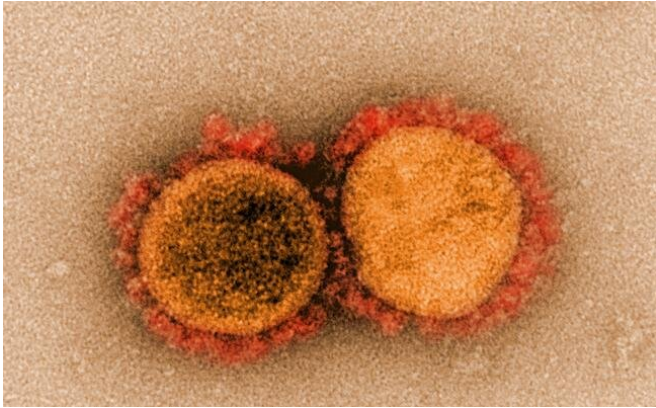


Effectiveness of mRNA vaccines against the COVID-19 Alpha and Beta variants in France

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Transmission electron micrograph of SARS-CoV-2 virus particles, isolated from a patient. Image captured and color-enhanced at the NIAID Integrated Research Facility (IRF) in Fort Detrick, Maryland. Credit: NIAID

Over the past six months, the World Health Organization has categorized four SARS-CoV-2 variants as being "of concern" because they are more transmissible or may escape the immune response. They have been termed the Alpha, Beta, Gamma and Delta variants. Scientists from the Institut Pasteur, in collaboration with the French National Health Insurance Fund (CNAM), Ipsos and Santé publique France, conducted a nationwide case-control study to evaluate the effectiveness of mRNA vaccines against symptomatic forms of SARS-CoV-2 infection, be that non-variant virus or the Alpha and Beta variants. The results show that the two-dose vaccination regimen of mRNA vaccines provides 88% protection against non-variant virus, 86% against the Alpha variant and 77% against the Beta variant. The results of this study were published in *The Lancet Regional Health Europe* on July 14, 2021.

In late 2020, two new variants of SARS-CoV-2 were reported in the United Kingdom and in South

Africa, respectively. This occurred at a time when the United Kingdom was experiencing a resurgence in the incidence of SARS-CoV-2 infections. This was later attributed to the emergence of the Alpha variant, which has now demonstrated increased transmissibility as compared to the original SARS-CoV-2. The Beta variant was first reported in South Africa and later identified to carry a mutation known as E484K and which is associated with immune evasion. The reporting of the first SARS-CoV-2 variants occurred as mass COVID-19 vaccination campaigns were commencing at global level. In France, both Alpha and Beta were circulating in the first months of 2021. It was therefore important to analyze the [effectiveness](#) of the messenger RNA (mRNA) COVID-19 vaccines against these SARS-CoV-2 variants of concern.

In October 2020, the Institut Pasteur, in collaboration with the French National Health Insurance Fund (CNAM), Ipsos and Santé publique France, launched the ComCor study, a case-control study at national level to analyze the sociodemographic, behavioral and practical factors associated with SARS-CoV-2 [infection](#). All those infected with SARS-CoV-2 were invited to take part in the study by the CNAM, while non-infected control were identified through an Ipsos representative panel. The first results of the study were published in *The Lancet Regional Health* on June 7, 2021.

In February 2021, the scientists adapted the ComCor questionnaire to add information about vaccination against COVID-19, previous SARS-CoV-2 infection and information on the variants responsible for infection, provided as part of test results. This information was used to assess the effectiveness of two doses of mRNA [vaccine](#) against the Alpha and Beta variants, and to evaluate the protection conferred by previous SARS-CoV-2 infection.

In this study, 7,288 people infected with the original

strain, 31,313 people infected with the Alpha variant, 2,550 people infected with the Beta variant and 3,644 non-infected controls were included between February and May 2021. The study enabled the scientists to demonstrate that two doses of mRNA vaccine conferred 88% (81-92) effectiveness against infection with original virus, 86% (81-90) effectiveness against infection with the Alpha variant and 77% (71-90) effectiveness against infection with the Beta variant, as measured seven days after the second dose. No difference in vaccine effectiveness was found between different categories of age, sex or occupational exposure.

"There was much expectation surrounding the (vaccine effectiveness) results for the Beta variant, known for its E484K mutation associated with immune evasion. Our estimate of 77% protection is very close to the estimate of 75% reached by the only other study worldwide to have evaluated the effectiveness of mRNA vaccines against this variant. These analyses confirm the effectiveness of the COVID-19 vaccines and the key role that they have to play in tackling the epidemic," explains Arnaud Fontanet, Head of the Epidemiology of Emerging Diseases Unit at the Institut Pasteur and Professor at the Conservatoire National des Arts et Métiers (CNAM).

Another important finding of the study related to previous SARS-CoV-2 infection. The scientists demonstrated that recent infection (in the past 2 to 6 months) confers similar protection to that observed with mRNA vaccines.

The analyses will now be extended to estimate vaccine effectiveness against the Delta variant, which has been the dominant variant in France since early July 2021.

The ComCor project is funded by REACTing, the Fondation de France via the 'All United Against Coronavirus' alliance, and the Institut Pasteur. It was recently awarded the CAPNET 'national research priority' label.

More information: Tiffany Charmet et al, Impact of original, B.1.1.7, and B.1.351/P.1 SARS-CoV-2 lineages on vaccine effectiveness of two doses of COVID-19 mRNA vaccines: Results from a

nationwide case-control study in France, *The Lancet Regional Health - Europe* (2021). [DOI: 10.1016/j.lanepe.2021.100171](https://doi.org/10.1016/j.lanepe.2021.100171)

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