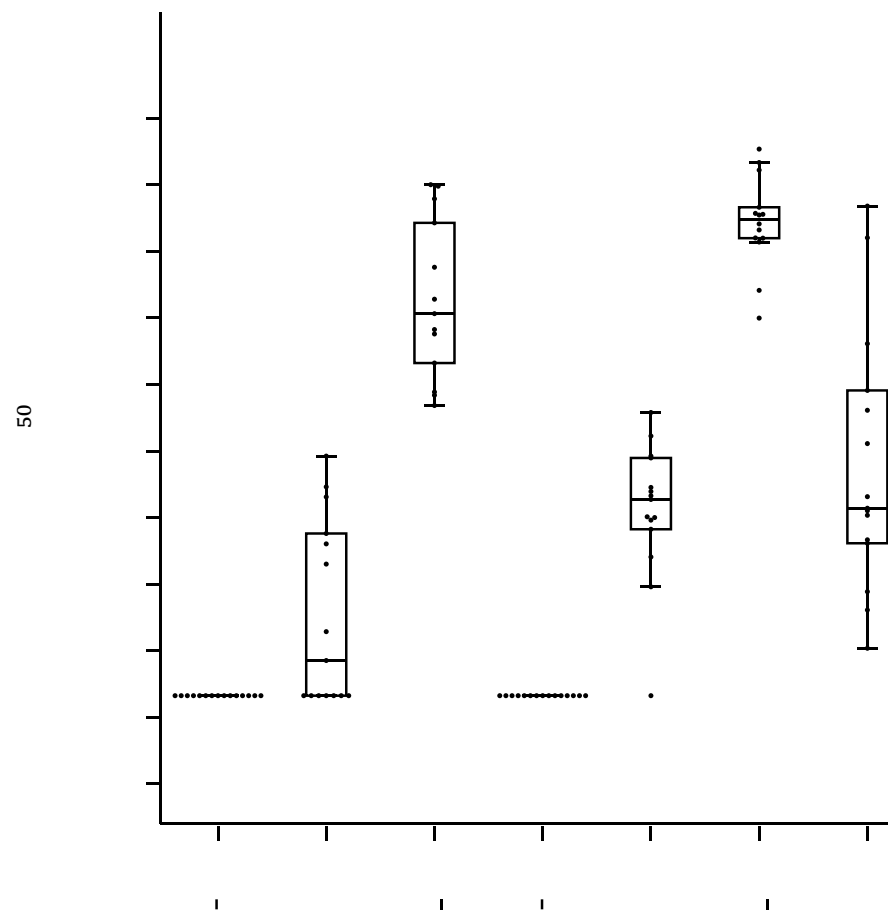
**Table 46. FRNT-mNG Geometric Mean (GM) Results with 95% Confidence Intervals by Time Point and Vaccination Group - ID<sub>50</sub> Age ≥71**

Time Point	Statistic	25 µg mRNA-1273 ≥71 years (N=10)	100 µg mRNA-1273 ≥71 years (N=10)	≥71 years (N=20)	Convalescent Sera
<b>Day 1 (Pre-Vaccination 1)</b>	n	10	10	20	15
	GM	10	10	10	109
	95% CI	NE	NE	NE	52, 229
<b>Day 29 Post Vaccination 1 (Pre-Vaccination 2)</b>	n	10	10	20	
	GM	18	39	27	
	95% CI	12, 29	18, 86	17, 42	
<b>Day 43 Post Vaccination 1 (14 Days Post Vaccination 2)</b>	n	10	10	20	
	GM	448	900	635	
	95% CI	299, 672	575, 1409	461, 874	
Note: N=Number of Subjects. n=Number of subjects with results available at time point. NE=Not Estimable					

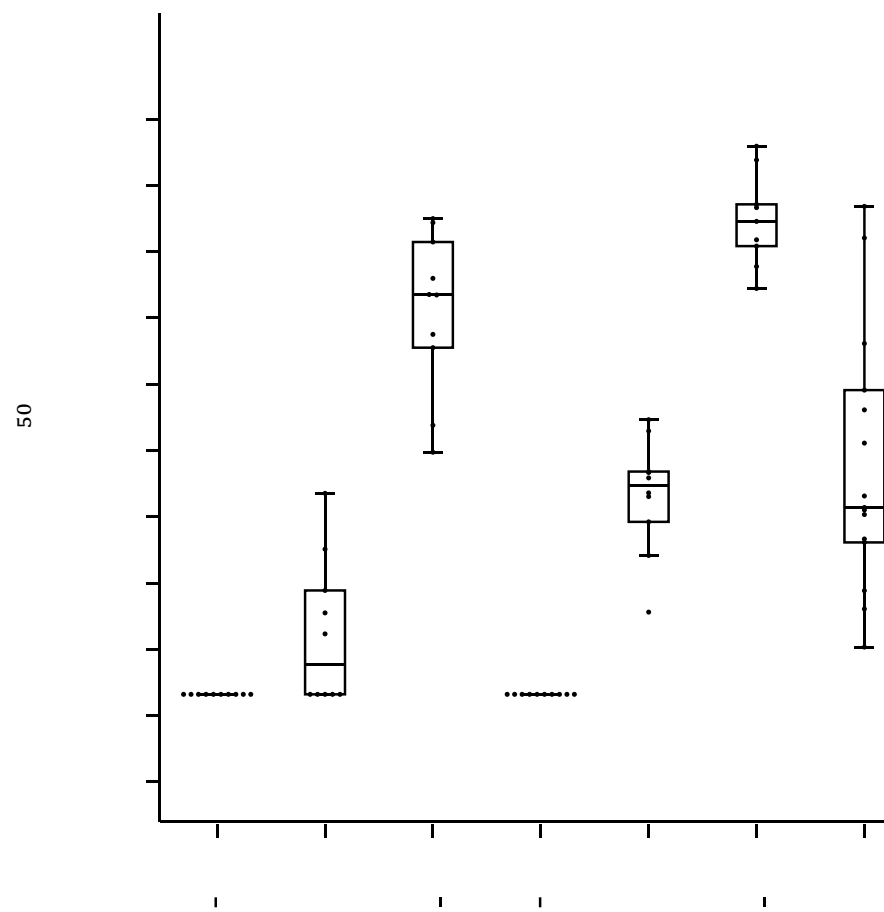
**Figure 50. FRNT-mNG Geometric Mean by Time Point and Vaccination Group - ID<sub>50</sub>**



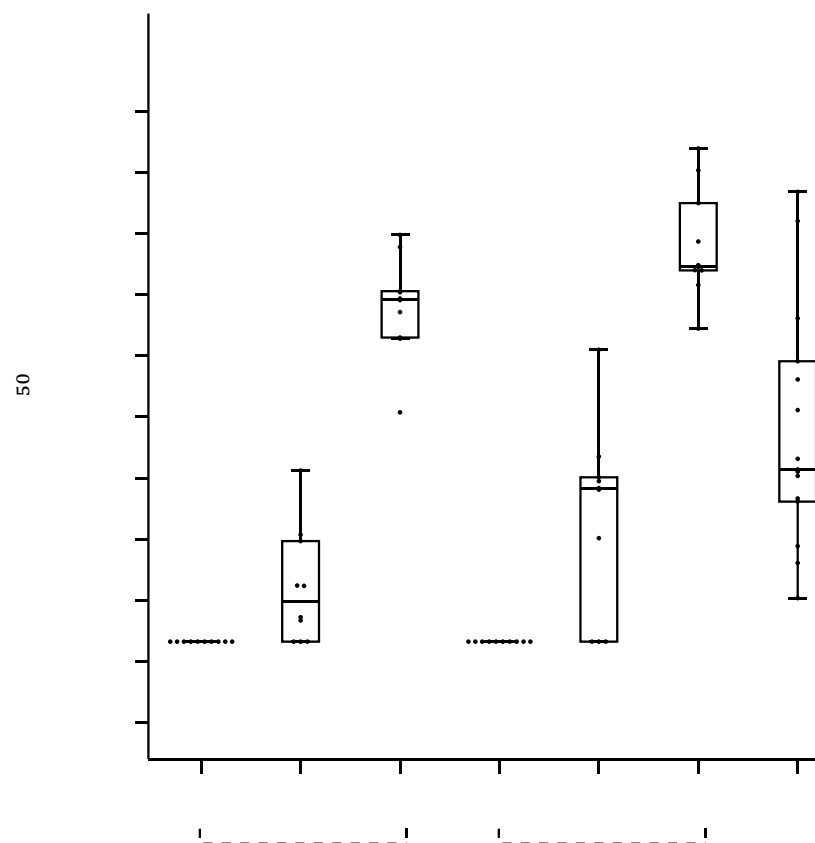
**Figure 51. FRNT-mNG Titers Distribution by Time Point and Treatment Group - ID<sub>50</sub> – Age 18-55**



**Figure 52. FRNT-mNG Titers Distribution by Time Point and Treatment Group - ID<sub>50</sub> – Age 56-70**



**Figure 53. FRNT-mNG Titers Distribution by Time Point and Treatment Group - ID<sub>50</sub> – Age ≥71**



**Table 47. FRNT-mNG Geometric Mean (GM) Results with 95% Confidence Intervals by Time Point and Vaccination Group - ID<sub>80</sub> – Age 18-55**

Time Point	Statistic	25 µg mRNA-1273 18-55 years (N=15)	100 µg mRNA-1273 18-55 years (N=15)	18-55 years (N=30)	Convalescent Sera
<b>Day 1 (Pre-Vaccination 1)</b>	n	15	15	30	15
	GMT	10	10	10	32
	95% CI	NE	NE	NE	16, 66
<b>Day 29 Post Vaccination 1 (Pre-Vaccination 2)</b>	n	15	15	30	
	GMT	12	25	17	
	95% CI	10, 15	18, 33	14, 22	
<b>Day 43 Post Vaccination 1 (14 Days Post Vaccination 2)</b>	n	13	14	27	
	GMT	234	525	356	
	95% CI	144, 381	416, 663	266, 477	
Note: N=Number of Subjects. n=Number of subjects with results available at time point. NE=Not Estimable					

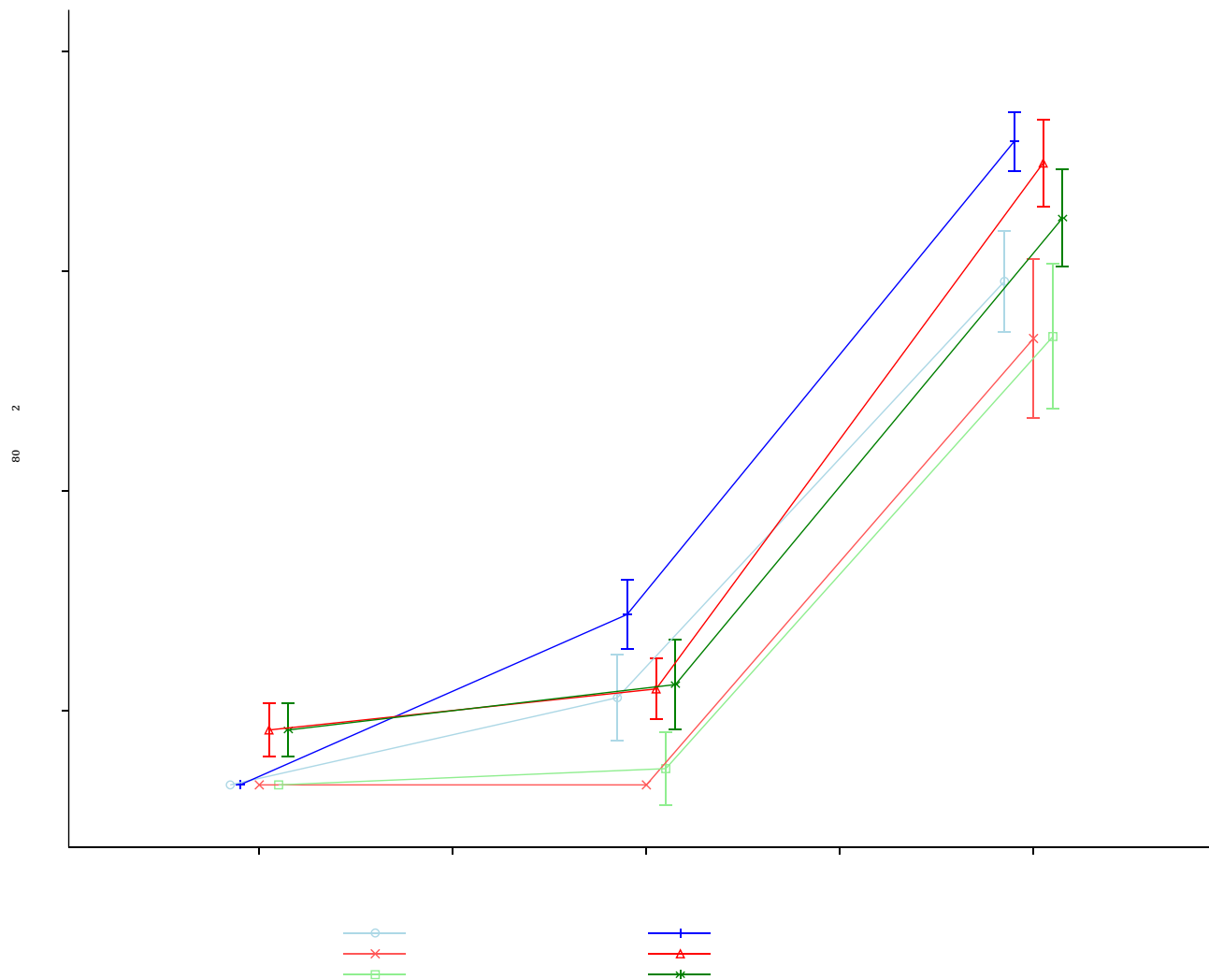
**Table 48. FRNT-mNG Geometric Mean (GM) Results with 95% Confidence Intervals by Time Point and Vaccination Group - ID<sub>80</sub> – Age 56-70**

Time Point	Statistic	25 µg mRNA-1273 56-70 years (N=10)	100 µg mRNA-1273 56-70 years (N=10)	56-70 years (N=20)	Convalescent Sera
<b>Day 1 (Pre-Vaccination 1)</b>	n	10	10	20	15
	GM	10	10	10	32
	95% CI	NE	NE	NE	16, 66
<b>Day 29 Post Vaccination 1 (Pre-Vaccination 2)</b>	n	10	10	20	
	GM	10	17	13	
	95% CI	NE	11, 25	10, 16	
<b>Day 43 Post Vaccination 1 (14 Days Post Vaccination 2)</b>	n	10	9	19	
	GM	167	583	302	
	95% CI	101, 277	400, 851	198, 461	
Note: N=Number of Subjects. n=Number of subjects with results available at time point. NE=Not Estimable					

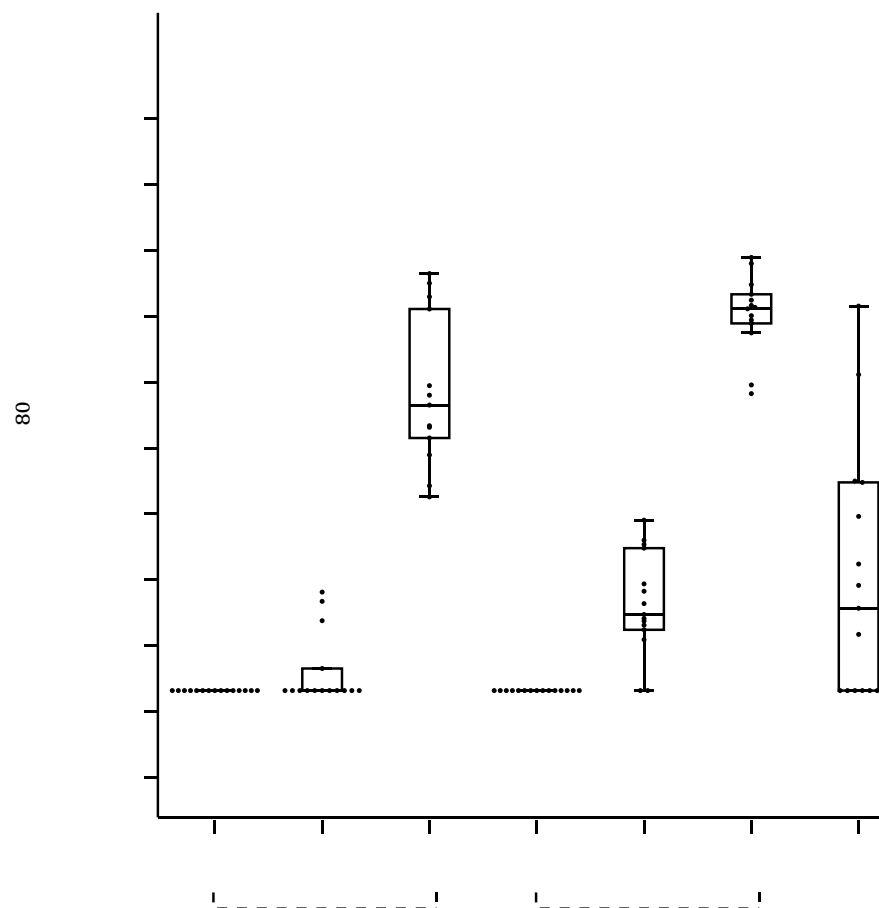
**Table 49. FRNT mNG Geometric Mean (GM) Results with 95% Confidence Intervals by Time Point and Vaccination Group - ID<sub>80</sub> – Age ≥71**

Time Point	Statistic	25 µg mRNA-1273 ≥71 years (N=10)	100 µg mRNA-1273 ≥71 years (N=10)	≥71 years (N=20)	Convalescent Sera
<b>Day 1 (Pre-Vaccination 1)</b>	n	10	10	20	15
	GM	10	10	10	32
	95% CI	NE	NE	NE	16, 66
<b>Day 29 Post Vaccination 1 (Pre-Vaccination 2)</b>	n	10	10	20	
	GM	11	15	13	
	95% CI	9, 14	9, 25	10, 17	
<b>Day 43 Post Vaccination 1 (14 Days Post Vaccination 2)</b>	n	10	10	20	
	GM	169	392	258	
	95% CI	107, 268	252, 609	182, 365	
Note: N=Number of Subjects. n=Number of subjects with results available at time point. NE=Not Estimable					

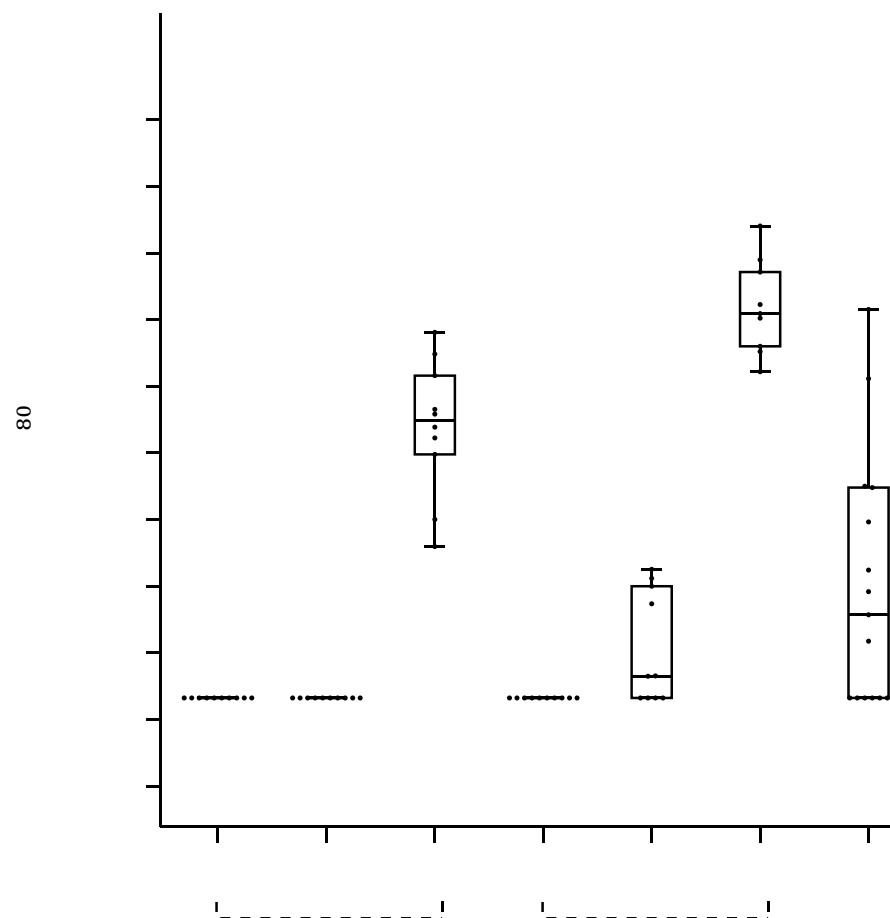
**Figure 54. FRNT-mNG Geometric Mean by Time Point and Vaccination Group - ID<sub>80</sub>**



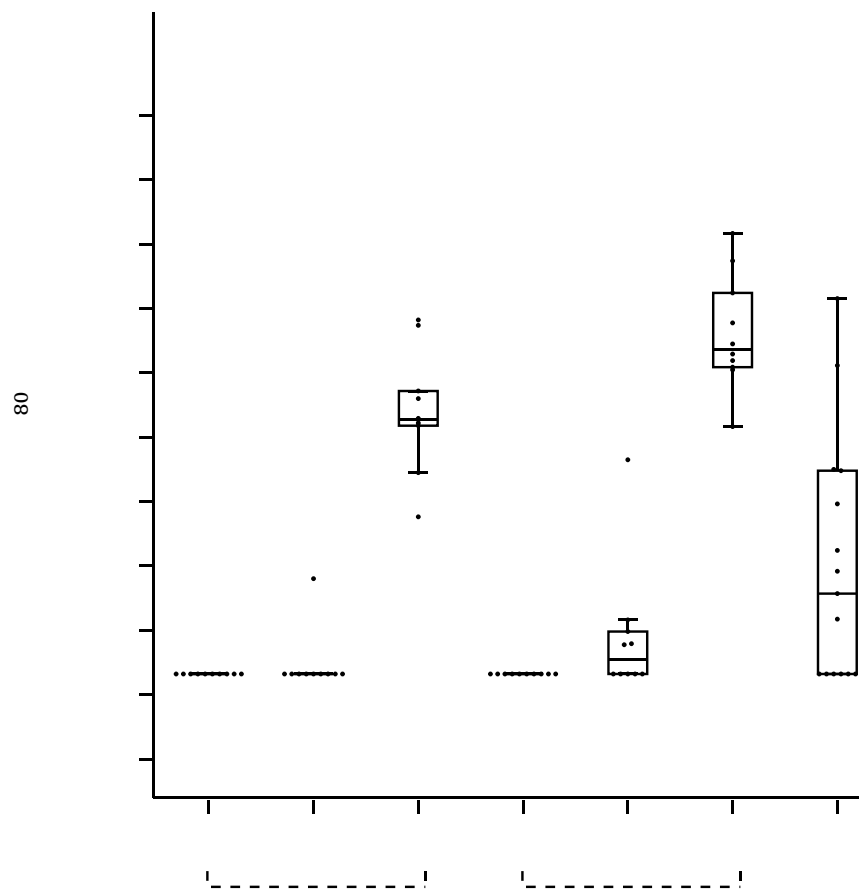
**Figure 55. FRNT-mNG Titers Distribution by Time Point and Treatment Group - ID<sub>80</sub> – Age 18-55**



**Figure 56. FRNT-mNG Titers Distribution by Time Point and Treatment Group - ID<sub>80</sub> – Age 56-70**



**Figure 57. FRNT-mNG Titers Distribution by Time Point and Treatment Group - ID<sub>80</sub> – Age ≥71**



**Table 50. nLuciferase Neutralization Assay Geometric Mean (GM) Results with 95% Confidence Intervals by Time Point and Vaccination Group - ID<sub>50</sub> – Age 18-55**

Time Point	Statistic	25 µg mRNA-1273 18-55 years (N=15)	100 µg mRNA-1273 18-55 years (N=15)	18-55 years (N=30)	Convalescent Sera
<b>Day 1 (Pre-Vaccination 1)</b>	n	15	15	30	28
	GM	10	10	10	46
	95% CI	NE	NE	NE	31, 69
<b>Day 29 Post Vaccination 1 (Pre-Vaccination 2)</b>	n	15	15	30	
	GM	21	29	25	
	95% CI	13, 33	19, 44	19, 33	
<b>Day 43 Post Vaccination 1 (14 Days Post Vaccination 2)</b>	n	13	13	26	
	GM	253	526	365	
	95% CI	145, 443	374, 739	260, 512	
Note: N=Number of Subjects. n=Number of subjects with results available at time point. NE=Not Estimable					

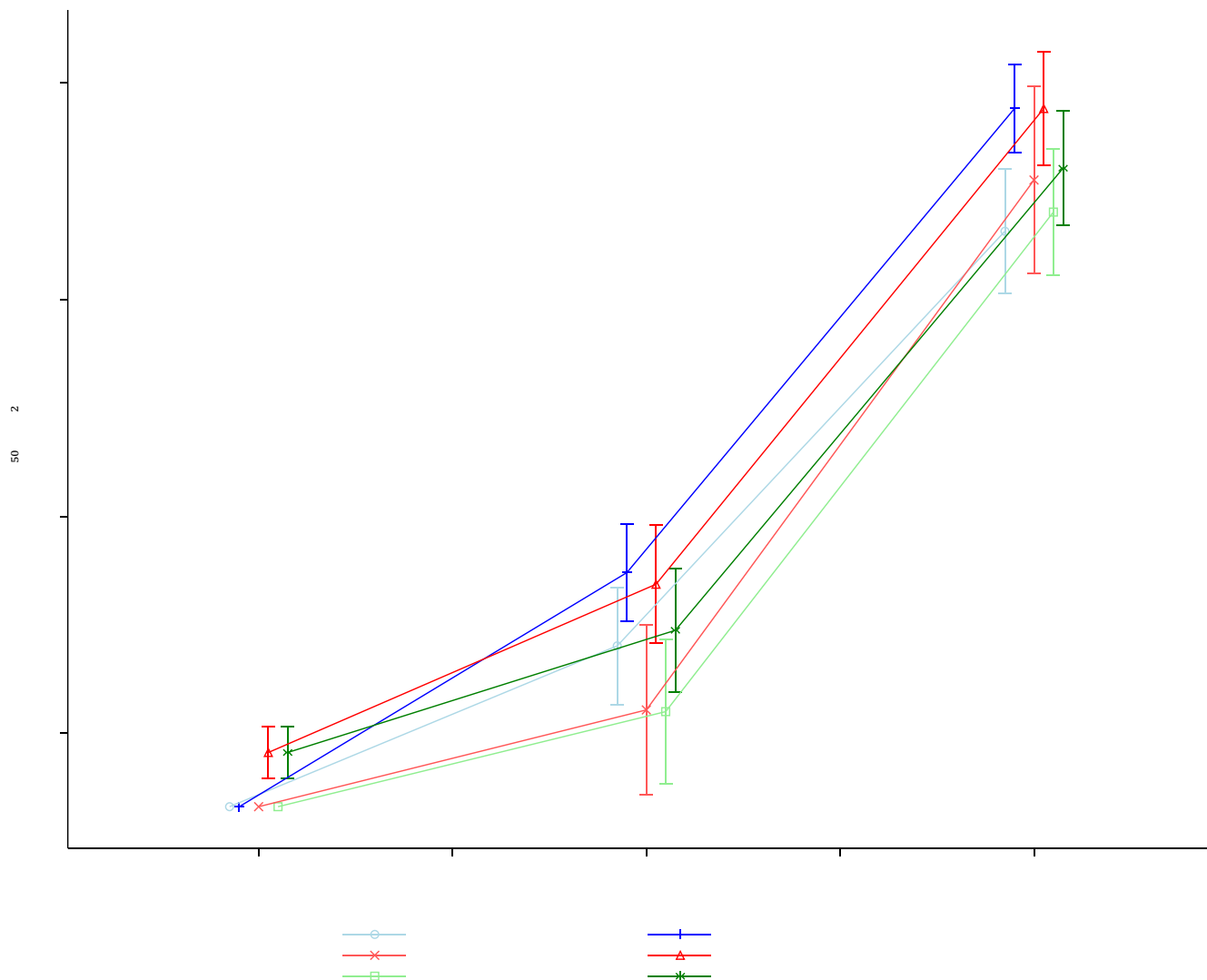
**Table 51. nLuciferase Neutralization Assay Geometric Mean (GM) Results with 95% Confidence Intervals by Time Point and Vaccination Group - ID<sub>50</sub> – Age 56-70**

Time Point	Statistic	100 µg mRNA-1273 56-70 years (N=10)	Convalescent Sera
<b>Day 1 (Pre-Vaccination 1)</b>	n	10	28
	GM	20	46
	95% CI	NE	31, 69
<b>Day 29 Post Vaccination 1 (Pre-Vaccination 2)</b>	n	10	
	GM	21	
	95% CI	18, 25	
<b>Day 43 Post Vaccination 1 (14 Days Post Vaccination 2)</b>	n	9	
	GM	530	
	95% CI	337, 835	
Note: N=Number of Subjects. n=Number of subjects with results available at time point. NE=Not Estimable			

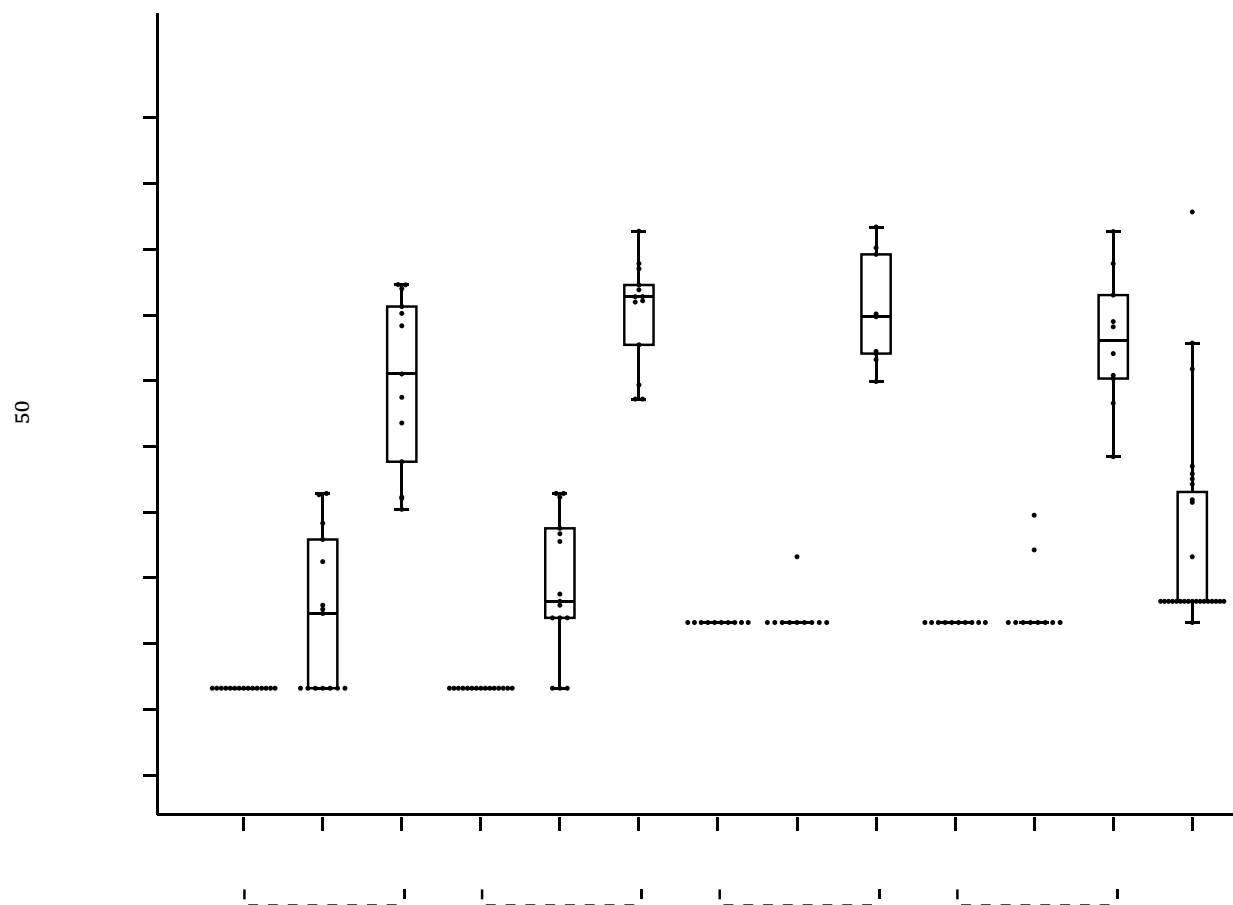
**Table 52. nLuciferase Neutralization Assay Geometric Mean (GM) Results with 95% Confidence Intervals by Time Point and Vaccination Group - ID<sub>50</sub> – Age ≥71**

Time Point	Statistic	100 µg mRNA-1273 ≥71 years (N=10)	Convalescent Sera
<b>Day 1 (Pre-Vaccination 1)</b>	n	10	28
	GM	20	46
	95% CI	NE	31, 69
<b>Day 29 Post Vaccination 1 (Pre-Vaccination 2)</b>	n	10	
	GM	24	
	95% CI	18, 32	
<b>Day 43 Post Vaccination 1 (14 Days Post Vaccination 2)</b>	n	10	
	GM	391	
	95% CI	235, 649	
Note: N=Number of Subjects. n=Number of subjects with results available at time point. NE=Not Estimable			

**Figure 58. nLuciferase Neutralization Assay Geometric Mean by Time Point and Vaccination Group - ID<sub>50</sub>**



**Figure 59. nLuciferase Neutralization Assay Titers Distribution by Time Point and Vaccination Group - ID<sub>50</sub>**



**Table 53. nLuciferase Neutralization Assay Geometric Mean (GM) Results with 95% Confidence Intervals by Time Point and Vaccination Group - ID<sub>80</sub> – Age 18-55**

Time Point	Statistic	25 µg mRNA-1273 18-55 years (N=15)	100 µg mRNA-1273 18-55 years (N=15)	18-55 years (N=30)
<b>Day 1 (Pre-Vaccination 1)</b>	n	15	15	30
	GM	10	10	10
	95% CI	NE	NE	NE
<b>Day 29 Post Vaccination 1 (Pre-Vaccination 2)</b>	n	14	15	29
	GM	20	32	26
	95% CI	13, 30	22, 46	20, 34
<b>Day 43 Post Vaccination 1 (14 Days Post Vaccination 2)</b>	n	13	13	26
	GM	246	646	399
	95% CI	150, 403	472, 885	285, 558
Note: N=Number of Subjects. n=Number of subjects with results available at time point. NE=Not Estimable				

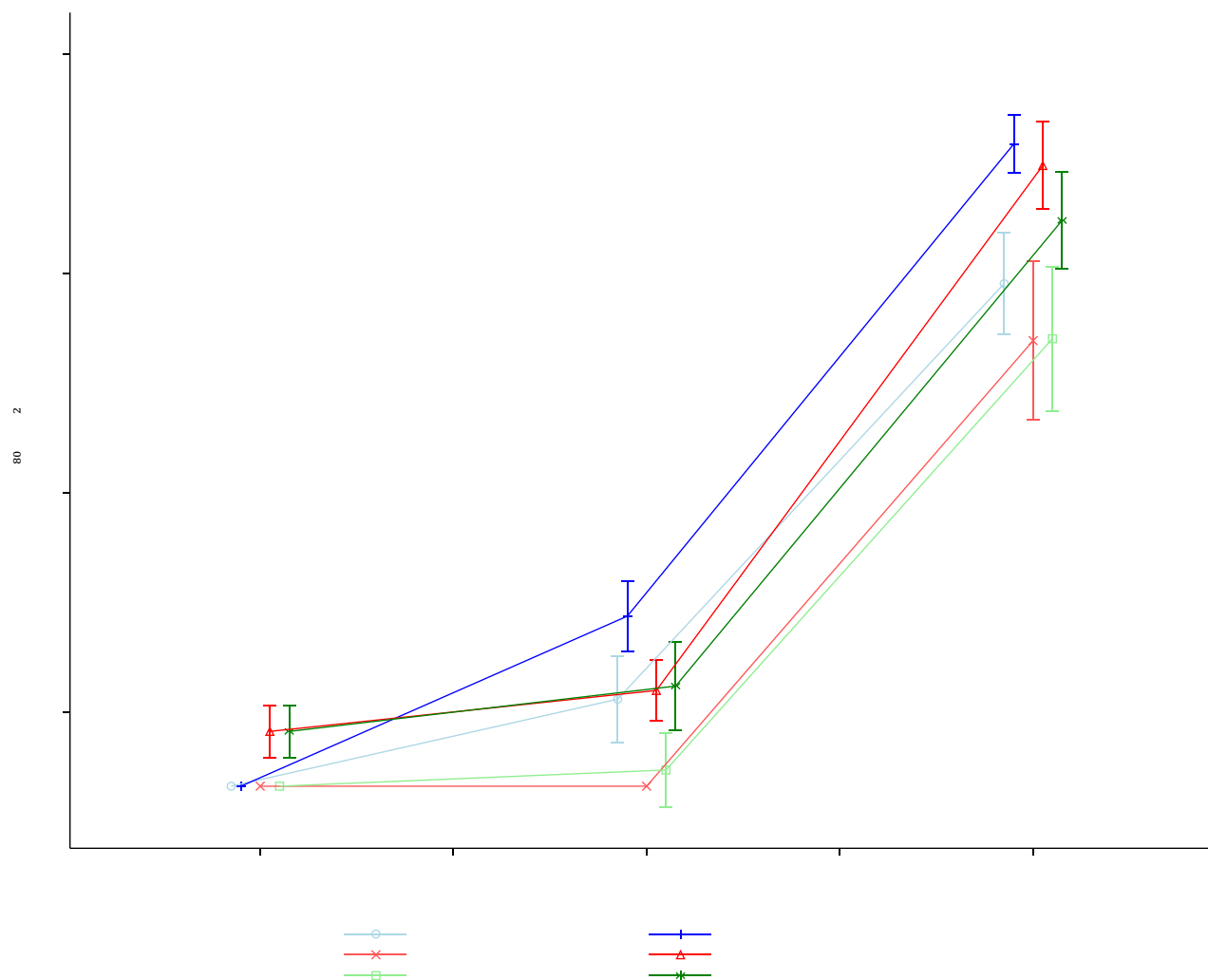
**Table 54. nLuciferase Neutralization Assay Geometric Mean (GM) Results with 95% Confidence Intervals by Time Point and Vaccination Group - ID<sub>80</sub> – Age 56-70**

Time Point	Statistic	100 µg mRNA-1273 56-70 years (N=10)
<b>Day 1 (Pre-Vaccination 1)</b>	n	10
	GM	20
	95% CI	NE
<b>Day 29 Post Vaccination 1 (Pre-Vaccination 2)</b>	n	10
	GM	20
	95% CI	NE
<b>Day 43 Post Vaccination 1 (14 Days Post Vaccination 2)</b>	n	9
	GM	440
	95% CI	276, 700
Note: N=Number of Subjects. n=Number of subjects with results available at time point. NE=Not Estimable		

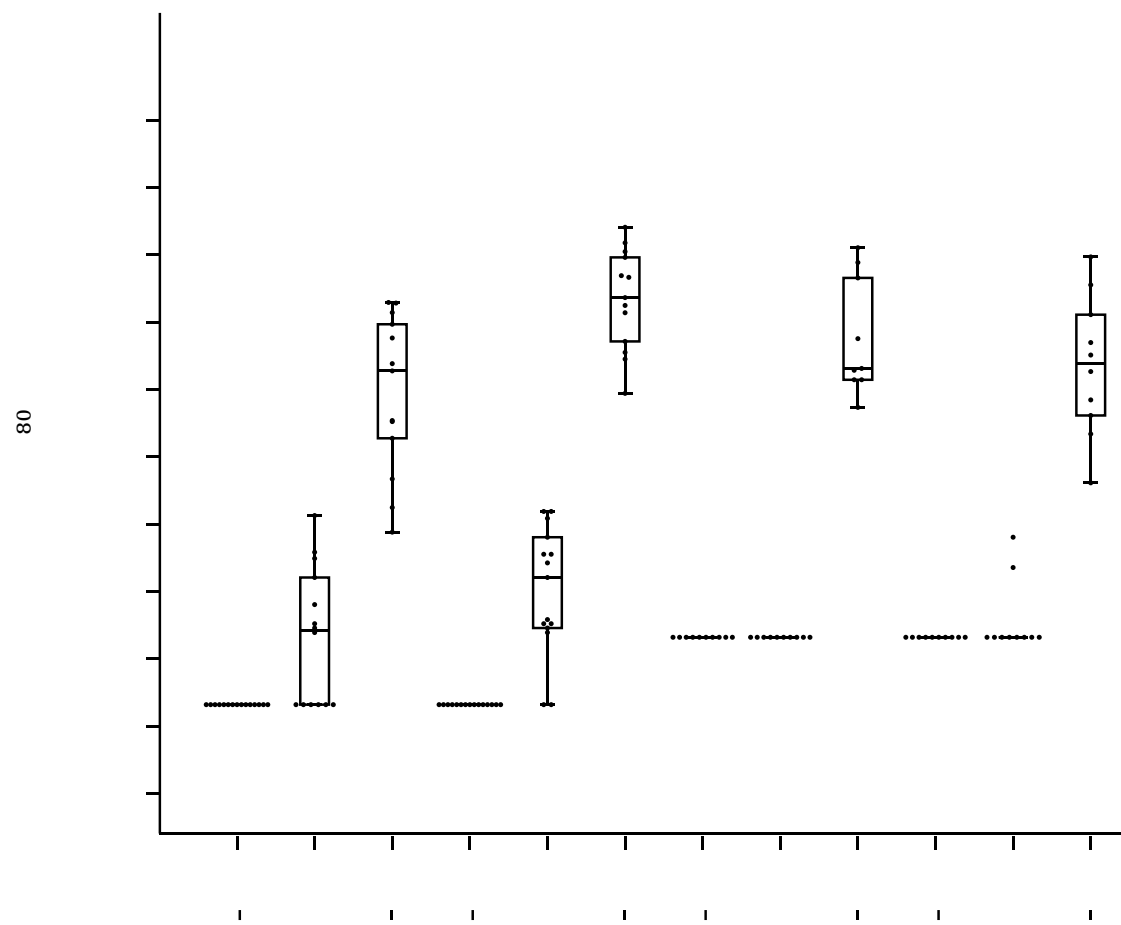
**Table 55. nLuciferase Neutralization Assay Geometric Mean (GM) Results with 95% Confidence Intervals by Time Point and Vaccination Group - ID<sub>80</sub> – Age ≥71**

Time Point	Statistic	100 µg mRNA-1273 ≥71 years (N=10)
<b>Day 1 (Pre-Vaccination 1)</b>	n	10
	GM	20
	95% CI	NE
<b>Day 29 Post Vaccination 1 (Pre-Vaccination 2)</b>	n	10
	GM	24
	95% CI	18, 31
<b>Day 43 Post Vaccination 1 (14 Days Post Vaccination 2)</b>	n	10
	GM	327
	95% CI	196, 546
Note: N=Number of Subjects. n=Number of subjects with results available at time point. NE=Not Estimable		

**Figure 60. nLuciferase Neutralization Assay Geometric Mean by Time Point and Vaccination Group – ID<sub>80</sub>**



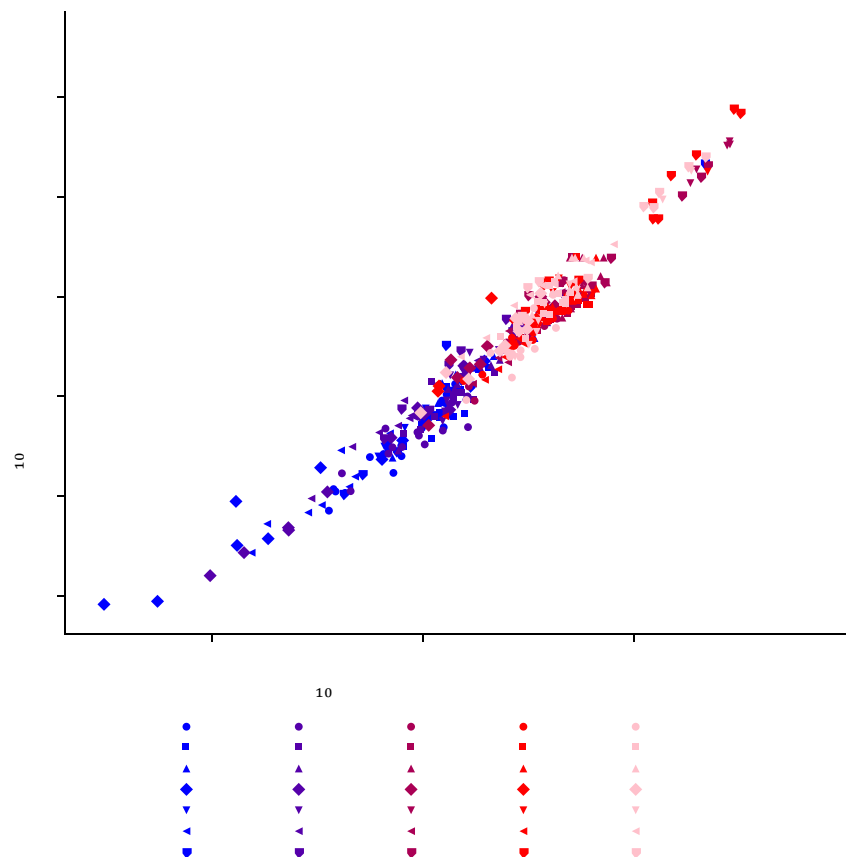
**Figure 61. nLuciferase Neutralization Assay Titers Distribution by Time Point and Vaccination Group – ID<sub>80</sub>**



**Figure 62. Binding to SARS-CoV-2 spike proteins in ELISA Expressed as Area-Under-the-Curve (AUC) is Highly Correlated with Binding Expressed as Endpoint Dilution Titer**

**A**, vaccinee sera binding to S-2P expressed as endpoint vs AUC. **B**, vaccinee sera binding to RBD expressed as endpoint vs AUC.  
**C**, convalescent sera binding to S-2P expressed as endpoint vs AUC. **D**, convalescent sera binding to RBD expressed as endpoint vs AUC.

**A**



**B**

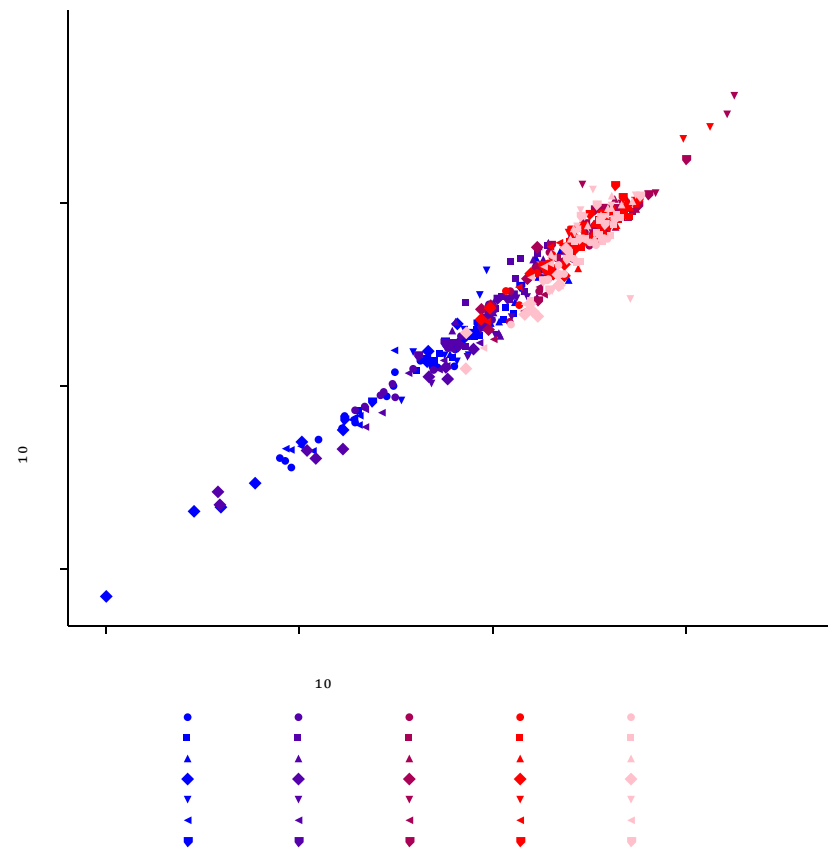
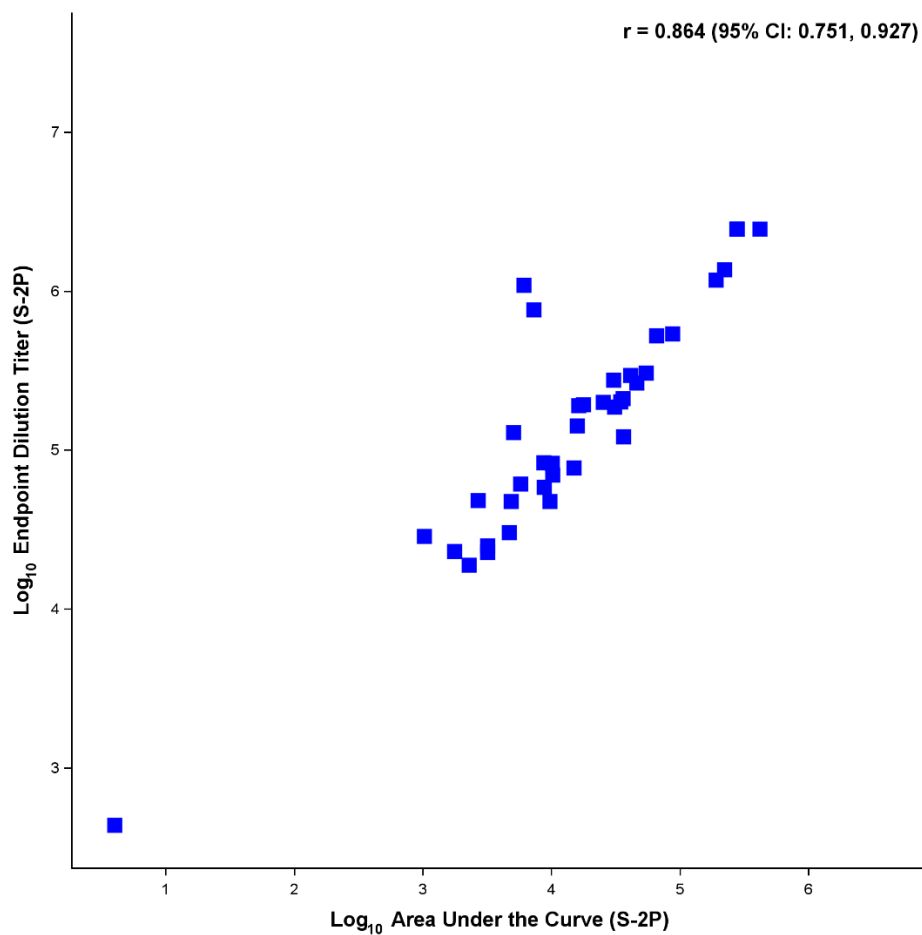
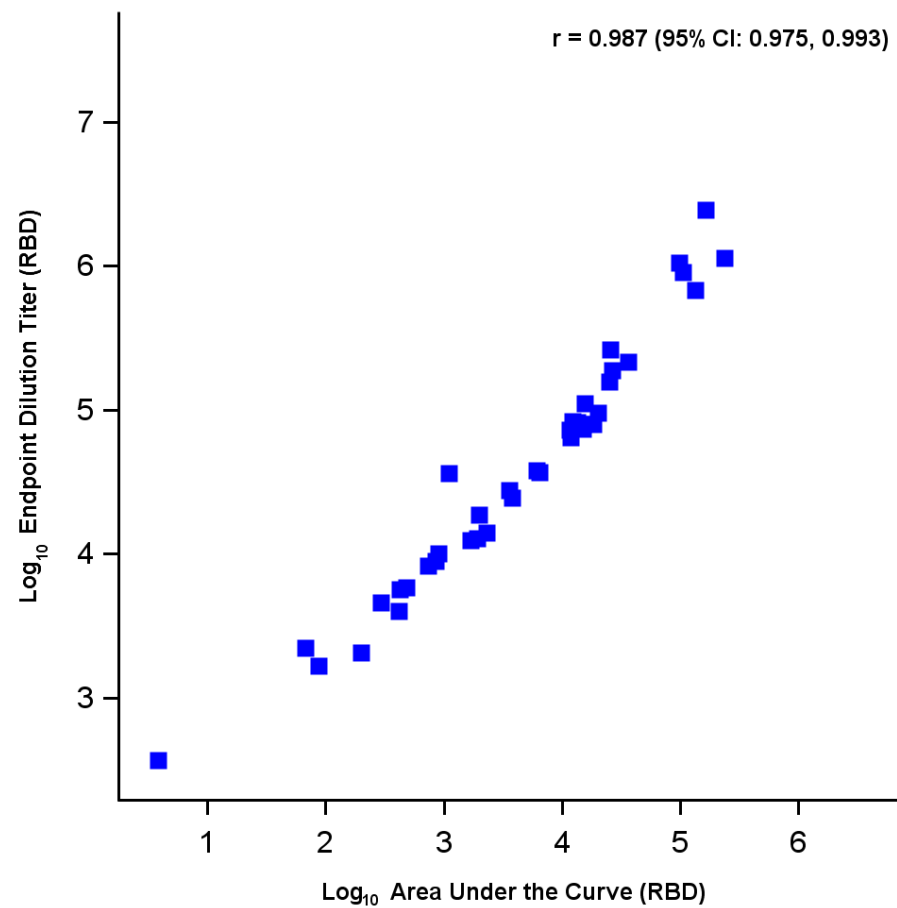


Figure 63 (continued)

C



D



**Figure 63. Binding to S-2P or RBD Proteins are Highly Correlated**

**A**, vaccinee sera binding to S-2P vs. RBD, expressed as area under the curve (AUC). **B**, vaccinee sera binding to S-2P vs. RBD, expressed as endpoint dilution titer. **C**, convalescent sera binding to S-2P vs. RBD, expressed as AUC. **D**, convalescent sera binding to S-2P vs. RBD, expressed as endpoint dilution titer.

**A**

**B**

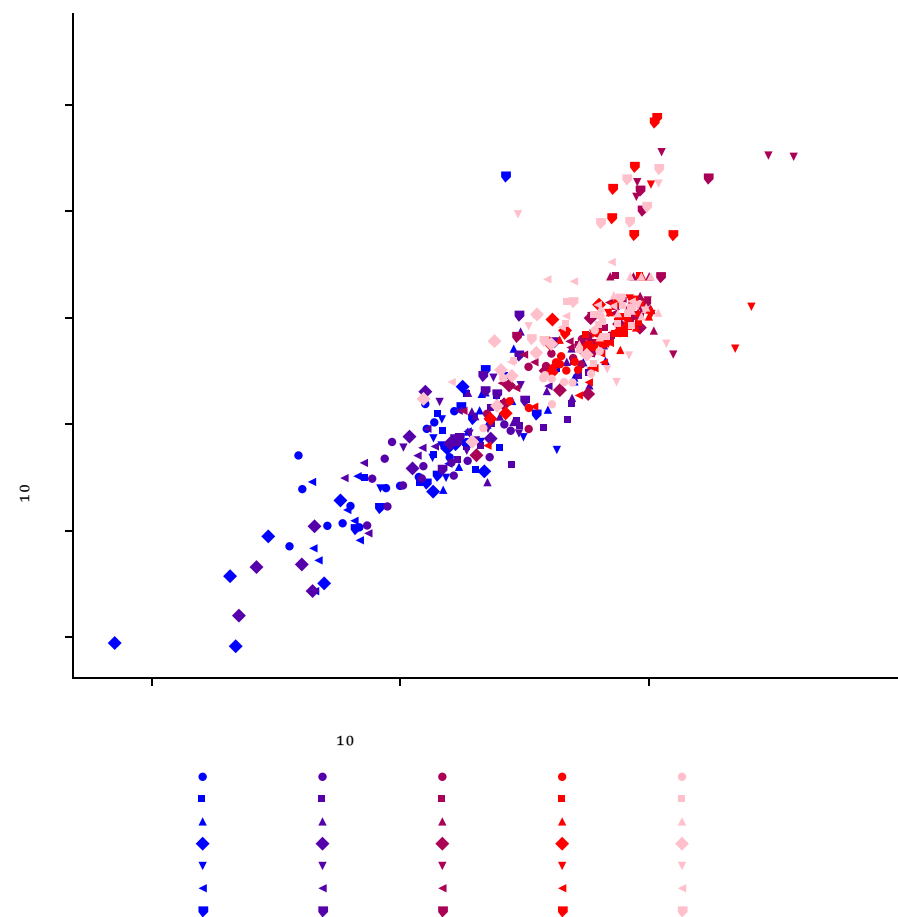
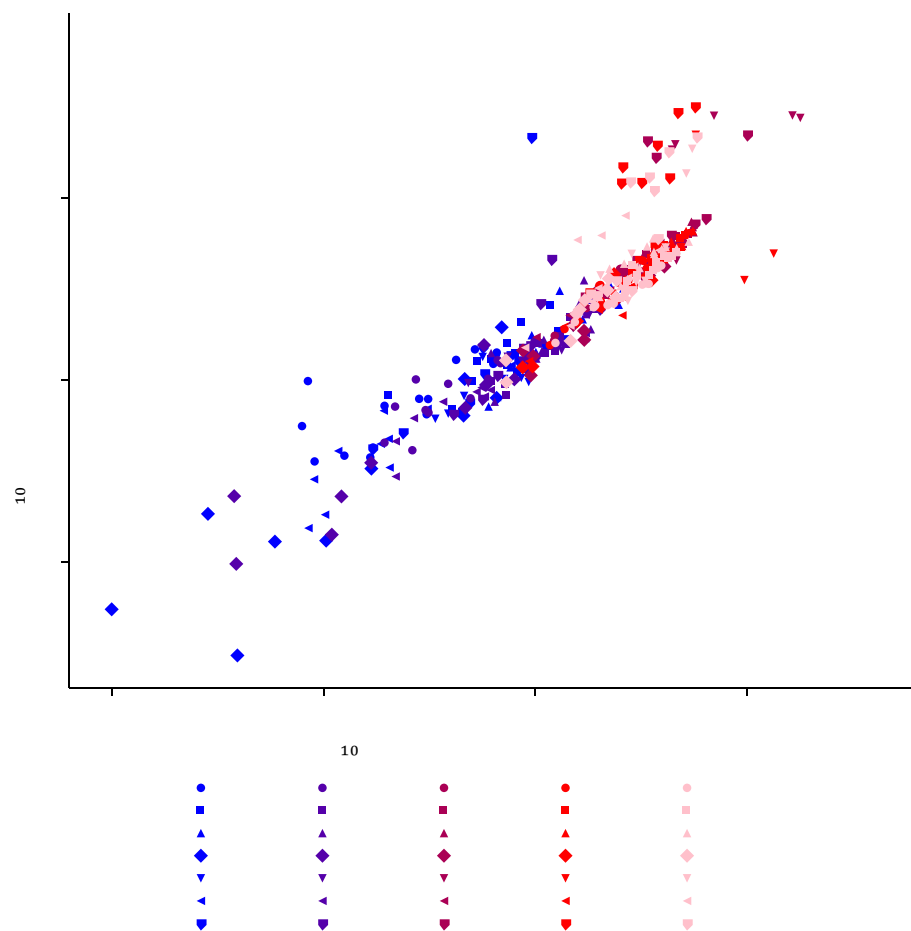
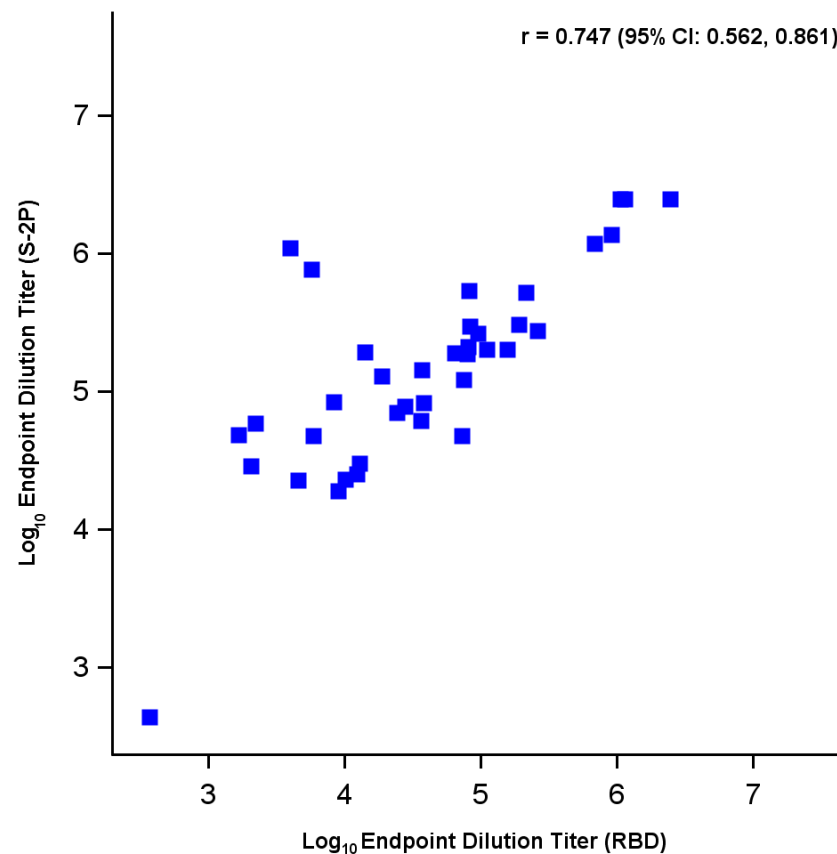
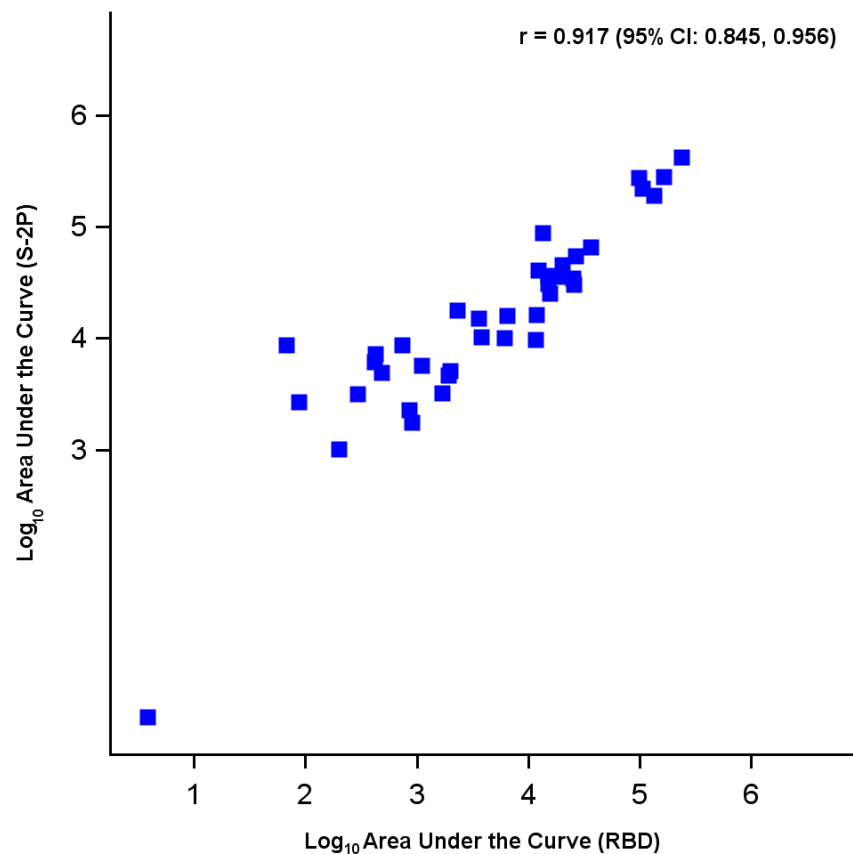


Figure 64 (continued)

C

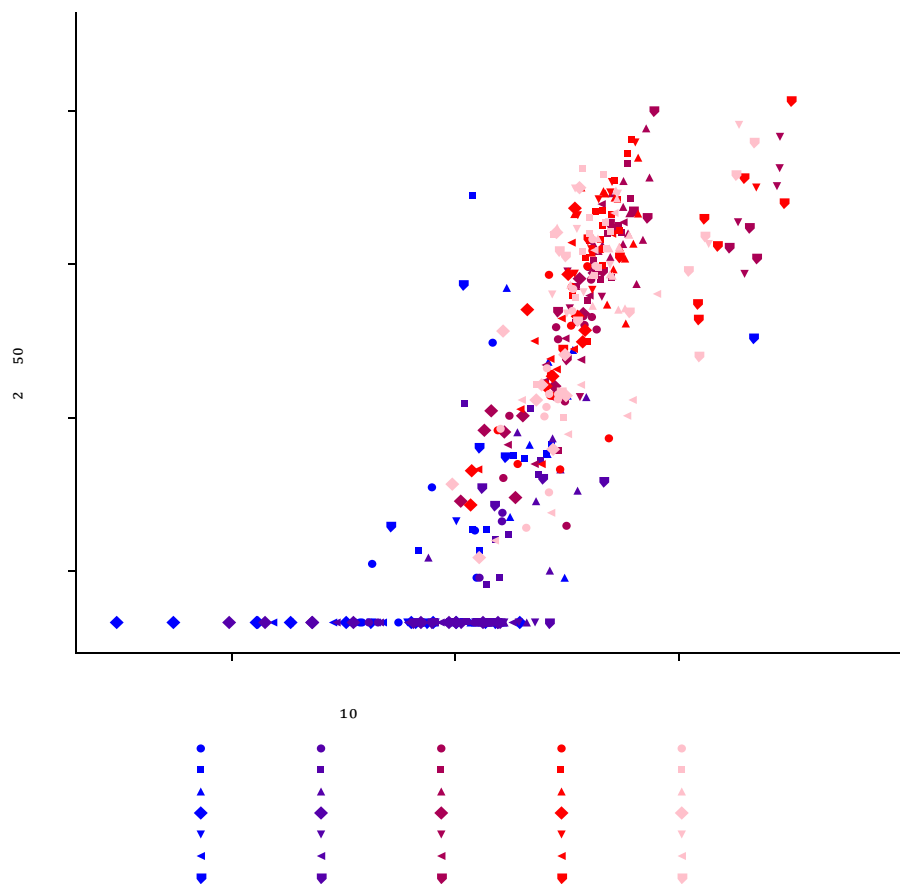
D



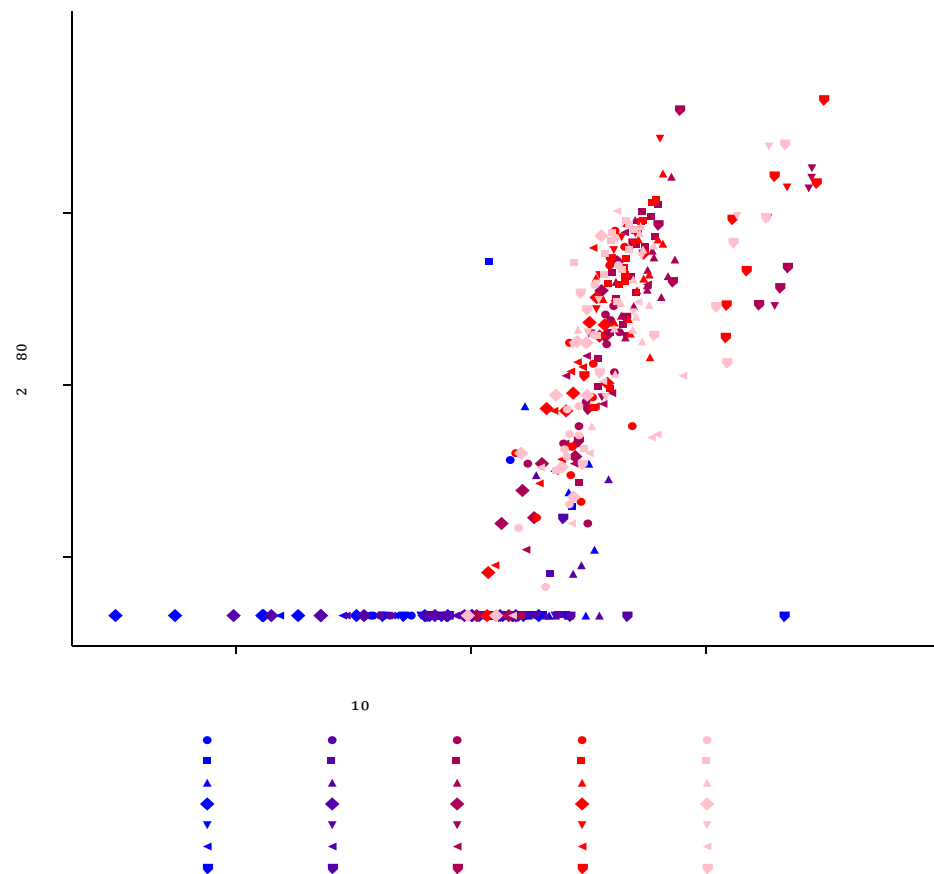
**Figure 64. Pseudovirus Neutralization Correlates with Binding in ELISA**

**A**, PsVNA vaccinee sera ID<sub>50</sub> vs. AUC S2P. **B**, PsVNA vaccinee sera ID<sub>80</sub> vs. AUC S2P. **C**, PsVNA convalescent sera ID<sub>50</sub> vs. AUC S2P. **D**, PsVNA convalescent sera ID<sub>80</sub> vs. AUC S2P

**A**

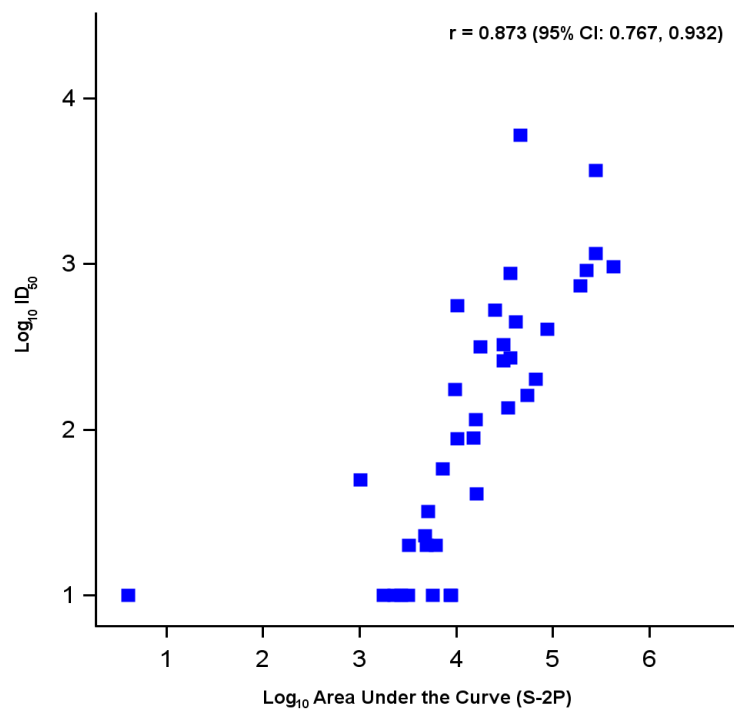


**B**

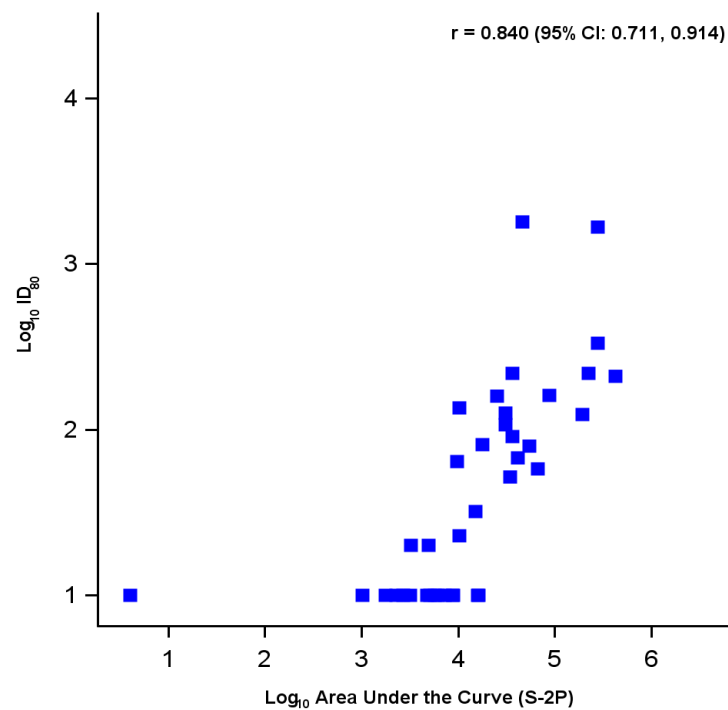


**Figure 65 (continued)**  
**D**

**C**



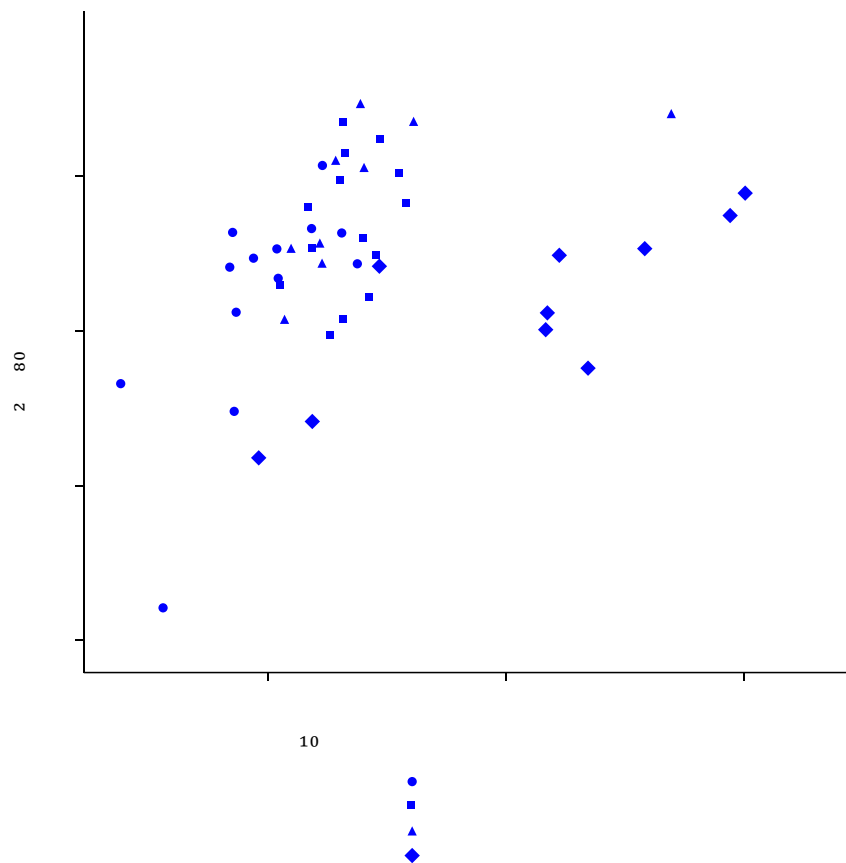
**D**



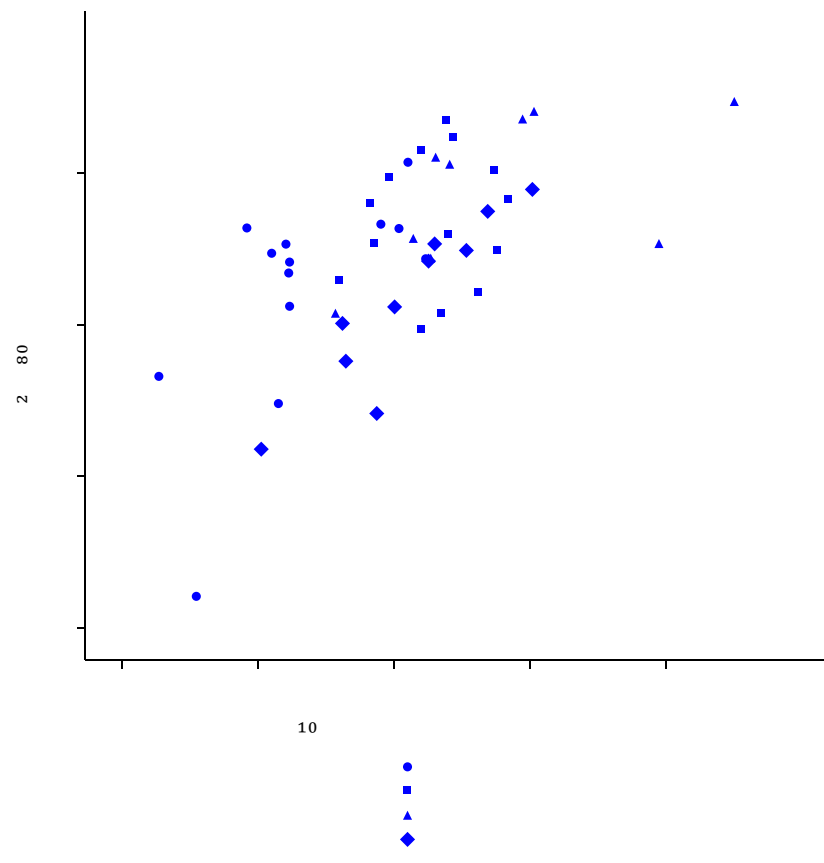
**Figure 65. Live-Virus Neutralization (PRNT<sub>80</sub>) Correlates with Binding in ELISA**

**A**, PRNT<sub>80</sub> vs. S-2P binding (AUC) . **B**, PRNT<sub>80</sub> vs. RBD binding (AUC).

**A**



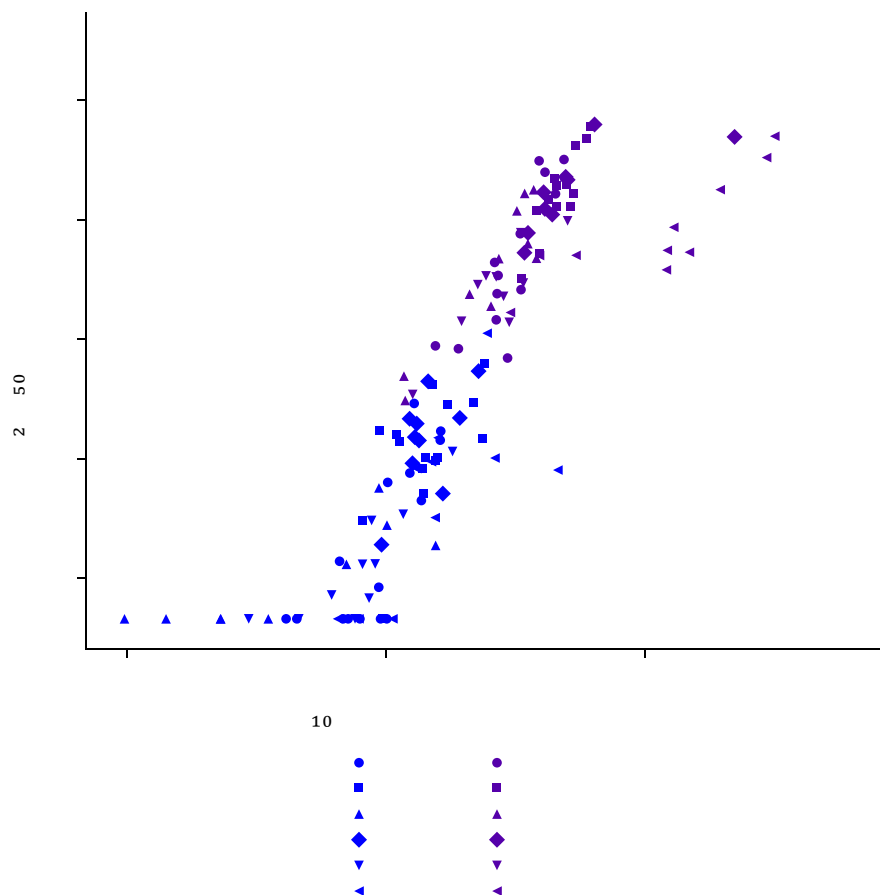
**B**



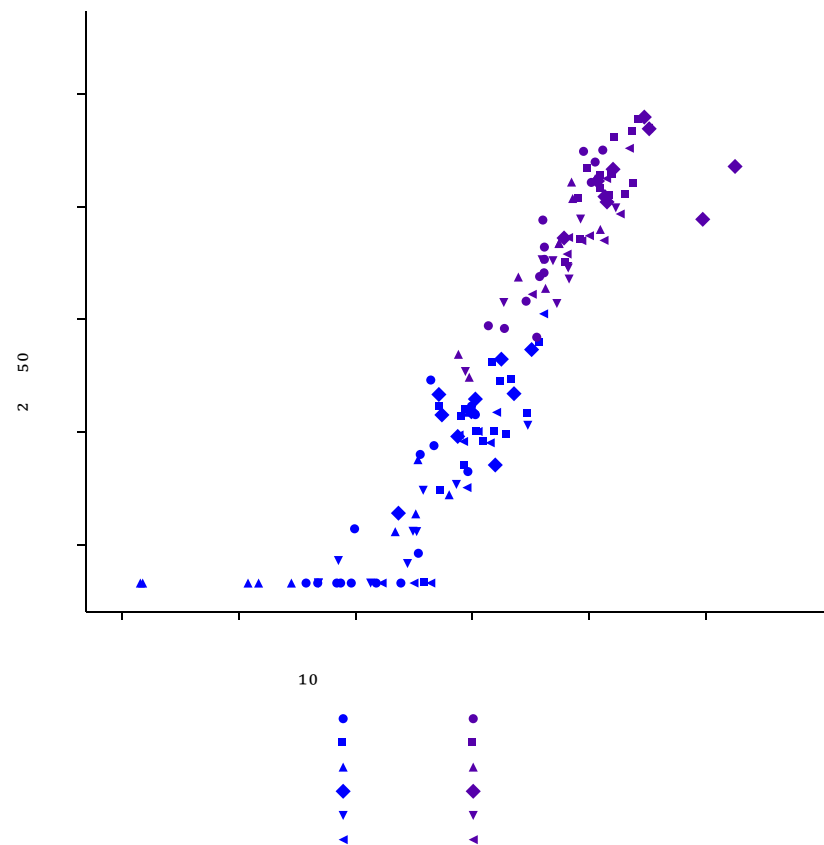
**Figure 66. FRNT-mNG Correlates with Binding in ELISA**

**A**, FRNT50 vs. S-2P binding (AUC) ; **B**, FRNT50 vs. RBD binding (AUC).

**A**



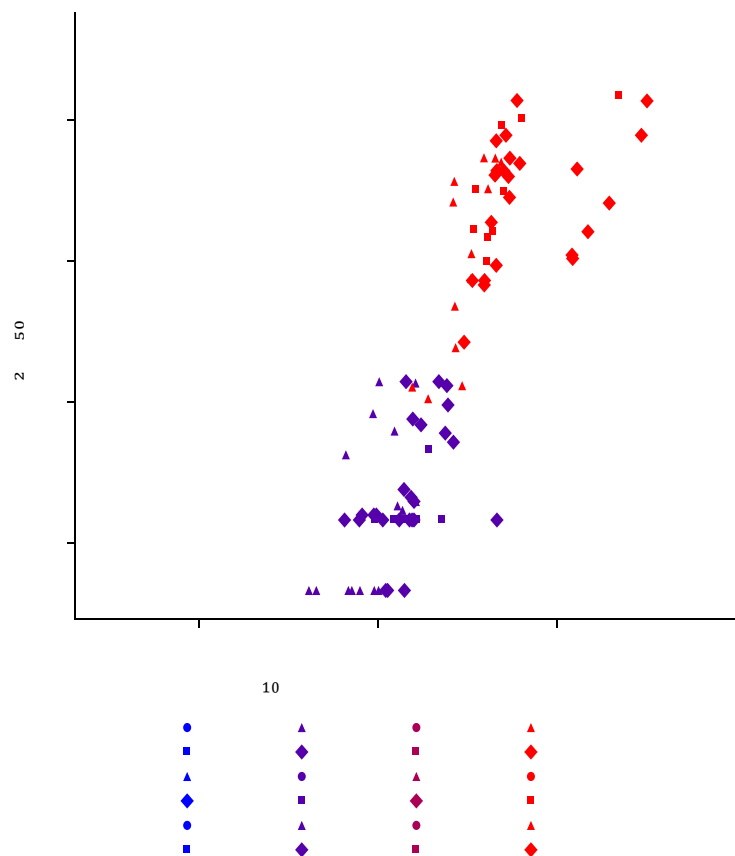
**B**



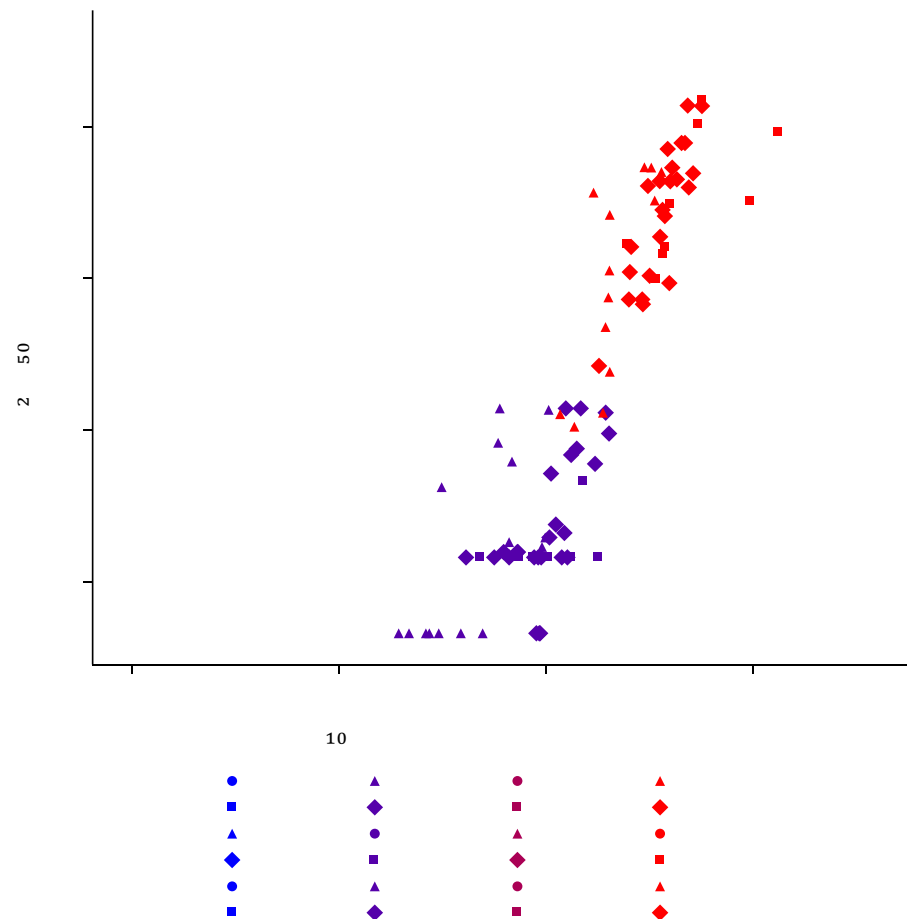
**Figure 67. nLuciferase Correlates with Binding in ELISA.**

**A**, nLuc ID<sub>50</sub> vs S-2P binding (AUC) . **B**, nLuc ID<sub>50</sub> vs RBD binding (AUC).

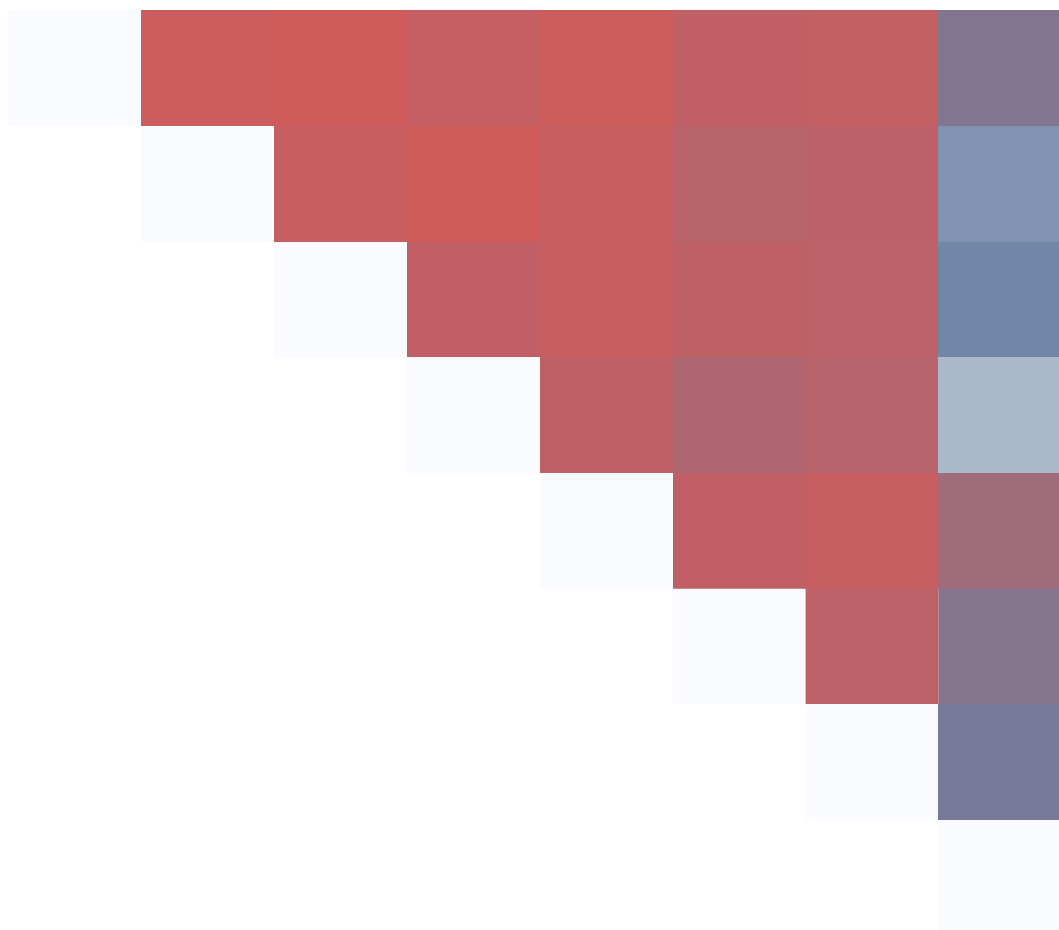
**A**



**B**



**Figure 68. Correlation Heatmap**



**Table 56. Mean Percentages of CD4 T Cells Expressing Cytokines with 95% CI - Th1 Response – Age 18-55**

Time Point	Simulation	Cell Type	Statistic	25 µg mRNA-1273 18-55 years (N=15)	100 µg mRNA-1273 18-55 years (N=15)	18-55 years (N=30)
Day 1 (Pre-Vaccination 1)	SARS-CoV-2 S1	Any Th1	n	15	15	30
			Mean	0.001	0.006	0.004
			95% CI	-0.004, 0.007	-0.001, 0.013	0.000, 0.008
		IFN $\gamma$	n	15	15	30
			Mean	0.000	0.000	0.000
			95% CI	NE	NE	NE
		IL-2	n	15	15	30
			Mean	-0.003	0.003	0.000
			95% CI	-0.008, 0.002	0.000, 0.005	-0.003, 0.003
		TNF	n	15	15	30
			Mean	0.004	0.007	0.005
			95% CI	-0.002, 0.010	0.001, 0.012	0.001, 0.009
	SARS-CoV-2 S2	Any Th1	n	15	15	30
			Mean	0.007	0.010	0.009
			95% CI	0.001, 0.014	0.006, 0.014	0.005, 0.012
		IFN $\gamma$	n	15	15	30
			Mean	0.004	0.004	0.004
			95% CI	0.001, 0.007	0.000, 0.008	0.002, 0.006
		IL-2	n	15	15	30
			Mean	0.002	0.003	0.003
			95% CI	-0.001, 0.005	0.001, 0.006	0.001, 0.005
		TNF	n	15	15	30
			Mean	0.008	0.011	0.009

Time Point	Simulation	Cell Type	Statistic	25 µg mRNA-1273 18-55 years (N=15)	100 µg mRNA-1273 18-55 years (N=15)	18-55 years (N=30)
			95% CI	0.001, 0.015	0.006, 0.015	0.006, 0.013
Day 29 Post Vaccination 1 (Pre-Vaccination 2)	SARS-CoV-2 S1	Any Th1	n	14	15	29
			Mean	0.030	0.065	0.048
			95% CI	0.014, 0.046	0.043, 0.087	0.034, 0.062
		IFN $\gamma$	n	14	15	29
			Mean	0.005	0.019	0.012
			95% CI	0.000, 0.010	0.012, 0.026	0.007, 0.017
		IL-2	n	14	15	29
			Mean	0.014	0.042	0.028
			95% CI	0.004, 0.024	0.026, 0.058	0.018, 0.039
		TNF	n	14	15	29
			Mean	0.026	0.058	0.043
			95% CI	0.013, 0.040	0.036, 0.080	0.029, 0.056
	SARS-CoV-2 S2	Any Th1	n	14	15	29
			Mean	0.025	0.060	0.043
			95% CI	0.017, 0.033	0.045, 0.075	0.033, 0.054
		IFN $\gamma$	n	14	15	29
			Mean	0.009	0.024	0.017
			95% CI	0.004, 0.013	0.014, 0.034	0.010, 0.023
		IL-2	n	14	15	29
			Mean	0.013	0.041	0.027
			95% CI	0.006, 0.019	0.029, 0.053	0.019, 0.036
		TNF	n	14	15	29
			Mean	0.026	0.055	0.041

Time Point	Simulation	Cell Type	Statistic	25 µg mRNA-1273 18-55 years (N=15)	100 µg mRNA-1273 18-55 years (N=15)	18-55 years (N=30)
			95% CI	0.018, 0.033	0.041, 0.070	0.031, 0.051
Day 43 Post Vaccination 1 (14 Days Post Vaccination 2)	SARS-CoV-2 S1	Any Th1	n	12	14	26
			Mean	0.106	0.216	0.165
			95% CI	0.059, 0.153	0.151, 0.281	0.121, 0.209
		IFN $\gamma$	n	12	14	26
			Mean	0.043	0.094	0.070
			95% CI	0.021, 0.066	0.063, 0.124	0.050, 0.091
		IL-2	n	12	14	26
			Mean	0.067	0.121	0.096
			95% CI	0.035, 0.098	0.075, 0.166	0.067, 0.125
		TNF	n	12	14	26
			Mean	0.095	0.191	0.147
			95% CI	0.051, 0.139	0.132, 0.251	0.106, 0.187
	SARS-CoV-2 S2	Any Th1	n	12	14	26
			Mean	0.098	0.241	0.175
			95% CI	0.061, 0.134	0.167, 0.316	0.125, 0.225
		IFN $\gamma$	n	12	14	26
			Mean	0.046	0.107	0.079
			95% CI	0.024, 0.067	0.074, 0.140	0.056, 0.102
		IL-2	n	12	14	26
			Mean	0.063	0.142	0.105
			95% CI	0.037, 0.088	0.093, 0.192	0.074, 0.137
		TNF	n	12	14	26
			Mean	0.094	0.218	0.161

Time Point	Simulation	Cell Type	Statistic	25 µg mRNA-1273 18-55 years (N=15)	100 µg mRNA-1273 18-55 years (N=15)	18-55 years (N=30)
			95% CI	0.059, 0.129	0.148, 0.288	0.115, 0.207
Note: N=Number of Subjects. n=Number of subjects with results available at time point. NE=Not Estimable						

**Table 57. Mean Percentages of CD4 T Cells Expressing Cytokines with 95% CI - Th2 Response – Age 18-55**

Time Point	Simulation	Cell Type	Statistic	25 µg mRNA-1273 18-55 years (N=15)	100 µg mRNA-1273 18-55 years (N=15)	18-55 years (N=30)
<b>Day 1 (Pre-Vaccination 1)</b>	<b>SARS-CoV-2 S1</b>	<b>Any Th2</b>	n	15	15	30
			Mean	0.002	0.000	0.001
			95% CI	-0.001, 0.005	-0.002, 0.002	-0.001, 0.003
		<b>IL-13</b>	n	15	15	30
			Mean	0.002	0.000	0.001
			95% CI	-0.001, 0.005	-0.002, 0.002	-0.001, 0.003
		<b>IL-4</b>	n	15	15	30
			Mean	0.000	0.000	0.000
			95% CI	NE	NE	NE
	<b>SARS-CoV-2 S2</b>	<b>Any Th2</b>	n	15	15	30
			Mean	0.001	0.002	0.001
			95% CI	-0.001, 0.002	-0.001, 0.005	0.000, 0.003
		<b>IL-13</b>	n	15	15	30
			Mean	0.001	0.001	0.001
			95% CI	-0.001, 0.002	-0.002, 0.004	-0.001, 0.003
		<b>IL-4</b>	n	15	15	30
			Mean	0.000	0.000	0.000
			95% CI	NE	NE	NE
<b>Day 29 Post Vaccination 1 (Pre-Vaccination 2)</b>	<b>SARS-CoV-2 S1</b>	<b>Any Th2</b>	n	14	15	29
			Mean	0.001	0.002	0.002
			95% CI	-0.002, 0.005	0.000, 0.004	0.000, 0.004
		<b>IL-13</b>	n	14	15	29
			Mean	0.001	0.002	0.002

Report Date: 24 September 2020  
Data Cutoff Date: 20 August 2020

Time Point	Simulation	Cell Type	Statistic	25 µg mRNA-1273 18-55 years (N=15)	100 µg mRNA-1273 18-55 years (N=15)	18-55 years (N=30)
		IL-4	95% CI	-0.002, 0.005	0.000, 0.004	0.000, 0.004
			n	14	15	29
			Mean	0.000	0.000	0.000
		Any Th2	95% CI	NE	NE	NE
			n	14	15	29
			Mean	0.002	0.004	0.003
		IL-13	95% CI	-0.001, 0.005	0.001, 0.007	0.001, 0.005
			n	14	15	29
			Mean	0.001	0.003	0.002
	SARS-CoV-2 S2	IL-4	95% CI	-0.002, 0.003	0.000, 0.005	0.000, 0.004
			n	14	15	29
			Mean	0.000	0.000	0.000
Day 43 Post Vaccination 1 (14 Days Post Vaccination 2)	SARS-CoV-2 S1	Any Th2	95% CI	NE	NE	NE
			n	12	14	26
			Mean	0.013	0.014	0.014
		IL-13	95% CI	0.007, 0.020	0.006, 0.022	0.009, 0.019
			n	12	14	26
			Mean	0.012	0.010	0.011
		IL-4	95% CI	0.006, 0.018	0.004, 0.016	0.007, 0.015
			n	12	14	26
			Mean	0.002	0.009	0.005
		Any Th2	95% CI	-0.001, 0.004	0.004, 0.013	0.003, 0.008
			n	12	14	26
			Mean	0.012	0.021	0.017

Time Point	Simulation	Cell Type	Statistic	25 µg mRNA-1273 18-55 years (N=15)	100 µg mRNA-1273 18-55 years (N=15)	18-55 years (N=30)
			95% CI	0.003, 0.020	0.013, 0.029	0.011, 0.022
		IL-13	n	12	14	26
			Mean	0.008	0.016	0.012
			95% CI	0.002, 0.015	0.007, 0.024	0.007, 0.018
		IL-4	n	12	14	26
			Mean	0.003	0.008	0.006
			95% CI	-0.002, 0.008	0.005, 0.011	0.003, 0.009
Note: N=Number of Subjects. n=Number of subjects with results available at time point. NE=Not Estimable						

**Table 58. Mean Percentages of CD8 T Cells Expressing Cytokines with 95% CI – Age 18-55**

Time Point	Simulation	Cell Type	Statistic	25 µg mRNA-1273 18-55 years (N=15)	100 µg mRNA-1273 18-55 years (N=15)	18-55 years (N=30)
<b>Day 1 (Pre-Vaccination 1)</b>	<b>SARS-CoV-2 S1</b>	<b>Any CD8</b>	n	15	15	30
			Mean	0.008	0.002	0.005
			95% CI	-0.006, 0.022	-0.006, 0.010	-0.003, 0.013
		<b>IFN<math>\gamma</math></b>	n	15	15	30
			Mean	0.002	-0.002	0.000
			95% CI	-0.006, 0.010	-0.008, 0.004	-0.005, 0.005
		<b>IL-2</b>	n	15	15	30
			Mean	0.003	0.003	0.003
			95% CI	-0.002, 0.008	0.000, 0.007	0.001, 0.006
		<b>TNF</b>	n	15	15	30
			Mean	0.007	0.001	0.004
			95% CI	-0.006, 0.021	-0.006, 0.007	-0.003, 0.011
	<b>SARS-CoV-2 S2</b>	<b>Any CD8</b>	n	15	15	30
			Mean	-0.002	-0.003	-0.002
			95% CI	-0.011, 0.007	-0.015, 0.009	-0.009, 0.005
		<b>IFN<math>\gamma</math></b>	n	15	15	30
			Mean	0.001	-0.002	-0.001
			95% CI	-0.003, 0.005	-0.006, 0.002	-0.003, 0.002
		<b>IL-2</b>	n	15	15	30
			Mean	-0.003	-0.001	-0.002
			95% CI	-0.008, 0.003	-0.009, 0.007	-0.006, 0.003
		<b>TNF</b>	n	15	15	30
			Mean	0.003	0.000	0.001

Report Date: 24 September 2020  
Data Cutoff Date: 20 August 2020

Time Point	Simulation	Cell Type	Statistic	25 µg mRNA-1273 18-55 years (N=15)	100 µg mRNA-1273 18-55 years (N=15)	18-55 years (N=30)
			95% CI	-0.004, 0.009	-0.006, 0.006	-0.003, 0.005
Day 29 Post Vaccination 1 (Pre-Vaccination 2)	SARS-CoV-2 S1	Any CD8	n	14	15	29
			Mean	0.008	0.010	0.009
			95% CI	0.000, 0.016	-0.002, 0.022	0.002, 0.016
		IFN $\gamma$	n	14	15	29
			Mean	0.001	0.006	0.003
			95% CI	-0.004, 0.005	0.000, 0.012	0.000, 0.007
		IL-2	n	14	15	29
			Mean	0.004	0.002	0.003
			95% CI	-0.001, 0.010	-0.009, 0.013	-0.003, 0.009
		TNF	n	14	15	29
			Mean	0.001	0.008	0.004
			95% CI	-0.005, 0.007	0.002, 0.014	0.000, 0.009
	SARS-CoV-2 S2	Any CD8	n	14	15	29
			Mean	0.004	0.005	0.005
			95% CI	-0.006, 0.014	-0.007, 0.018	-0.003, 0.012
		IFN $\gamma$	n	14	15	29
			Mean	0.003	0.004	0.003
			95% CI	-0.003, 0.009	-0.002, 0.010	0.000, 0.007
		IL-2	n	14	15	29
			Mean	0.004	-0.001	0.002
			95% CI	-0.003, 0.012	-0.012, 0.011	-0.005, 0.008
		TNF	n	14	15	29
			Mean	0.004	0.007	0.006

Time Point	Simulation	Cell Type	Statistic	25 µg mRNA-1273 18-55 years (N=15)	100 µg mRNA-1273 18-55 years (N=15)	18-55 years (N=30)
			95% CI	-0.002, 0.009	0.001, 0.014	0.002, 0.010
Day 43 Post Vaccination 1 (14 Days Post Vaccination 2)	SARS-CoV-2 S1	Any CD8	n	12	14	26
			Mean	0.028	0.046	0.037
			95% CI	0.006, 0.049	0.013, 0.078	0.018, 0.056
		IFN $\gamma$	n	12	14	26
			Mean	0.019	0.046	0.033
			95% CI	-0.003, 0.041	0.016, 0.076	0.015, 0.052
		IL-2	n	12	14	26
			Mean	0.017	0.018	0.017
			95% CI	0.003, 0.030	0.001, 0.035	0.007, 0.028
		TNF	n	12	14	26
			Mean	0.018	0.026	0.022
			95% CI	-0.001, 0.038	0.005, 0.046	0.009, 0.036
	SARS-CoV-2 S2	Any CD8	n	12	14	26
			Mean	0.018	0.021	0.020
			95% CI	0.004, 0.033	0.009, 0.034	0.011, 0.029
		IFN $\gamma$	n	12	14	26
			Mean	0.017	0.018	0.017
			95% CI	0.005, 0.028	0.011, 0.025	0.011, 0.023
		IL-2	n	12	14	26
			Mean	0.008	0.011	0.010
			95% CI	-0.001, 0.017	0.004, 0.018	0.004, 0.015
		TNF	n	12	14	26
			Mean	0.013	0.011	0.012

Time Point	Simulation	Cell Type	Statistic	25 µg mRNA-1273 18-55 years (N=15)	100 µg mRNA-1273 18-55 years (N=15)	18-55 years (N=30)
			95% CI	0.000, 0.026	0.001, 0.020	0.005, 0.019
Note: N=Number of Subjects. n=Number of subjects with results available at time point. NE=Not Estimable						

**Table 59. Mean Percentages of CD4 T cells expressing cytokines with 95% CI - Th1 Response – Age 56-70**

Time Point	Simulation	Cell Type	Statistic	25 µg mRNA-1273 56-70 years (N=10)	100 µg mRNA-1273 56-70 years (N=10)	56-70 years (N=20)
<b>Day 1 (Pre-Vaccination 1)</b>	<b>SARS-CoV-2 S1</b>	<b>Any Th1</b>	n	9	9	18
			Mean	-0.001	0.008	0.003
			95% CI	-0.012, 0.010	-0.002, 0.018	-0.004, 0.010
		<b>IFN<math>\gamma</math></b>	n	9	9	18
			Mean	-0.001	0.001	0.000
			95% CI	-0.004, 0.001	-0.001, 0.004	-0.002, 0.002
		<b>IL-2</b>	n	9	9	18
			Mean	0.000	-0.001	-0.001
			95% CI	-0.007, 0.007	-0.004, 0.001	-0.004, 0.003
		<b>TNF</b>	n	9	9	18
			Mean	-0.001	0.008	0.003
			95% CI	-0.011, 0.009	0.000, 0.015	-0.003, 0.009
	<b>SARS-CoV-2 S2</b>	<b>Any Th1</b>	n	9	9	18
			Mean	0.014	0.010	0.012
			95% CI	-0.006, 0.035	0.006, 0.014	0.003, 0.022
		<b>IFN<math>\gamma</math></b>	n	9	9	18
			Mean	0.003	0.001	0.002
			95% CI	-0.002, 0.009	-0.001, 0.004	-0.001, 0.005
		<b>IL-2</b>	n	9	9	18
			Mean	0.012	0.002	0.007
			95% CI	-0.003, 0.027	-0.003, 0.007	0.000, 0.015
		<b>TNF</b>	n	9	9	18
			Mean	0.014	0.010	0.012

Report Date: 24 September 2020  
Data Cutoff Date: 20 August 2020

Time Point	Simulation	Cell Type	Statistic	25 µg mRNA-1273 56-70 years (N=10)	100 µg mRNA-1273 56-70 years (N=10)	56-70 years (N=20)
			95% CI	-0.003, 0.032	0.006, 0.014	0.004, 0.020
Day 29 Post Vaccination 1 (Pre-Vaccination 2)	SARS-CoV-2 S1	Any Th1	n	9	9	18
			Mean	0.037	0.102	0.069
			95% CI	0.020, 0.053	0.078, 0.126	0.048, 0.091
		IFN $\gamma$	n	9	9	18
			Mean	0.007	0.022	0.014
			95% CI	0.001, 0.012	0.012, 0.033	0.008, 0.021
		IL-2	n	9	9	18
			Mean	0.026	0.072	0.049
			95% CI	0.013, 0.038	0.052, 0.092	0.033, 0.065
		TNF	n	9	9	18
			Mean	0.033	0.096	0.064
			95% CI	0.017, 0.050	0.076, 0.115	0.045, 0.084
	SARS-CoV-2 S2	Any Th1	n	9	9	18
			Mean	0.031	0.093	0.062
			95% CI	0.021, 0.041	0.061, 0.126	0.040, 0.084
		IFN $\gamma$	n	9	9	18
			Mean	0.008	0.029	0.018
			95% CI	0.003, 0.013	0.011, 0.047	0.008, 0.028
		IL-2	n	9	9	18
			Mean	0.023	0.067	0.045
			95% CI	0.016, 0.031	0.041, 0.093	0.029, 0.061
		TNF	n	9	9	18
			Mean	0.030	0.089	0.059

Time Point	Simulation	Cell Type	Statistic	25 µg mRNA-1273 56-70 years (N=10)	100 µg mRNA-1273 56-70 years (N=10)	56-70 years (N=20)
			95% CI	0.020, 0.040	0.064, 0.114	0.040, 0.079
Day 43 Post Vaccination 1 (14 Days Post Vaccination 2)	SARS-CoV-2 S1	Any Th1	n	9	8	17
			Mean	0.264	0.336	0.298
			95% CI	0.096, 0.433	0.196, 0.476	0.198, 0.398
		IFN $\gamma$	n	9	8	17
			Mean	0.108	0.148	0.126
			95% CI	0.062, 0.153	0.101, 0.194	0.096, 0.157
		IL-2	n	9	8	17
			Mean	0.204	0.224	0.214
			95% CI	0.074, 0.335	0.122, 0.325	0.139, 0.288
		TNF	n	9	8	17
			Mean	0.224	0.296	0.258
			95% CI	0.085, 0.364	0.176, 0.416	0.174, 0.342
	SARS-CoV-2 S2	Any Th1	n	9	8	17
			Mean	0.263	0.344	0.301
			95% CI	0.097, 0.430	0.164, 0.524	0.192, 0.411
		IFN $\gamma$	n	9	8	17
			Mean	0.112	0.160	0.135
			95% CI	0.059, 0.166	0.088, 0.232	0.094, 0.175
		IL-2	n	9	8	17
			Mean	0.209	0.255	0.231
			95% CI	0.074, 0.344	0.109, 0.401	0.142, 0.319
		TNF	n	9	8	17
			Mean	0.236	0.314	0.272

Time Point	Simulation	Cell Type	Statistic	25 µg mRNA-1273 56-70 years (N=10)	100 µg mRNA-1273 56-70 years (N=10)	56-70 years (N=20)
			95% CI	0.092, 0.379	0.151, 0.477	0.175, 0.369
Note: N=Number of Subjects. n=Number of subjects with results available at time point. NE=Not Estimable						

**Table 60. Mean Percentages of CD4 T cells expressing cytokines with 95% CI - Th2 Response – Age 56-70**

Time Point	Simulation	Cell Type	Statistic	25 µg mRNA-1273 56-70 years (N=10)	100 µg mRNA-1273 56-70 years (N=10)	56-70 years (N=20)
<b>Day 1 (Pre-Vaccination 1)</b>	<b>SARS-CoV-2 S1</b>	<b>Any Th2</b>	n	9	9	18
			Mean	0.001	0.000	0.001
			95% CI	-0.001, 0.004	NE	-0.001, 0.002
		<b>IL-13</b>	n	9	9	18
			Mean	0.001	0.001	0.001
			95% CI	-0.001, 0.004	-0.001, 0.004	0.000, 0.003
		<b>IL-4</b>	n	9	9	18
			Mean	0.000	0.000	0.000
			95% CI	NE	NE	NE
	<b>SARS-CoV-2 S2</b>	<b>Any Th2</b>	n	9	9	18
			Mean	0.001	0.001	0.001
			95% CI	-0.001, 0.004	-0.001, 0.004	0.000, 0.003
		<b>IL-13</b>	n	9	9	18
			Mean	0.001	0.001	0.001
			95% CI	-0.001, 0.004	-0.001, 0.004	0.000, 0.003
		<b>IL-4</b>	n	9	9	18
			Mean	0.000	0.000	0.000
			95% CI	NE	NE	NE
<b>Day 29 Post Vaccination 1 (Pre-Vaccination 2)</b>	<b>SARS-CoV-2 S1</b>	<b>Any Th2</b>	n	9	9	18
			Mean	0.000	0.002	0.001
			95% CI	NE	-0.001, 0.006	0.000, 0.003
		<b>IL-13</b>	n	9	9	18
			Mean	0.000	0.000	0.000

Time Point	Simulation	Cell Type	Statistic	25 µg mRNA-1273 56-70 years (N=10)	100 µg mRNA-1273 56-70 years (N=10)	56-70 years (N=20)
		IL-4	95% CI	NE	NE	NE
			n	9	9	18
			Mean	0.000	0.000	0.000
		Any Th2	95% CI	NE	NE	NE
			n	9	9	18
			Mean	0.002	0.006	0.004
			95% CI	-0.001, 0.006	0.002, 0.010	0.001, 0.006
		IL-13	n	9	9	18
			Mean	0.001	0.002	0.002
			95% CI	-0.001, 0.004	-0.001, 0.006	0.000, 0.004
	SARS-CoV-2 S2	IL-4	n	9	9	18
			Mean	0.000	0.003	0.002
			95% CI	NE	-0.001, 0.007	0.000, 0.004
Day 43 Post Vaccination 1 (14 Days Post Vaccination 2)	SARS-CoV-2 S1	Any Th2	n	9	8	17
			Mean	0.022	0.029	0.025
			95% CI	0.012, 0.033	0.010, 0.047	0.016, 0.035
		IL-13	n	9	8	17
			Mean	0.019	0.018	0.018
			95% CI	0.007, 0.031	0.005, 0.030	0.011, 0.026
		IL-4	n	9	8	17
			Mean	0.010	0.021	0.015
			95% CI	0.006, 0.014	0.008, 0.035	0.009, 0.022
	SARS-CoV-2 S2	Any Th2	n	9	8	17
			Mean	0.021	0.035	0.028

Time Point	Simulation	Cell Type	Statistic	25 µg mRNA-1273 56-70 years (N=10)	100 µg mRNA-1273 56-70 years (N=10)	56-70 years (N=20)
			95% CI	0.011, 0.032	0.007, 0.063	0.015, 0.041
		IL-13	n	9	8	17
			Mean	0.016	0.024	0.019
			95% CI	0.005, 0.026	0.000, 0.047	0.008, 0.030
		IL-4	n	9	8	17
			Mean	0.011	0.020	0.015
			95% CI	0.006, 0.016	0.002, 0.038	0.007, 0.023
Note: N=Number of Subjects. n=Number of subjects with results available at time point. NE=Not Estimable						

**Table 61. Mean Percentages of CD8 T cells expressing cytokines with 95% CI – Age 56-70**

Time Point	Simulation	Cell Type	Statistic	25 µg mRNA-1273 56-70 years (N=10)	100 µg mRNA-1273 56-70 years (N=10)	56-70 years (N=20)
<b>Day 1 (Pre-Vaccination 1)</b>	<b>SARS-CoV-2 S1</b>	<b>Any CD8</b>	n	9	9	18
			Mean	-0.004	0.002	-0.001
			95% CI	-0.022, 0.013	-0.007, 0.011	-0.010, 0.008
		<b>IFN<math>\gamma</math></b>	n	9	9	18
			Mean	-0.001	0.001	0.000
			95% CI	-0.007, 0.005	-0.005, 0.007	-0.004, 0.004
		<b>IL-2</b>	n	9	9	18
			Mean	-0.001	-0.001	-0.001
			95% CI	-0.006, 0.004	-0.007, 0.005	-0.004, 0.002
		<b>TNF</b>	n	9	9	18
			Mean	-0.003	0.000	-0.002
			95% CI	-0.019, 0.012	-0.007, 0.007	-0.009, 0.006
	<b>SARS-CoV-2 S2</b>	<b>Any CD8</b>	n	9	9	18
			Mean	0.010	0.002	0.006
			95% CI	-0.021, 0.041	-0.014, 0.018	-0.010, 0.022
		<b>IFN<math>\gamma</math></b>	n	9	9	18
			Mean	0.012	0.000	0.006
			95% CI	-0.010, 0.034	-0.009, 0.009	-0.005, 0.017
		<b>IL-2</b>	n	9	9	18
			Mean	0.000	-0.001	-0.001
			95% CI	-0.008, 0.008	-0.008, 0.006	-0.005, 0.004
		<b>TNF</b>	n	9	9	18
			Mean	0.010	0.002	0.006

Time Point	Simulation	Cell Type	Statistic	25 µg mRNA-1273 56-70 years (N=10)	100 µg mRNA-1273 56-70 years (N=10)	56-70 years (N=20)
			95% CI	-0.016, 0.036	-0.007, 0.011	-0.006, 0.018
Day 29 Post Vaccination 1 (Pre-Vaccination 2)	SARS-CoV-2 S1	Any CD8	n	9	9	18
			Mean	-0.004	0.023	0.009
			95% CI	-0.023, 0.014	0.007, 0.039	-0.004, 0.022
		IFN $\gamma$	n	9	9	18
			Mean	-0.002	0.000	-0.001
			95% CI	-0.014, 0.009	-0.011, 0.011	-0.008, 0.006
		IL-2	n	9	9	18
			Mean	0.001	0.008	0.004
			95% CI	-0.001, 0.004	0.003, 0.013	0.001, 0.008
		TNF	n	9	9	18
			Mean	-0.008	0.017	0.004
			95% CI	-0.026, 0.010	0.001, 0.033	-0.008, 0.017
	SARS-CoV-2 S2	Any CD8	n	9	9	18
			Mean	0.003	0.003	0.003
			95% CI	-0.024, 0.031	-0.006, 0.013	-0.010, 0.016
		IFN $\gamma$	n	9	9	18
			Mean	0.004	0.002	0.003
			95% CI	-0.013, 0.022	-0.003, 0.007	-0.005, 0.011
		IL-2	n	9	9	18
			Mean	0.003	0.000	0.002
			95% CI	-0.001, 0.007	-0.008, 0.008	-0.002, 0.006
		TNF	n	9	9	18
			Mean	0.007	0.003	0.005

Time Point	Simulation	Cell Type	Statistic	25 µg mRNA-1273 56-70 years (N=10)	100 µg mRNA-1273 56-70 years (N=10)	56-70 years (N=20)
			95% CI	-0.020, 0.033	-0.004, 0.011	-0.007, 0.017
Day 43 Post Vaccination 1 (14 Days Post Vaccination 2)	SARS-CoV-2 S1	Any CD8	n	9	8	17
			Mean	0.089	0.075	0.082
			95% CI	-0.025, 0.202	0.031, 0.119	0.026, 0.139
		IFN $\gamma$	n	9	8	17
			Mean	0.088	0.058	0.074
			95% CI	-0.020, 0.195	0.024, 0.091	0.020, 0.127
		IL-2	n	9	8	17
			Mean	0.047	0.029	0.038
			95% CI	-0.012, 0.105	0.003, 0.054	0.008, 0.068
		TNF	n	9	8	17
			Mean	0.061	0.036	0.049
			95% CI	-0.032, 0.154	0.002, 0.071	0.003, 0.096
	SARS-CoV-2 S2	Any CD8	n	9	8	17
			Mean	0.264	0.026	0.152
			95% CI	-0.080, 0.608	0.006, 0.047	-0.022, 0.327
		IFN $\gamma$	n	9	8	17
			Mean	0.254	0.021	0.145
			95% CI	-0.077, 0.586	0.001, 0.042	-0.024, 0.313
		IL-2	n	9	8	17
			Mean	0.122	0.009	0.069
			95% CI	-0.049, 0.293	-0.001, 0.018	-0.017, 0.155
		TNF	n	9	8	17
			Mean	0.204	0.016	0.116

Time Point	Simulation	Cell Type	Statistic	25 µg mRNA-1273 56-70 years (N=10)	100 µg mRNA-1273 56-70 years (N=10)	56-70 years (N=20)
			95% CI	-0.060, 0.469	-0.005, 0.037	-0.019, 0.251
Note: N=Number of Subjects. n=Number of subjects with results available at time point. NE=Not Estimable						

**Table 62. Mean Percentages of CD4 T cells expressing cytokines with 95% CI - Th1 Response – Age ≥71**

Time Point	Simulation	Cell Type	Statistic	25 µg mRNA-1273 ≥71 years (N=10)	100 µg mRNA-1273 ≥71 years (N=10)	≥71 years (N=20)
<b>Day 1 (Pre-Vaccination 1)</b>	<b>SARS-CoV-2 S1</b>	<b>Any Th1</b>	n	10	10	20
			Mean	0.004	0.004	0.004
			95% CI	-0.004, 0.012	-0.002, 0.010	0.000, 0.008
		<b>IFN<math>\gamma</math></b>	n	10	10	20
			Mean	-0.001	0.001	0.000
			95% CI	-0.005, 0.003	-0.001, 0.003	-0.002, 0.002
		<b>IL-2</b>	n	10	10	20
			Mean	0.005	0.000	0.003
			95% CI	0.000, 0.010	-0.003, 0.003	0.000, 0.005
		<b>TNF</b>	n	10	10	20
			Mean	0.004	0.004	0.004
			95% CI	0.000, 0.008	-0.001, 0.009	0.001, 0.007
	<b>SARS-CoV-2 S2</b>	<b>Any Th1</b>	n	10	10	20
			Mean	0.010	0.066	0.038
			95% CI	0.003, 0.017	-0.033, 0.165	-0.009, 0.085
		<b>IFN<math>\gamma</math></b>	n	10	10	20
			Mean	0.001	0.017	0.009
			95% CI	-0.001, 0.003	-0.010, 0.044	-0.004, 0.022
		<b>IL-2</b>	n	10	10	20
			Mean	0.004	0.037	0.021
			95% CI	-0.003, 0.011	-0.022, 0.096	-0.007, 0.048
		<b>TNF</b>	n	10	10	20
			Mean	0.007	0.063	0.035

Time Point	Simulation	Cell Type	Statistic	25 µg mRNA-1273 ≥71 years (N=10)	100 µg mRNA-1273 ≥71 years (N=10)	≥71 years (N=20)
			95% CI	0.001, 0.013	-0.030, 0.156	-0.009, 0.079
Day 29 Post Vaccination 1 (Pre-Vaccination 2)	SARS-CoV-2 S1	Any Th1	n	10	10	20
			Mean	0.023	0.069	0.046
			95% CI	0.003, 0.043	0.022, 0.116	0.021, 0.071
		IFN $\gamma$	n	10	10	20
			Mean	0.001	0.016	0.009
			95% CI	-0.003, 0.005	0.003, 0.029	0.001, 0.016
		IL-2	n	10	10	20
			Mean	0.014	0.046	0.030
			95% CI	0.000, 0.028	0.012, 0.080	0.012, 0.048
		TNF	n	10	10	20
			Mean	0.023	0.066	0.045
			95% CI	0.003, 0.043	0.021, 0.111	0.020, 0.069
	SARS-CoV-2 S2	Any Th1	n	10	10	20
			Mean	0.028	0.058	0.043
			95% CI	0.008, 0.048	0.029, 0.087	0.026, 0.060
		IFN $\gamma$	n	10	10	20
			Mean	0.005	0.014	0.010
			95% CI	0.000, 0.010	0.006, 0.022	0.005, 0.014
		IL-2	n	10	10	20
			Mean	0.018	0.040	0.029
			95% CI	0.002, 0.034	0.021, 0.059	0.016, 0.042
		TNF	n	10	10	20
			Mean	0.031	0.057	0.044

Time Point	Simulation	Cell Type	Statistic	25 µg mRNA-1273 ≥71 years (N=10)	100 µg mRNA-1273 ≥71 years (N=10)	≥71 years (N=20)
			95% CI	0.011, 0.051	0.029, 0.085	0.027, 0.061
Day 43 Post Vaccination 1 (14 Days Post Vaccination 2)	SARS-CoV-2 S1	Any Th1	n	10	10	20
			Mean	0.095	0.317	0.206
			95% CI	0.061, 0.129	0.162, 0.472	0.117, 0.295
		IFN $\gamma$	n	10	10	20
			Mean	0.031	0.164	0.098
			95% CI	0.016, 0.046	0.077, 0.251	0.047, 0.148
		IL-2	n	10	10	20
			Mean	0.065	0.214	0.140
			95% CI	0.042, 0.088	0.110, 0.318	0.079, 0.200
		TNF	n	10	10	20
			Mean	0.085	0.295	0.190
			95% CI	0.050, 0.120	0.145, 0.445	0.104, 0.276
	SARS-CoV-2 S2	Any Th1	n	10	10	20
			Mean	0.116	0.366	0.241
			95% CI	0.075, 0.157	0.166, 0.566	0.131, 0.351
		IFN $\gamma$	n	10	10	20
			Mean	0.039	0.198	0.119
			95% CI	0.025, 0.053	0.054, 0.342	0.043, 0.194
		IL-2	n	10	10	20
			Mean	0.081	0.271	0.176
			95% CI	0.053, 0.109	0.108, 0.434	0.089, 0.263
		TNF	n	10	10	20
			Mean	0.110	0.345	0.228

Time Point	Simulation	Cell Type	Statistic	25 µg mRNA-1273 ≥71 years (N=10)	100 µg mRNA-1273 ≥71 years (N=10)	≥71 years (N=20)
			95% CI	0.068, 0.152	0.148, 0.542	0.120, 0.335
Note: N=Number of Subjects. n=Number of subjects with results available at time point. NE=Not Estimable						

**Table 63. Mean Percentages of CD4 T cells expressing cytokines with 95% CI – Th2 Response – Age ≥71**

Time Point	Simulation	Cell Type	Statistic	25 µg mRNA-1273 ≥71 years (N=10)	100 µg mRNA-1273 ≥71 years (N=10)	≥71 years (N=20)
<b>Day 1 (Pre-Vaccination 1)</b>	<b>SARS-CoV-2 S1</b>	<b>Any Th2</b>	n	10	10	20
			Mean	0.009	0.002	0.006
			95% CI	-0.007, 0.025	-0.001, 0.005	-0.002, 0.013
		<b>IL-13</b>	n	10	10	20
			Mean	0.009	0.002	0.006
			95% CI	-0.007, 0.025	-0.001, 0.005	-0.002, 0.013
		<b>IL-4</b>	n	10	10	20
			Mean	0.000	0.000	0.000
			95% CI	NE	NE	NE
	<b>SARS-CoV-2 S2</b>	<b>Any Th2</b>	n	10	10	20
			Mean	0.010	0.004	0.007
			95% CI	-0.010, 0.030	0.000, 0.008	-0.002, 0.016
		<b>IL-13</b>	n	10	10	20
			Mean	0.011	0.004	0.008
			95% CI	-0.009, 0.031	0.000, 0.008	-0.002, 0.017
		<b>IL-4</b>	n	10	10	20
			Mean	0.000	0.000	0.000
			95% CI	NE	NE	NE
<b>Day 29 Post Vaccination 1 (Pre-Vaccination 2)</b>	<b>SARS-CoV-2 S1</b>	<b>Any Th2</b>	n	10	10	20
			Mean	0.012	0.002	0.007
			95% CI	-0.008, 0.032	-0.001, 0.005	-0.002, 0.016
		<b>IL-13</b>	n	10	10	20
			Mean	0.011	0.002	0.007

Time Point	Simulation	Cell Type	Statistic	25 µg mRNA-1273 ≥71 years (N=10)	100 µg mRNA-1273 ≥71 years (N=10)	≥71 years (N=20)
		IL-4	95% CI	-0.009, 0.031	-0.001, 0.005	-0.003, 0.016
			n	10	10	20
			Mean	0.000	0.000	0.000
		Any Th2	95% CI	NE	NE	NE
			n	10	10	20
			Mean	0.008	0.000	0.004
		IL-13	95% CI	-0.008, 0.024	NE	-0.004, 0.012
			n	10	10	20
			Mean	0.007	0.000	0.004
	SARS-CoV-2 S2	IL-4	95% CI	-0.009, 0.023	NE	-0.004, 0.011
			n	10	10	20
			Mean	0.001	0.000	0.001
		Any Th2	95% CI	-0.001, 0.003	NE	-0.001, 0.002
			n	10	10	20
			Mean	0.015	0.023	0.019
		IL-13	95% CI	0.009, 0.021	0.011, 0.035	0.013, 0.025
			n	10	10	20
			Mean	0.013	0.015	0.014
Day 43 Post Vaccination 1 (14 Days Post Vaccination 2)	SARS-CoV-2 S1	IL-4	95% CI	0.007, 0.019	0.008, 0.022	0.010, 0.018
			n	10	10	20
			Mean	0.005	0.015	0.010
		Any Th2	95% CI	0.001, 0.009	0.007, 0.023	0.005, 0.015
			n	10	10	20
			Mean	0.020	0.027	0.024
	SARS-CoV-2 S2	Any Th2	n	10	10	20
			Mean	0.020	0.027	0.024
			95% CI	0.020	0.027	0.024

Time Point	Simulation	Cell Type	Statistic	25 µg mRNA-1273 ≥71 years (N=10)	100 µg mRNA-1273 ≥71 years (N=10)	≥71 years (N=20)
			95% CI	0.008, 0.032	0.016, 0.038	0.016, 0.031
		IL-13	n	10	10	20
			Mean	0.017	0.017	0.017
			95% CI	0.004, 0.030	0.007, 0.027	0.010, 0.024
		IL-4	n	10	10	20
			Mean	0.005	0.016	0.011
			95% CI	0.001, 0.009	0.008, 0.024	0.006, 0.015
Note: N=Number of Subjects. n=Number of subjects with results available at time point. NE=Not Estimable						

**Table 64. Mean Percentages of CD8 T cells expressing cytokines with 95% CI – Age ≥71**

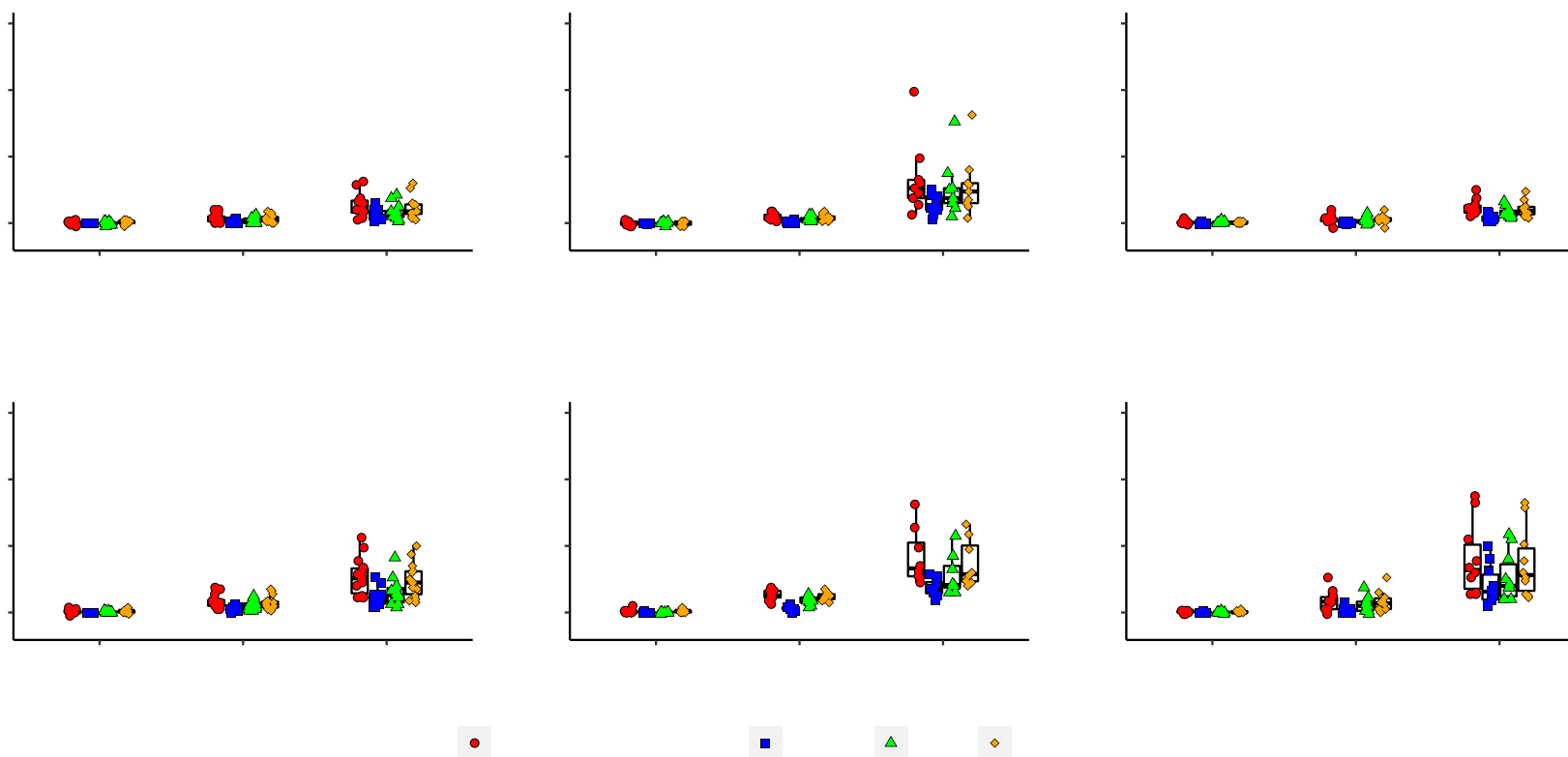
Time Point	Simulation	Cell Type	Statistic	25 µg mRNA-1273 ≥71 years (N=10)	100 µg mRNA-1273 ≥71 years (N=10)	≥71 years (N=20)
<b>Day 1 (Pre-Vaccination 1)</b>	<b>SARS-CoV-2 S1</b>	<b>Any CD8</b>	n	10	10	20
			Mean	0.006	-0.005	0.001
			95% CI	-0.005, 0.017	-0.024, 0.014	-0.010, 0.011
		<b>IFN<math>\gamma</math></b>	n	10	10	20
			Mean	0.003	-0.008	-0.003
			95% CI	-0.007, 0.013	-0.020, 0.004	-0.010, 0.005
		<b>IL-2</b>	n	10	10	20
			Mean	-0.002	-0.003	-0.003
			95% CI	-0.007, 0.003	-0.010, 0.004	-0.006, 0.001
		<b>TNF</b>	n	10	10	20
			Mean	0.004	-0.002	0.001
			95% CI	-0.007, 0.015	-0.021, 0.017	-0.009, 0.011
	<b>SARS-CoV-2 S2</b>	<b>Any CD8</b>	n	10	10	20
			Mean	0.009	0.043	0.026
			95% CI	-0.002, 0.020	-0.028, 0.114	-0.007, 0.059
		<b>IFN<math>\gamma</math></b>	n	10	10	20
			Mean	0.002	0.034	0.018
			95% CI	-0.009, 0.013	-0.031, 0.099	-0.013, 0.049
		<b>IL-2</b>	n	10	10	20
			Mean	0.001	0.025	0.013
			95% CI	-0.005, 0.007	-0.014, 0.064	-0.006, 0.032
		<b>TNF</b>	n	10	10	20
			Mean	0.008	0.044	0.026

Time Point	Simulation	Cell Type	Statistic	25 µg mRNA-1273 ≥71 years (N=10)	100 µg mRNA-1273 ≥71 years (N=10)	≥71 years (N=20)
			95% CI	0.000, 0.016	-0.023, 0.111	-0.006, 0.058
Day 29 Post Vaccination 1 (Pre-Vaccination 2)	SARS-CoV-2 S1	Any CD8	n	10	10	20
			Mean	-0.009	-0.010	-0.010
			95% CI	-0.029, 0.011	-0.030, 0.010	-0.022, 0.003
		IFN $\gamma$	n	10	10	20
			Mean	0.002	-0.007	-0.003
			95% CI	-0.013, 0.017	-0.021, 0.007	-0.012, 0.007
		IL-2	n	10	10	20
			Mean	-0.006	0.001	-0.003
			95% CI	-0.015, 0.003	-0.008, 0.010	-0.009, 0.004
		TNF	n	10	10	20
			Mean	-0.011	-0.004	-0.008
			95% CI	-0.029, 0.007	-0.022, 0.014	-0.019, 0.004
	SARS-CoV-2 S2	Any CD8	n	10	10	20
			Mean	0.015	-0.005	0.005
			95% CI	-0.018, 0.048	-0.030, 0.020	-0.014, 0.024
		IFN $\gamma$	n	10	10	20
			Mean	0.022	-0.005	0.009
			95% CI	0.000, 0.044	-0.025, 0.015	-0.007, 0.024
		IL-2	n	10	10	20
			Mean	0.002	0.001	0.002
			95% CI	-0.009, 0.013	-0.008, 0.010	-0.005, 0.008
		TNF	n	10	10	20
			Mean	0.004	0.002	0.003

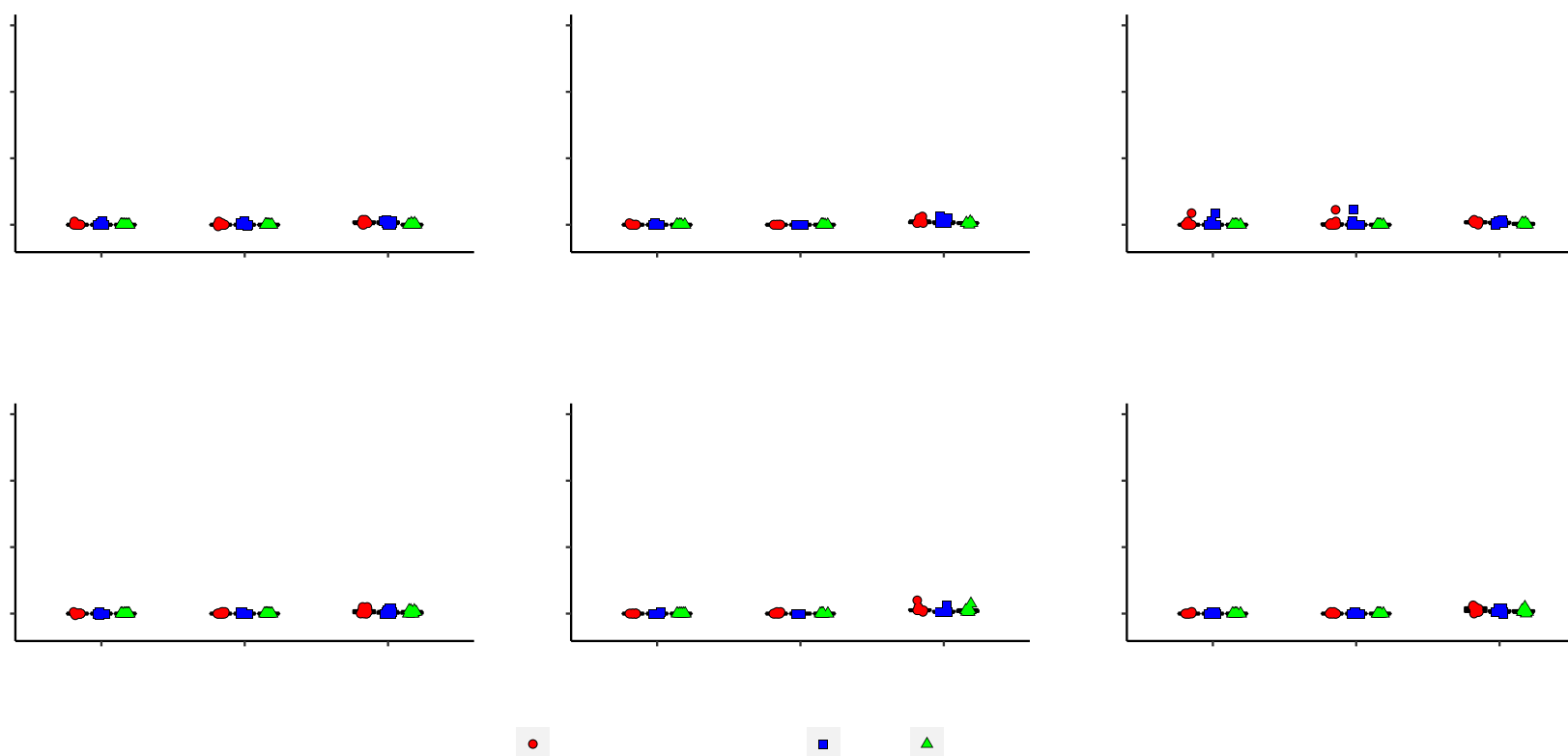
Time Point	Simulation	Cell Type	Statistic	25 µg mRNA-1273 ≥71 years (N=10)	100 µg mRNA-1273 ≥71 years (N=10)	≥71 years (N=20)
			95% CI	-0.029, 0.037	-0.020, 0.024	-0.015, 0.021
Day 43 Post Vaccination 1 (14 Days Post Vaccination 2)	SARS-CoV-2 S1	Any CD8	n	10	10	20
			Mean	0.035	0.128	0.082
			95% CI	0.005, 0.065	-0.014, 0.270	0.013, 0.150
		IFN $\gamma$	n	10	10	20
			Mean	0.031	0.126	0.079
			95% CI	0.007, 0.055	-0.012, 0.264	0.011, 0.146
		IL-2	n	10	10	20
			Mean	0.008	0.056	0.032
			95% CI	-0.001, 0.017	-0.001, 0.113	0.004, 0.060
		TNF	n	10	10	20
			Mean	0.018	0.087	0.053
			95% CI	0.005, 0.031	-0.018, 0.192	0.002, 0.103
	SARS-CoV-2 S2	Any CD8	n	10	10	20
			Mean	0.050	0.022	0.036
			95% CI	0.003, 0.097	-0.004, 0.048	0.011, 0.061
		IFN $\gamma$	n	10	10	20
			Mean	0.042	0.021	0.032
			95% CI	-0.007, 0.091	-0.004, 0.046	0.006, 0.057
		IL-2	n	10	10	20
			Mean	0.028	0.011	0.020
			95% CI	0.003, 0.053	0.000, 0.022	0.006, 0.033
		TNF	n	10	10	20
			Mean	0.034	0.021	0.028

Time Point	Simulation	Cell Type	Statistic	25 µg mRNA-1273 ≥71 years (N=10)	100 µg mRNA-1273 ≥71 years (N=10)	≥71 years (N=20)
			95% CI	0.013, 0.055	0.005, 0.037	0.015, 0.040
Note: N=Number of Subjects. n=Number of subjects with results available at time point. NE=Not Estimable						

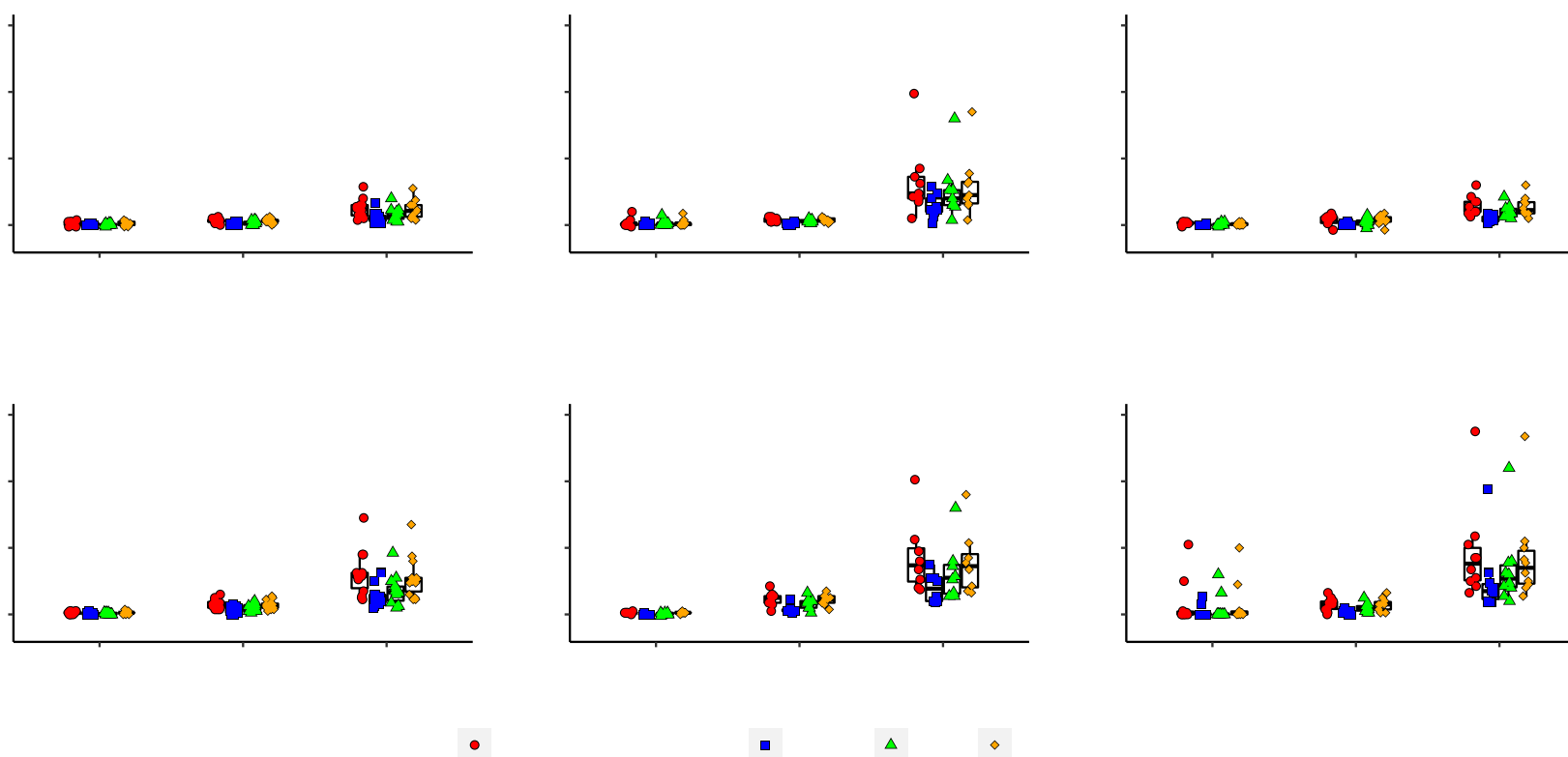
**Figure 69. Percentages of CD4 T Cells Expressing Th1 Cytokines S1 Peptide Pool**



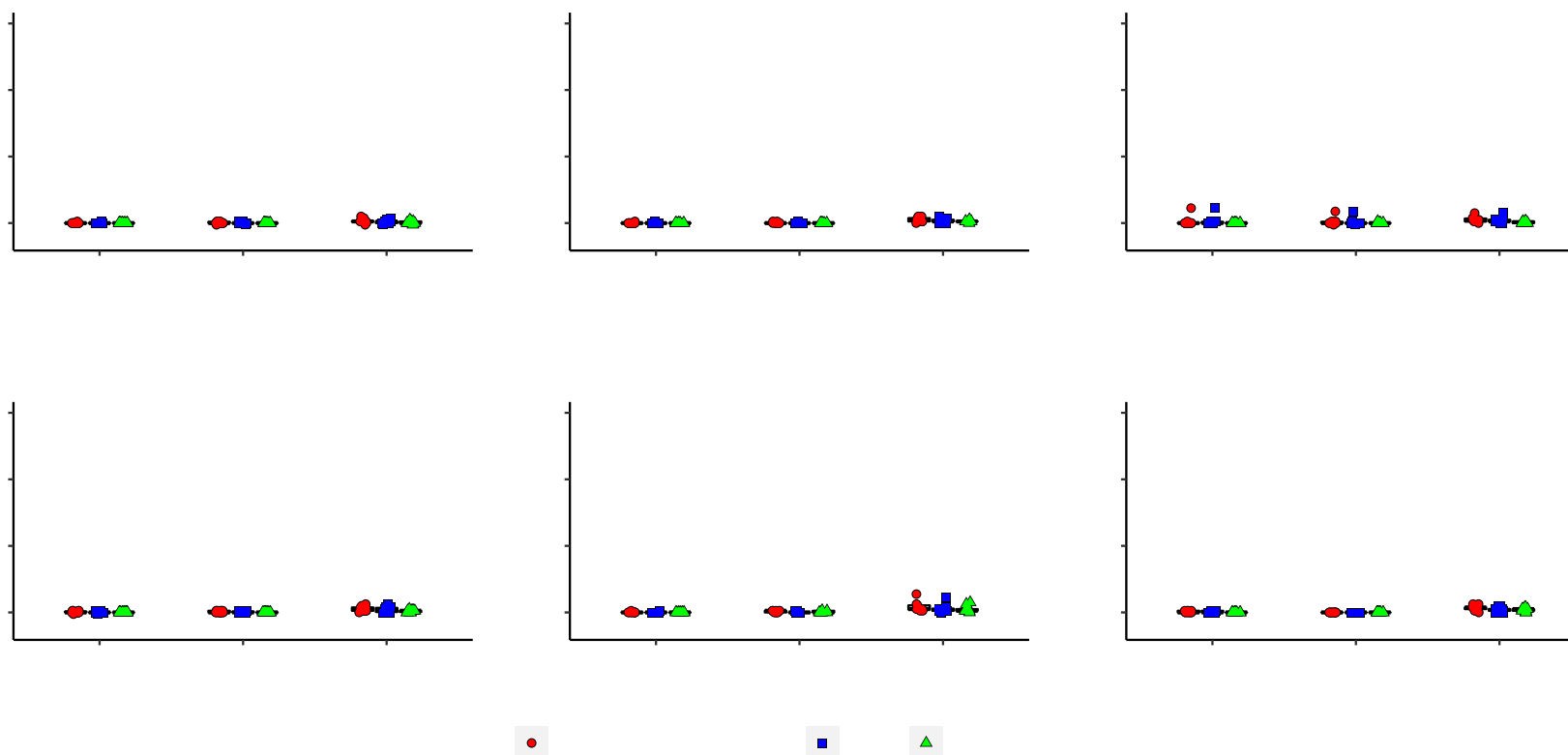
**Figure 70. Percentages of CD4 T cells expressing Th2 cytokines S1 Peptide Pool**



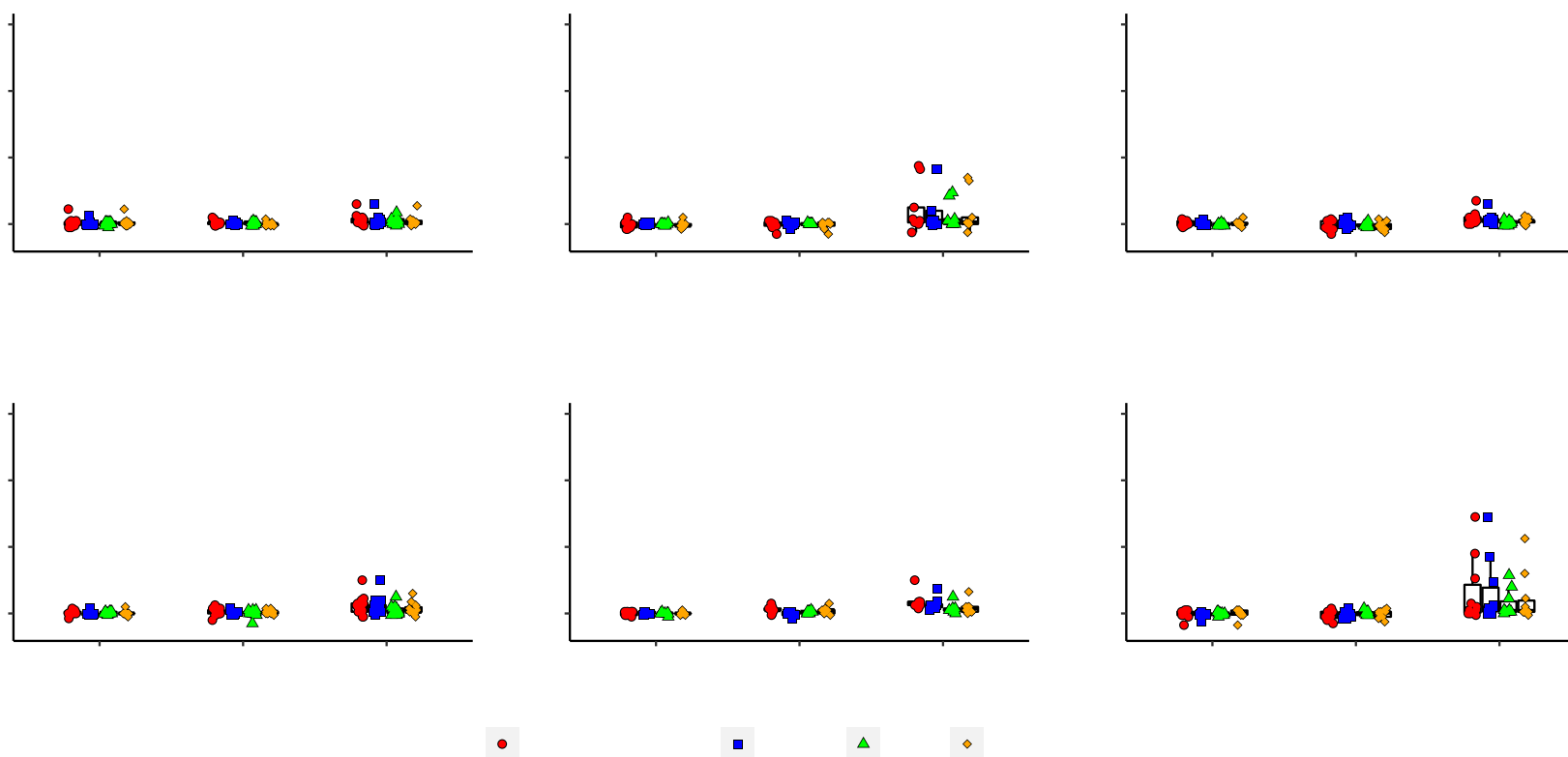
**Figure 71. Percentages of CD4 T cells expressing Th1 cytokines S2 Peptide Pool**



**Figure 72. Percentages of CD4 T Cells Expressing Th2 Cytokines S2 Peptide Pool**



**Figure 73. Percentages of CD8 T cells expressing cytokines S1 Peptide Pool**



**Figure 74. Percentages of CD8 T Cells Expressing Cytokines S2 Peptide Pool**

