

# COVID-19

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## RESEARCH PUBLICATIONS

**Publication Date: Sep 22, 2021**

### Effect of SARS-CoV-2 mRNA vaccination in MS patients treated with disease modifying therapies

#### **Abstract**

*Background:* In patients with Multiple Sclerosis (pwMS) disease-modifying therapies (DMTs) affects immune response to antigens. Therefore, post-vaccination serological assessments are needed to evaluate the effect of the vaccine on SARS-CoV-2 antibody response.

*Methods:* A prospective multicenter cohort study was designed enrolling pwMS who were scheduled for SARS-Cov-2 vaccination with mRNA vaccines (BNT162b2, Pfizer/BioNTech, Inc or mRNA-1273, Moderna Tx, Inc). A blood collection before the first vaccine dose and 4 weeks after the second dose was planned, with a centralized serological assessment (electrochemiluminescence immunoassay, ECLIA, Roche-Diagnostics). The log-transform of the antibody levels was analyzed by multivariable linear regression.

*Findings:* 780 pwMS (76% BNT162b2 and 24% mRNA-1273) had pre- and 4-week post-vaccination blood assessments. 87 (11.2%) were untreated, 154 (19.7%) on ocrelizumab, 25 (3.2%) on rituximab, 85 (10.9%) on fingolimod, 25 (3.2%) on cladribine and 404 (51.7%) on other DMTs. 677 patients (86.8%) had detectable post-vaccination SARS-CoV-2 antibodies. At multivariable analysis, the antibody levels of patients on ocrelizumab (201-fold decrease (95%CI=128–317),  $p < 0.001$ ), fingolimod (26-fold decrease (95%CI=16–42),  $p < 0.001$ ) and rituximab (20-fold decrease (95%CI=10–43),  $p < 0.001$ ) were significantly reduced as compared to untreated patients. Vaccination with mRNA-1273 resulted in a systematically 3-25-fold higher antibody level

(95%CI=2.46–4.27) than with the BNT162b2 vaccine ( $p < 0.001$ ). The antibody levels on anti-CD20 therapies correlated to the time since last infusion, and rituximab had longer intervals (mean=386 days) than ocrelizumab patients (mean=129 days).

*Interpretation:* In pwMS, anti-CD20 treatment and fingolimod led to a reduced humoral response to mRNA-based SARS-CoV-2 vaccines. As mRNA-1273 elicits 3.25-higher antibody levels than BNT162b2, this vaccine may be preferentially considered for patients under anti-CD20 treatment or fingolimod. Combining our data with those on the cellular immune response to vaccines, and including clinical follow-up, will contribute to better define the most appropriate SARS-CoV-2 vaccine strategies in the context of DMTs and MS.

## Reference

[https://www.thelancet.com/journals/ebiom/article/PIIS2352-3964\(21\)00374-1/fulltext](https://www.thelancet.com/journals/ebiom/article/PIIS2352-3964(21)00374-1/fulltext)

**Publication Date: Sep 21, 2021**

## Prior infection with SARS-CoV-2 WA1/2020 partially protects rhesus macaques against reinfection with B.1.1.7 and B.1.351 variants

### Abstract

Severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) variants that result in increased transmissibility and partial evasion of neutralizing antibodies have recently emerged. Whether natural immunity induced by the original SARS-CoV-2 WA1/2020 strain protects against rechallenge with these SARS-CoV-2 variants remains a critical unresolved question. In this study, we show that natural immunity induced by the WA1/2020 strain leads to partial but incomplete protection against the SARS-CoV-2 variants B.1.1.7 (alpha) and B.1.351 (beta) in rhesus macaques. We challenged rhesus macaques with B.1.1.7 and B.1.351 and showed that infection with these variants resulted in high viral replication in the upper and lower respiratory tract. Rhesus macaques was then with infected the WA1/2020 strain and rechallenged them on day 35 with the WA1/2020, B.1.1.7, or B.1.351 variants. Natural immunity to WA1/2020 led to robust protection against rechallenge with WA1/2020 but only partial protection against rechallenge with B.1.351. An intermediate degree of protection was observed in rhesus macaques against rechallenge with B.1.1.7. These data demonstrate partial but

incomplete protective efficacy of natural immunity induced by WA1/2020 against SARS-CoV-2 variants of concern. These findings have important implications for both vaccination and public health strategies in the context of emerging SARS-CoV-2 variants of concern.

## **Reference**

<https://www.science.org/doi/10.1126/scitranslmed.abj2641>

### **Protection against SARS-CoV-2 beta variant in mRNA-1273 vaccine–boosted nonhuman primates**

#### **Abstract**

Neutralizing antibody responses gradually wane against several variants of concern (VOC) after vaccination with the SARS-CoV-2 vaccine mRNA-1273. We evaluated the immune responses in nonhuman primates that received a primary vaccination series of mRNA-1273 and were boosted ~6 months later with either homologous mRNA-1273 or heterologous mRNA-1273.β, which encompasses the spike sequence of the B.1.351 beta (β) variant. Following boost, animals had increased neutralizing antibody responses across all VOC, which was sustained for at least 8 weeks post-boost. Nine weeks following boost, animals were challenged with the SARS-CoV-2 β variant. Viral replication was low to undetectable in bronchoalveolar lavages and significantly reduced in nasal swabs in all boosted animals suggesting booster vaccinations may be required to sustain immunity and protection.

## **Reference**

<https://www.science.org/doi/10.1126/science.abl8912>

**The BNT162b2 vaccine effectiveness against new COVID-19 cases and complications of breakthrough cases: A nation-wide retrospective longitudinal multiple cohort analysis using individualised data**

**Abstract**

*Background:* The rapid vaccination campaign against COVID-19 in Israel relied on the BNT162b2 vaccine. A longitudinal analysis of multiple cohorts was performed, using individual data, to evaluate the effectiveness of the vaccine against new and breakthrough cases.

*Methods:* Vaccine effectiveness (VE) for 27 consecutive cohorts were estimated, each comprised of individuals vaccinated on specific days. VE against new COVID-19 cases was evaluated for five SARS-CoV-2-related outcomes: infection, symptomatic disease, hospitalisation, severe/critical disease and death. For breakthrough cases, rate reduction was evaluated for hospitalisation, severe/critical disease and death. Outcomes were evaluated at predetermined time-periods after vaccination, the last one dedicated to individuals who became SARS-CoV-2-positive 22–28 days after the second dose.

*Findings:* The highest VE estimates against new cases in  $\geq 16$  year old individuals, for all outcomes, were reached at the 15–21 day period after the second dose, ranging between 97.7% (95% CI: 95.9–98.7%) for deaths and 98.6% (95% CI: 97.8–99.1%) for severe/critical disease. VE estimates of the 14–20 day period after the first dose ranged between 54.3% (95% CI: 50.6–57.8%) for infection and 77.3% (95% CI: 71.2–82.1%) for severe/critical disease. VE rose more slowly among  $\geq 80$  year old individuals. Rate reductions of breakthrough complications were highest at the 22–28 day period after the second dose, ranging between 47.4% (95% CI: 4.3–71.2%) for death and 66.2% (95% CI: 44.2–79.6%) for severe/critical disease.

*Interpretation:* The BNT162 vaccine is highly effective in preventing new SARS-CoV-2 cases. Among  $\geq 80$  year old individuals, high effectiveness develops more slowly. In breakthrough cases, vaccination reduces complications and death.

## Reference

[https://www.thelancet.com/journals/ebiom/article/PIIS2352-3964\(21\)00367-4/fulltext](https://www.thelancet.com/journals/ebiom/article/PIIS2352-3964(21)00367-4/fulltext)