

Intranasal COVID-19 vaccine candidate shows sterilizing immunity in preclinical tests

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A single intranasal dose provided sterilizing immunity — no detectable COVID-19 virus — in the lungs of vaccinated mice, in contrast to dense infection in lungs of unvaccinated mice. Credit: University of Alabama at Birmingham

University of Alabama at Birmingham researchers report additional preclinical evidence of the potency of a single-dose, intranasal COVID-19 vaccine candidate—AdCOVID—that was created by

Altimmune Inc., a Maryland-based clinical-stage biopharmaceutical company.

The UAB researchers, led by Fran Lund, Ph.D., in collaboration with Altimmune, have found that a single intranasal dose provided sterilizing immunity in the lungs of vaccinated animals. In contrast, the lungs of non-vaccinated animals showed dense pulmonary infection and disease following infection with SARS-CoV-2, the virus that causes COVID-19.

"In the current study," said Scot Roberts, Ph.D., chief scientific officer at Altimmune, "we found a heavy burden of infectious SARS-CoV-2 virus in the lungs of non-vaccinated mice following challenge with the virus. Importantly, no infectious virus could be detected in the lungs of AdCOVID-vaccinated animals. These data suggest that a single intranasal vaccination with AdCOVID can provide sterilizing immunity that neutralizes infectious virus, which is believed to be the best way to block viral transmission.

"Blocking transmission is critical for preventing spread of the virus and preventing the emergence of new variants of concern, both of which have the potential to prolong the pandemic," Roberts said.

AdCOVID is currently in a Phase 1 clinical trial to test safety and immunogenicity in people, and Altimmune expects to report topline data in June.

"Growing [vaccine](#) hesitancy is emerging as a real problem in the fight against SARS-CoV-2," said Lund, the Charles H. McCauley Professor and chair for the UAB Department of Microbiology. This underscores the importance of developing novel vaccine approaches like AdCOVID, which is well-tolerated, needle-free and thermostable, can be delivered in a single dose, and has the potential to prevent SARS-CoV-2 transmission.

"These attributes could foster vaccine acceptance, both nationally and globally," Lund said. "In addition, intranasally delivered AdCOVID could play a critical role in re-vaccination campaigns to control future spread of the virus, and ultimately help bring an end to this devastating global pandemic."

The COVID-19 pandemic—with more than 3.25 million global deaths—has highlighted the urgent need for effective preventive vaccination to reduce the burden and spread of the virus.

Last spring and summer, Lund and 23 other researchers from six labs in the UAB School of Medicine tested AdCOVID preclinically. Working under strict COVID-19 safety protocols that required masking and social distancing, the UAB researchers found potent serum-neutralizing antibody responses, T cell responses and a robust induction in mucosal immunity in mice following a single intranasal dose of AdCOVID.

In details of the current study, K18-hACE2 transgenic mice, which are highly permissive for SARS-CoV-2 replication, were vaccinated with a single intranasal dose of AdCOVID and challenged one month later with live SARS-CoV-2 virus.

When the mice were evaluated for infectious SARS-CoV-2 virus, no infectious virus could be detected in the lungs from vaccinated mice, representing a greater than 1-million-fold reduction of infectious [virus](#) compared to the non-vaccinated controls. Demonstration of sterilizing immunity is consistent with the stimulation of local and systemic immunity by AdCOVID, including high serum-neutralizing antibody, T cell responses and, perhaps most importantly, mucosal IgA in the respiratory tract.

The Altimmune [vaccine candidate](#) has tantalizing promises, company leaders say. No need for refrigeration. Simple one-dose administration

by a spray into the nose. The power to elicit mucosal immunity at the linings of the nose and lungs that would protect not only against infection but also against transmission. Existing intramuscular COVID-19 vaccines given as shots in the upper arm are not known to elicit this kind of immunity.

Altimmune expects that these simple and convenient handling requirements, together with the potential ability to block SARS-CoV-2 transmission, could position AdCOVID as a leading intranasal COVID-19 vaccine.

Provided by University of Alabama at Birmingham

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