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## Archived Editions (COVID-19 Genomics and Precision Public Health Weekly Update)

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### COVID-19 Genomics and Precision Public Health Weekly Update Content

- Pathogen and Human Genomics Studies
- Non-Genomics Precision Health Studies
- News, Reviews and Commentaries

### Pathogen and Human Genomics Studies

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- The emergence and ongoing convergent evolution of the SARS-CoV-2 N501Y lineages ([https://www.cell.com/cell/fulltext/S0092-8674\(21\)01050-3](https://www.cell.com/cell/fulltext/S0092-8674(21)01050-3))

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selective forces acting on various SARS-CoV-2 genes. Following their emergence, the adaptive evolution of 501Y lineage viruses has involved repeatedly favored convergent mutations at 35 genome sites: mutations we refer to as the 501Y meta-signature. The ongoing convergence of viruses in many other lineages on this meta-signature suggests that it includes multiple mutation combinations capable of promoting the persistence of diverse SARS-CoV-2 lineages in the face of mounting host immune recognition.

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We conclude that the mRNA-1273 vaccine can efficiently stimulate the SARS-CoV-2-specific B-cell memory that has been generated by a prime dose of ChAdOx1 nCoV-19 vaccine 9 to 12 weeks earlier and that it may provide better protection against the B.1.351 variant than a ChAdOx1 nCoV-19 boost. These data also suggest that mRNA vaccines (here in the form of mRNA-1273) may be useful for vaccination strategies in which a third dose is to be administered to persons who have previously received two doses of ChAdOx1 nCoV-19.

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(<https://www.nature.com/articles/s41586-021-03944-y>)

P Mlcochova et al, Nature, September 6, 2021

B.1.617.2 is 6-fold less sensitive to serum neutralising antibodies from recovered individuals, and 8-fold less sensitive to vaccine-elicited antibodies as compared to wild type (WT) Wuhan-1 bearing D614G. Serum neutralising titres against B.1.617.2 were lower in ChAdOx-1 versus BNT162b2 vaccinees. B.1.617.2 spike pseudotyped viruses exhibited compromised sensitivity to monoclonal antibodies against the receptor binding domain (RBD) and N-terminal domain (NTD). B.1.617.2 demonstrated higher replication efficiency in both airway organoid and human airway epithelial systems compared to B.1.1.7.

- Effectiveness of the BNT162b2 mRNA COVID-19 vaccine in pregnancy

(<https://www.nature.com/articles/s41591-021-01490-8>)

N Dagan et al, Nature Medicine, September 7, 2021

A total of 10,861 vaccinated pregnant women were matched to 10,861 unvaccinated pregnant controls using demographic and clinical characteristics. Study outcomes included documented infection with SARS-CoV-2, symptomatic COVID-19, COVID-19-related hospitalization, severe illness and death. Estimated vaccine effectiveness from 7 through to 56?d after the second dose was 96% (95% confidence interval 89–100%) for any documented infection, 97% (91–100%) for infections with documented symptoms and 89% (43–100%) for COVID-19-related hospitalization.

- The emergence and ongoing convergent evolution of the SARS-CoV-2 N501Y lineages

([https://www.cell.com/cell/fulltext/S0092-8674\(21\)01050-3](https://www.cell.com/cell/fulltext/S0092-8674(21)01050-3))

DP Martin et al, Cell, September 6, 2021

The independent emergence late in 2020 of the B.1.1.7, B.1.351 and P.1 lineages of SARS-CoV-2 prompted renewed concerns about the evolutionary capacity of this virus to overcome public health interventions and rising population immunity. Here, by examining patterns of synonymous and non-synonymous mutations that have accumulated in SARS-CoV-2 genomes since the pandemic began, we find that the emergence of these three “501Y lineages” coincided with a major global shift in the selective forces acting on various SARS-CoV-2 genes. Following their emergence, the adaptive evolution of 501Y lineage viruses has involved repeated selectively favored convergent mutations at 35 genome sites: mutations we refer to as the 501Y meta-signature. The ongoing convergence of viruses in many other lineages on this meta-signature suggests that it includes multiple mutation combinations capable of promoting the persistence of diverse SARS-CoV-2 lineages in the face of mounting host immune recognition.

- Effectiveness of the mRNA BNT162b2 vaccine six months after vaccination: findings from a large Israeli HMO (<https://www.medrxiv.org/content/10.1101/2021.09.01.21262957v1>)

J Kertes et al, MEDRXIV, September 7, 2021

Israel is currently experiencing a new wave of CoVid-19 infection, six months after implementing a national vaccination campaign. We carried out three discrete analyses using data from a large Israeli HMO to determine whether IgG levels of those fully vaccinated drop over time, the relationship between IgG titer and subsequent PCR-confirmed infection, and compare PCR-confirmed infection rates by period of vaccination. We found that mean IgG antibody levels steadily decreased over the six-month period in the total tested population, and in all age groups. An inverse relationship was found between IgG titer and subsequent CoVid-19 infection (PCR-positive). Those participants vaccinated in the first two months of the campaign were more likely to become infected than those subsequently vaccinated. The 60+ vaccinated had lower initial IgG levels, and were at greater risk of infection.

- Spontaneous Abortion Following COVID-19 Vaccination During Pregnancy

(<https://jamanetwork.com/journals/jama/fullarticle/2784193>)

EO Kharbanda et al, JAMA, September 8, 2021

Of 105,446 unique pregnancies, 13,160 spontaneous abortions and 92,286 ongoing pregnancies were identified. Overall, 7.8% of women received 1 or more BNT162b2 (Pfizer-BioNTech) vaccines; 6.0% received 1 or more mRNA-1273 (Moderna) vaccines; and 0.5% received an Ad26.COV.2.S (Janssen) vaccine during pregnancy and before 20 weeks' gestation. Spontaneous abortions did not have an increased odds of exposure to a COVID-19 vaccination in the prior 28 days compared with ongoing pregnancies (adjusted odds ratio, 1.02; 95% CI, 0.96-1.08). Results were consistent for mRNA-1273 and BNT162b2 and by gestational age group.

- Heterologous ChAdOx1 nCoV-19 and mRNA-1273 Vaccination.

(<https://pubmed.ncbi.nlm.nih.gov/34260850>)

Normark Johan et al. The New England journal of medicine 2021 7 (11) 1049-1051

We conclude that the mRNA-1273 vaccine can efficiently stimulate the SARS-CoV-2-specific B-cell memory that has been generated by a prime dose of ChAdOx1 nCoV-19 vaccine 9 to 12 weeks earlier and that it may provide better protection against the B.1.351 variant than a ChAdOx1 nCoV-19 boost. These data also suggest that mRNA vaccines (here in the form of mRNA-1273) may be useful for vaccination strategies in which a third dose is to be administered to persons who have previously received two doses of ChAdOx1 nCoV-19.

- Effect of Vaccination on Transmission of SARS-CoV-2. (<https://pubmed.ncbi.nlm.nih.gov/34496200>)

Shah Anoop S V et al. The New England journal of medicine 2021 9

Cases of Covid-19 were less common among household members of vaccinated health care workers during the period beginning 14 days after the first dose than during the unvaccinated period before the first dose (event rate per 100 person-years, 9.40 before the first dose and 5.93 beginning 14 days after the first dose). After the health care worker's second dose, the rate in household members was lower still (2.98 cases per 100 person-years)

- Receipt of mRNA Covid-19 Vaccines and Risk of Spontaneous Abortion.

(<https://pubmed.ncbi.nlm.nih.gov/34496196>)

Zauche Lauren H et al. The New England journal of medicine 2021 9

As compared with data from two historical cohorts that represent the lower and upper ranges of spontaneous-abortion risk,<sup>2,4</sup> the cumulative risks of spontaneous abortion from our primary and sensitivity analyses were within the expected risk range.

- On Preliminary Findings of mRNA Covid-19 Vaccine Safety in Pregnant Persons. Reply.

(<https://pubmed.ncbi.nlm.nih.gov/34496198>)

Meaney-Delman Dana M et al. The New England journal of medicine 2021 9

- Effectiveness of Covid-19 Vaccines in Ambulatory and Inpatient Care Settings.

(<https://pubmed.ncbi.nlm.nih.gov/34496194>)

Thompson Mark G et al. The New England journal of medicine 2021 9

The effectiveness of full messenger RNA (mRNA) vaccination (=14 days after the second dose) was 89% (95% confidence interval [CI], 87 to 91) against laboratory-confirmed SARS-CoV-2 infection leading to hospitalization, 90% (95% CI, 85 to 93) against infection leading to an ICU admission, and 91% (95% CI, 89 to 93) against infection leading to an emergency department or urgent care clinic visit. The effectiveness of full vaccination with respect to a Covid-19-associated hospitalization or emergency department or urgent care clinic visit was similar with the BNT162b2 and mRNA-1273 vaccines and ranged from 81% to 95% among adults 85 years of age or older, persons with chronic medical conditions, and Black or Hispanic adults.

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