

# **Experimental COVID-19 vaccine protects upper and lower airways in nonhuman primates**

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Colorized scanning electron micrograph of a cell (blue) heavily infected with SARS-CoV-2 virus particles (red), isolated from a patient sample. Image captured at the NIAID Integrated Research Facility (IRF) in Fort Detrick, Maryland. Credit: NIAID

Two doses of an experimental vaccine to prevent coronavirus disease 2019 (COVID-19) induced robust immune responses and rapidly controlled the coronavirus in the upper and lower airways of rhesus macaques exposed to SARS-CoV-2, report scientists from the National Institute of Allergy and Infectious Diseases (NIAID), part of the National Institutes of Health. SARS-CoV-2 is the virus that causes COVID-19.

The [candidate vaccine](#), mRNA-1273, was co-developed by scientists at the NIAID Vaccine Research Center and at Moderna, Inc., Cambridge, Massachusetts. The animal study results published online today in the *New England Journal of Medicine* complement [recently reported interim results](#) from an NIAID-sponsored Phase 1 clinical trial of mRNA-1273. The candidate mRNA-1273 [vaccine](#) is manufactured by Moderna.

In this study, three groups of eight [rhesus macaques](#) received two injections of 10 or 100 micrograms ( $\mu\text{g}$ ) of mRNA-1273 or a placebo. Injections were spaced 28 days apart. Vaccinated macaques produced high levels of neutralizing antibodies directed at the surface spike protein used by SARS-CoV-2 to attach to and enter cells. Notably, say the investigators, animals receiving the 10- $\mu\text{g}$  or 100- $\mu\text{g}$  dose vaccine candidate produced neutralizing antibodies in the blood at levels well above those found in people who recovered from COVID-19.

The experimental vaccine also induced Th1 T-cell responses but not Th2 responses. Induction of Th2 responses has been associated with a phenomenon called vaccine-associated enhancement of respiratory disease (VAERD). Vaccine-induced Th1 responses have not been associated with VAERD for other respiratory diseases. In addition, the experimental vaccine induced T follicular helper T-cell responses that may have contributed to the robust antibody [response](#).

Four weeks after the second injection, all the macaques were exposed to SARS-CoV-2 via both the nose and the lungs. Remarkably, after two days, no replicating virus was detectable in the lungs of seven out of eight of the macaques in both vaccinated groups, while all eight placebo-injected animals continued to have replicating virus in the lung. Moreover, none of the eight macaques vaccinated with 100 µg of mRNA-1273 had detectable virus in their noses two days after virus exposure. This is the first time an experimental COVID-19 vaccine tested in [nonhuman primates](#) has been shown to produce such rapid viral control in the upper airway, the investigators note. A COVID-19 vaccine that reduces viral replication in the lungs would limit disease in the individual, while reducing shedding in the upper airway would potentially lessen transmission of SARS-CoV-2 and consequently reduce the spread of [disease](#), they add.

**More information:** KS Corbett et al. Evaluation of the mRNA-1273 vaccine against SARS-CoV-2 in nonhuman primates. *New England Journal of Medicine* [DOI: 10.1056/NEJMoa2024671](https://doi.org/10.1056/NEJMoa2024671) (2020).

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