Neutralization of SARS-CoV-2 lineage B.1.1.7 pseudovirus by BNT162b2 vaccine–elicited human sera

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Recently, a new severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) lineage called B.1.1.7 (variant of concern: VOC 202012/01), which is reported to spread more efficiently and faster than other strains, emerged in the United Kingdom. This variant has an unusually large number of mutations, with 10 amino acid changes in the spike (S) protein, raising concerns that its recognition by neutralizing antibodies may be affected. In this study, we tested SARS-CoV-2-S pseudoviruses bearing either the Wuhan reference strain or the B.1.1.7 lineage spike protein with sera of 40 participants who were vaccinated in a previously reported trial with the messenger RNA–based COVID-19 vaccine BNT162b2. The immune sera had slightly reduced but overall largely preserved neutralizing titers against the B.1.1.7 lineage pseudovirus. These data indicate that the B.1.1.7 lineage will not escape BNT162b2-mediated protection.

![Fig. 1. 50% pseudovirus neutralization titers (pVNT50) of 40 sera from BNT162b2 vaccine recipients against VSV-SARS-CoV-2-S pseudovirus bearing the Wuhan reference strain or lineage B.1.1.7 spike protein. Sera from n = 26 younger adults (aged 23 to 55 years; indicated by triangles) and n = 14 older adults (aged 57 to 73 years; indicated by circles) drawn at either day 29 or day 43 (7 or 21 days after vaccine dose two) were tested. Statistical significance of the difference between the neutralization of the VSV-SARS-CoV-2-S pseudovirus bearing the Wuhan or lineage B.1.1.7 spike protein was calculated by a Wilcoxon matched-pairs signed rank test. Two-tailed P values are reported. GMTs and 95% CIs are indicated.](http://science.sciencemag.org/)

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Fig. 2. pVNT50 ratio of SARS-CoV-2 lineage B.1.1.7 to Wuhan reference strain spike–pseudotyped VSV. Triangles represent sera from younger adults (aged 23 to 55 years), and circles represent sera from older adults (aged 57 to 73 years). Sera were drawn on either day 29 or day 43 (7 or 21 days after vaccine dose two). Geometric means of the pVNT50 ratios of SARS-CoV-2 lineage B.1.1.7 to Wuhan spike–pseudotyped VSV and 95% CIs are indicated. The difference in distribution of titer ratios between younger and older adults was tested for statistical significance with a two-tailed Mann-Whitney U test. Statistical significance of age-related differences in distribution of pVNT50 ratios between younger and older adults was tested for statistical difference in distribution of titer ratios between pseudotyped VSV and 95% CIs are indicated. The ongoing evolution of SARS-CoV-2 necessitates continuous monitoring of the biological relevance of changes for maintained protection and demonstrates for the SARS-CoV-2 B.11.7 lineage. Additional experiments will be needed to confirm efficient neutralization of B.11.7 lineage clinical isolates. This study has evaluated sera elicited by the recommended regimen of two doses administered 21 days apart and does not provide insight into neutralization if the recommended dosing regimen is not followed. The ongoing evolution of SARS-CoV-2 necessitates continuous monitoring of the biological relevance of changes for maintained protection by the currently authorized vaccines. Unlike the protocol for influenza vaccines, the degree of reduction in neutralization that might indicate a need for a strain change has not yet been established for COVID-19 vaccines. A previous study demonstrated that BNT162b2 elicits both a polyepitopic CD8+ T cell response to the encoded spike protein and virus-neutralizing antibodies (7). Given the multiple potential mediators of protection elicited by BNT162b2, it is possible that vaccine efficacy could be preserved in the longer term, even with substantial losses of neutralization by vaccine-elicited sera. This view is further supported by the rapid onset of disease protection ~12 days after the first dose of BNT162b2, at a time when neutralizing antibody titers are still very low (7). Without an established correlate of protection, clinical effectiveness data will be needed to provide definitive assessment of vaccine-mediated protection against viral variants.

Although sustained neutralization of the current B.1.1.7 variant is reassuring, preparation for potential COVID-19 vaccine strain change is prudent. Adaptation of the vaccine to a new virus strain would be facilitated by the flexibility of mRNA-based vaccine technology.

REFERENCES AND NOTES

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Materials and Methods.
Figs. S1 to S3.
Tables S1 and S2.
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Vaccine protects against B1.1.7 variant
The severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) B1.1.7 (VOC 202012/01) variant that emerged in late 2020 in the United Kingdom has many changes in the spike protein gene. Three of these are associated with enhanced infectivity and transmissibility, and there are concerns that B.1.1.7 might compromise the effectiveness of the vaccine. Muik et al. compared the neutralization efficacy of sera from 40 subjects immunized with the BioNTech-Pfizer mRNA vaccine BNT162b2 against a pseudovirus bearing the Wuhan reference strain or the lineage B.1.1.7 spike protein (see the Perspective by Altmann et al.). Serum was derived from 40 subjects in two age groups 21 days after the booster shot. The vaccine remained effective against B.1.1.7 with a slight but significant decrease in neutralization that was more apparent in participants under 55 years of age. Thus, the vaccine provides a significant “cushion” of protection against this variant.
Science, this issue p. 1152; see also p. 1103

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