



# DMID 21-0012 - Heterologous Platform Boost Study

## Mix and Match

WHO COVID-19 Vaccines Research  
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## Disclosures:

The speaker receives grant funding from NIAID/IDCRC as co-Chair and site PI for the MixNMatch and as an investigator on the Moderna and Novavax Phase III studies

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**Booster Vaccination**

Group	Sample Size	EUA Vaccine	Interval (weeks)	Delayed Booster Vaccination	Strategy Tested
Moderna (100 mcg)	1	Previously dosed Janssen – Ad26.COVID-S	≥12	Moderna- mRNA-1273	Same Strain Heterologous platform
	2	Previously dosed Moderna – mRNA-1273	≥12	Moderna- mRNA-1273	Control - Same Strain & platform
	3	Previously dosed Pfizer/BioNTech –BNT162b2	≥12	Moderna- mRNA-1273	Same Strain Similar platform
Janssen (5x10 <sup>10</sup> vp)	4	Previously dosed Janssen – Ad26.COVID-S	≥12	Janssen – Ad26.COVID.S	Control - Same Strain & platform
	5	Previously dosed Moderna – mRNA-1273	≥12	Janssen – Ad26.COVID.S	Same Strain Heterologous platform
	6	Previously dosed Pfizer/BioNTech –BNT162b2	≥12	Janssen – Ad26.COVID.S	Same Strain Heterologous platform
Pfizer (30 mcg)	7	Previously dosed Janssen – Ad26.COVID-S	≥12	Pfizer/BioNTech – BNT162b2	Same Strain Heterologous platform
	8	Previously dosed Moderna – mRNA-1273	≥12	Pfizer/BioNTech- BNT162b2	Same Strain Similar platform
	9	Previously dosed Pfizer/BioNTech –BNT162b2	≥12	Pfizer/BioNTech – BNT162b2	Control - Same Strain & platform

**Study Visits: Days 1, 8 (safety call), 15, 29, Months 3, 6, 12**  
**Blood for immunogenicity studies**

## Summary of Available Immunogenicity through D15/D29

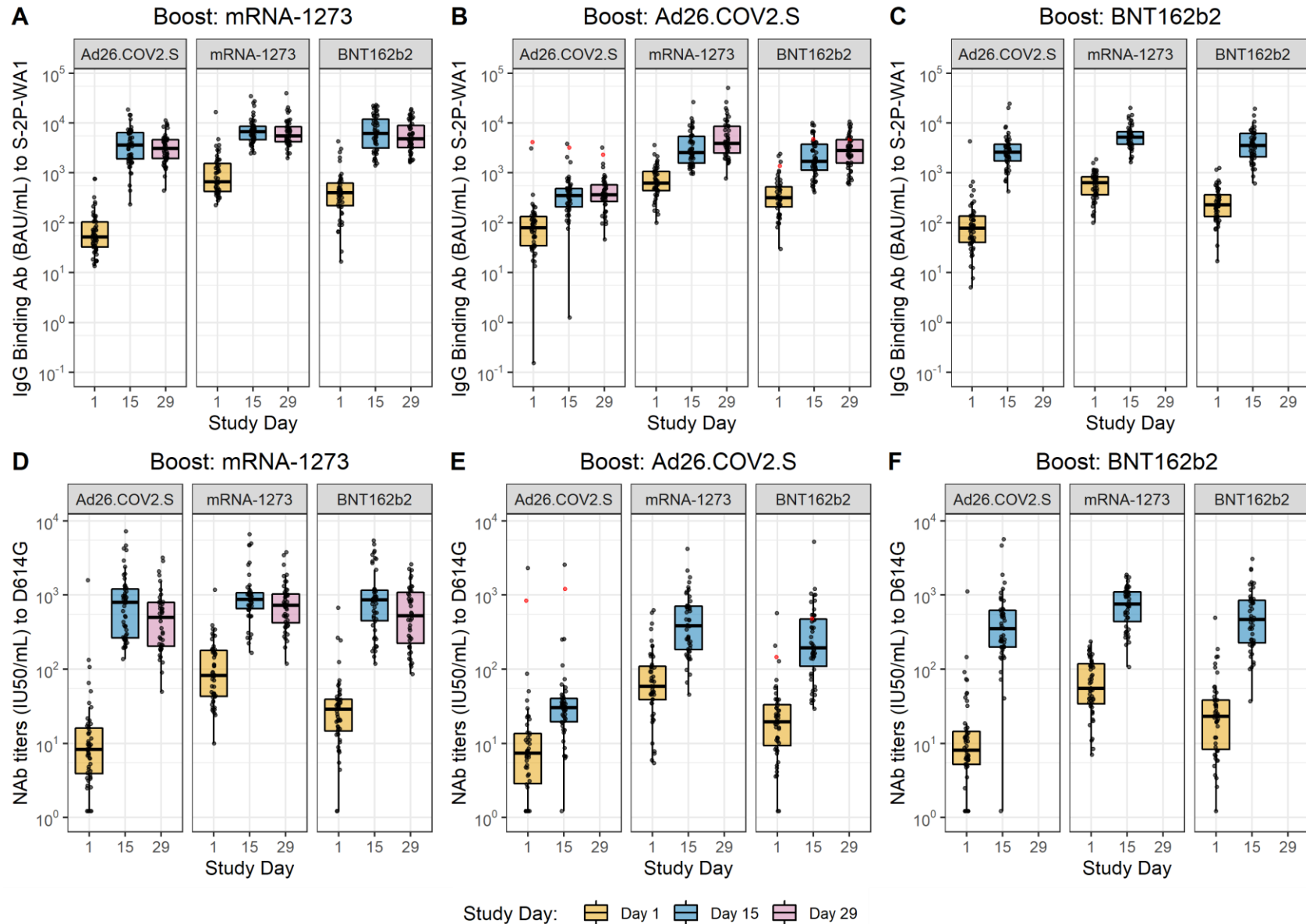
### Duke (Montefiori Lab): PsVN (ID<sub>50</sub>, ID<sub>80</sub> and in IU<sub>50</sub>/mL, IU<sub>80</sub>/mL)

- D614G N= $\sim$ 450 (50/arm)
- VoCs N=60, 20/arm, 10/age group
  - Beta, Delta - In process

### VRC (McDermott Lab): IgG Antibody Binding

- 4-plex (validated) (AU/mL)
  - S-2P (Wa-1 and Beta) N= $\sim$ 450 ( $\sim$ 50/arm) (AU/mL)
    - S-2P Wa-1: Binding Antibody Units/mL (BAU/mL) (International Standard)
- 10-plex Fit for Purpose (FFP)
  - S-2P (Alpha, Beta, Gamma, Delta, Wa-1) (AUC/m)

# Immunogenicity of all three boosters - IgG binding Antibody (A-C) and Neutralizing Antibody (D-F) Through Days 15/29



mRNA: **Peaks D15, Stable D29**

Janssen: **Incremental rise D29**

Homologous GMFR: **4.2-20**

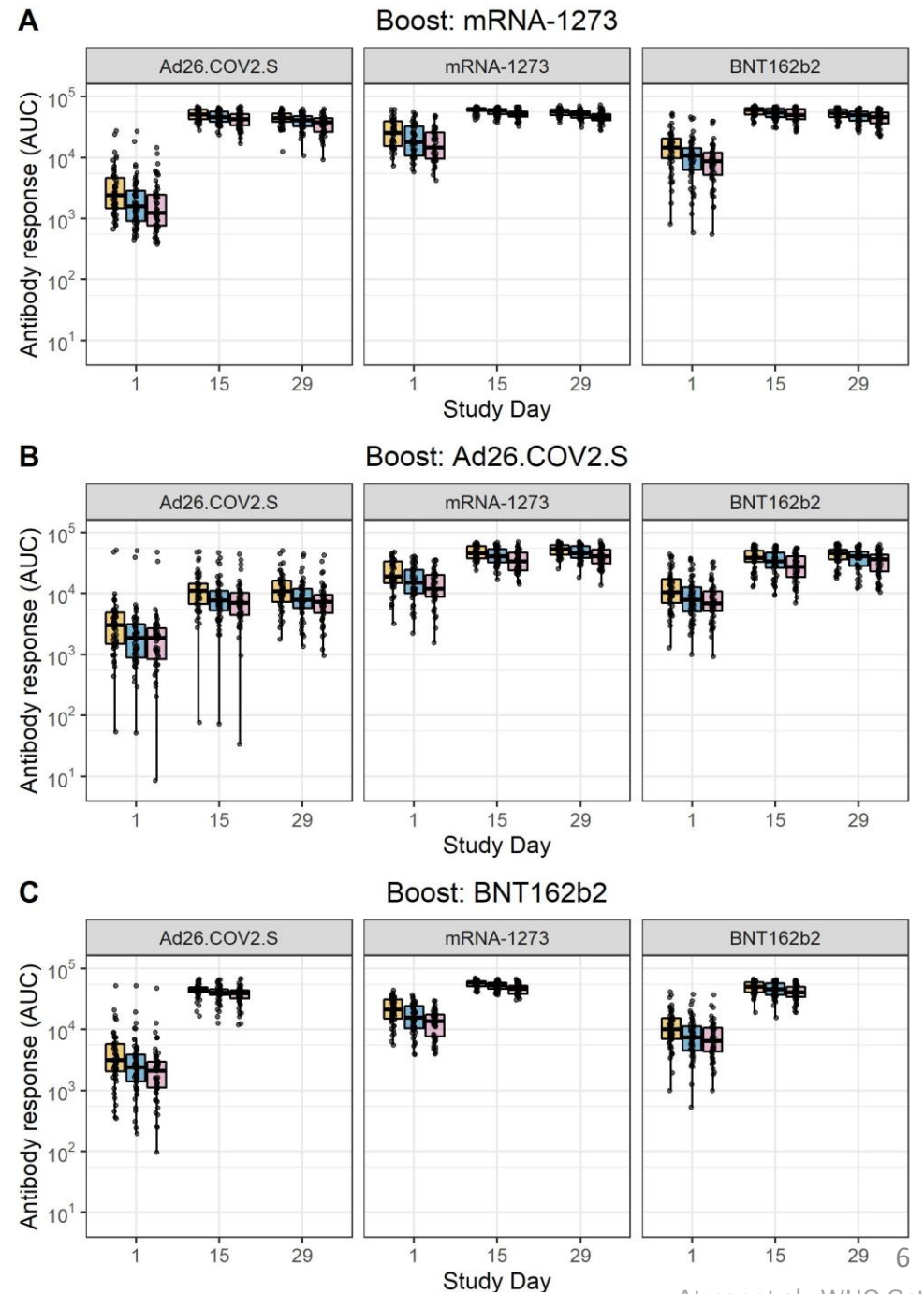
Heterologous GMFR: **6.2-76**

# All 3 vaccines

IgG Serum Binding Antibody Response to S-2P-Wa-1 (control), B.1.1.7 (alpha), and B.1.617.2 (delta)

FFP 10-plex ECLIA, by Group and Timepoint  
Results are reported as Area Under Curve (AUC)

Antigen:



## Limitations -

- Non-randomized, open label design
- Study not designed to compare between boosts
  - Didn't control for intervals between primary vaccine and boosts
- Correlates of protection are not completely elucidated
- Correlates for severe disease and death are even less well understood
- This is only antibody data
  - Cellular immune responses are still being analyzed
- These data represent only early timepoints from the trial
  - Vaccines may differ in time to reach peak responses, and may have different durability of the responses

## Conclusions -

1. Use of mRNA-1273, Ad26.COVS and BNT162b2 as booster vaccines led to anamnestic serologic responses in all 3 EUA-dose vaccine groups
2. For a given primary EUA Covid-19 vaccine, heterologous boosts elicited similar or higher serologic responses as compared to their respective homologous booster responses
3. mRNA vaccines resulted in higher antibody titers in the first 28 days after the boost
4. No safety concerns identified



# The "MixNMatch" Study Team

Kaiser Permanente  
Washington Health Research  
Institute

Fred Hutch / SCHARP

The University of Washington

Cincinnati Children's  
Hospital

University of  
Pittsburgh

University of Rochester

New York University

University of  
Maryland

VRC

Duke University

FHI360

Emory  
University

Clinical Sites

Labs

Regulatory, Data and Statistical Centers

Moderna, Inc., Johnson&Johnson/Janssen, Pfizer/BioNTech

Baylor College of Medicine

University of Texas Medical  
Branch

Questions?

N = 458

2 Participants

- Group 4 (n = 1)
- Group 6 (n = 1)
- High N protein antibody (D1) suggestive of prior infection

1 Participant

- Group 5 (n = 1)
- Covid-19 Study Day 27

**Table 1. Characteristics of the Participants at Enrollment**

Group	1	2	3	4	5	6	7	8	9
Primary EUA Immunization Vaccine	Janssen	Moderna	Pfizer/BioNTech	Janssen	Moderna	Pfizer/BioNTech	Janssen	Moderna	Pfizer/BioNTech
	Ad26.COVS-2-S	mRNA-1273	BNT162b2	Ad26.COVS-2-S	mRNA-1273	BNT162b2	Ad26.COVS-2-S	mRNA-1273	BNT162b2
	5x10 <sup>10</sup> vp	100-mcg	30-mcg	5x10 <sup>10</sup> vp	100-mcg	30-mcg	5x10 <sup>10</sup> vp	100-mcg	30-mcg
Booster	Moderna mRNA-1273 100-mcg			Janssen Ad26.COVS-2-S 5x10 <sup>10</sup> vp			Pfizer/BioNTech BNT162b2 30-mcg		
Total Number	53	51	50	50	49	51	53	51	50
Sex – no. (%)									
Female	26 (49.1)	32 (62.7)	29 (58.0)	27 (46.0)	16 (32.7)	23 (45.1)	29 (54.7)	26 (51.0)	23 (46.0)
Male	27 (50.9)	19 (37.3)	21 (42.0)	23 (54.0)	33 (67.3)	28 (54.9)	24 (45.3)	25 (49.0)	27 (54.0)
Age – years									
Mean (s.d.)	56.8 (14.5)	53.1 (16.2)	54.8 (17.4)	50.1 (13.9)	49.9 (16.8)	50.3 (15.4)	47.7 (14.5)	54.3 (16.8)	50.4 (17.9)
Range	24-81	24-76	22-85	24-77	20-75	20-76	22-74	23-75	19-80
Race – no. (%)									
Asian	4 (7.5)	5 (9.8)	4 (8.0)	3 (6.0)	5 (10.2)	6 (11.8)	1 (1.9)	2 (3.9)	1 (2.0)
Hawaiian or Pacific Islander	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	1 (1.9)	0 (0.0)	0 (0.0)
Black/African American	1 (1.9)	2 (3.9)	3 (6.0)	0 (0.0)	0 (0.0)	2(3.9)	0 (0.0)	2 (3.9)	1 (2.0)
White	46 (86.8)	41 (80.4)	43 (86.0)	44 (88.0)	43 (87.8)	40 (78.4)	50(94.3)	47 (92.2)	43 (86.0)
Multi-racial	1 (1.9)	3 (5.9)	0 (0.0)	3 (6.0)	1 (2.0)	2 (3.9)	1 (1.9)	0 (0.0)	4 (8.0)
Other	1 (1.9%)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	1 (2.0%)	0 (0.0)	0 (0.0)	1 (2.0%)
Ethnicity – no (%)									
Non-Hispanic	49 (92.5)	46 (90.2)	47 (94.0)	47 (94.0)	49 (100.0)	48 (94.1)	51 (96.2)	49 (96.1)	45 (90.0)
Hispanic/Latino	4 (7.5)	4 (7.8)	3 (6.0)	2 (4.0)	0 (0.0)	3 (5.9)	2 (3.8)	2 (3.9)	5 (10.0)
Unknown/Not reported	0 (0.0)	1 (2.0)	0 (0.0)	1 (2.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)
Boost Interval weeks	15.4 wks			18.4 wks			21.5 wks		
Mean (s.d.)	13.7 (1.0)	16.4 (1.9)	16.8 (2.2)	17.7 (2.0)	19.3 (4.2)	20.6 (5.8)	19.9 (2.5)	22.9 (4.6)	24.1 (5.2)
Range	12.0-15.9	12.4-20.0	12.0-20.9	13.9-21.0	12.6-26.0	12.3-41.3	10.9-23.0	12.6-28.7	14.3-31.9

# Booster Solicited AEs

## Local and Systemic Reactogenicity – Through Day 8

