

PRESS RELEASE

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NUS Medicine-Monash study: Intranasal vaccine booster shows stronger immune response and protection against sarbecoviruses

Researchers at the NUS Yong Loo Lin School of Medicine and Monash University have developed a vaccine booster candidate administered via the nasal route, which confers strong immunity in the respiratory tract. The study offers a promising strategy to enhance immunity and inform future booster approaches.

Singapore, 2 March 2026 — Researchers at the Yong Loo Lin School of Medicine, National University of Singapore (NUS Medicine) and Monash University in Australia, have demonstrated that an intranasal vaccine booster may confer significantly stronger and broader immune responses, and provide robust neutralising antibody and resident T cell responses in the lung and nasal tissues, outperforming conventional mRNA booster vaccination. Published in [The Journal of Clinical Investigation](#), the study offers a promising and more effective method for delivering vaccine boosters that may offer stronger protection against infections and maintain optimal immunity.

Led by Associate Professor Sylvie Alonso and first author Dr Nicholas Cheang, both from the Department of Microbiology and Immunology, and Infectious Diseases Translational Research Programme at NUS Medicine, the study examined alternative vaccine booster candidates and administration methods that may improve protective immunity and longevity towards sarbecoviruses. Sarbecoviruses are a category of coronaviruses that can cause respiratory infections, including SARS-CoV-2, the virus responsible for COVID-19, and SARS-CoV-1, responsible for the 2003 SARS outbreak.

Leveraging a dendritic cell (DC)-targeting platform that consists of fusing a DC targeting monoclonal antibody (Clec9A) to a vaccine antigen candidate, the researchers developed Clec9A^{OMNI}, a dendritic cell-targeting booster vaccine that carries the receptor-binding domain (RBD) from SARS-CoV-2 Omicron XBB.1.5 and SARS-CoV-1 viruses. Dendritic cells are innate immune cells that are essential for initiating adaptive immune responses, which include antibody and T-cell responses. In the study, laboratory models vaccinated with mRNA COVID-19 vaccines three months prior received a single intranasal dose of Clec9A^{OMNI}. Immune responses were assessed in the blood and respiratory tract for up to six months, alongside efficacy against SARS-CoV-2 Omicron infection.

Compared with intramuscular mRNA booster vaccination, the study found that nasal boosting with Clec9A^{OMNI} induced significantly stronger neutralising antibody responses, robust T-cell responses in the lungs and nasal tissues, and sustained immunity for at least six months. Stronger protection against SARS-CoV-2 (Omicron) infection was also observed with nasal boosting of Clec9A^{OMNI}, with undetectable virus in the lung and nasal tissues.

The findings also suggest that Clec9A^{OMNI} presents potential in addressing the current shortcomings of the current COVID-19 mRNA vaccines, including waning immunity, inadequate mucosal immunity and limited breadth as they do not provide protective coverage against sarbecoviruses beyond the SARS-CoV-2 family. With Clec9A^{OMNI}'s ability to confer broad and long-lasting protective immunity against SARS-CoV-2 variants when tested in the study, there is greater potential to eliminate the need for repeated booster shots and may likely contribute to maintaining the optimal immunity at a population level.

Assoc Prof Alonso said, "While existing vaccines remain highly effective at preventing severe disease, their protection against infection and transmission decreases within months, partly because they generate little immunity at mucosal surfaces such as the nose and lungs. Our findings suggest that the intranasal Clec9A^{OMNI} vaccine candidate addresses these shortcomings. It may also better protect the elderly and other vulnerable groups who are unable to receive conventional intramuscular vaccine administration."

Currently, most vaccine formulations are largely not optimised for nasal administration, as the harsh mucosal environment can lead to rapid degradation of the vaccine components before effective immune responses are induced. The Clec9A targeting vaccine platform therefore offers a promising solution by ensuring vaccine efficacy and longevity at the respiratory tract.

"Targeting dendritic cells through the Clec9A platform opens a new avenue for vaccine design. By leveraging the role of dendritic cells in orchestrating immune responses, the study highlights the promise of intranasal booster vaccines in preventing infection at the point of viral entry," noted collaborator Assoc Prof Mireille Lahoud, from the Monash Biomedicine Discovery Institute at Monash University.

Given that dendritic cell subset targeted by the Clec9A platform is present in humans, the researchers plan to further validate their findings to ensure their relevance to human anatomical structures and immune landscape. Ultimately, the team aims to apply this approach to other infectious and non-infectious diseases in preparation of future pandemics and health crises, harnessing its ease of deployment and versatility at a low cost.

This research is supported by the Singapore Ministry of Health through the National Medical Research Council (NMRC) Office, MOH Holdings Pte Ltd through the Programme for Research in Epidemic Preparedness and REsponse (PREPARE), under project ID PREPARE-CS1-2022-002.

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About National University of Singapore (NUS)

The National University of Singapore (NUS) is Singapore's flagship university, which offers a global approach to education, research, and entrepreneurship, with a focus on Asian perspectives and expertise. We have 15 colleges, faculties and schools across three campuses in Singapore, with more than 40,000 students from 100 countries enriching our vibrant and diverse campus community. We have also established our NUS Overseas Colleges programme in more than 15 cities around the world.

Our multidisciplinary and real-world approach to education, research, and entrepreneurship enables us to work closely with industry, governments and academia to address crucial and complex issues relevant to Asia and the world. Researchers in our faculties, 30 university-level research institutes, research centres of excellence and corporate labs focus on themes that include energy; environmental and urban sustainability; treatment and prevention of diseases; active ageing; advanced materials; risk management and resilience of financial systems; Asian studies; and Smart Nation capabilities such as artificial intelligence, data science, operations research and cybersecurity.

For more information on NUS, please visit www.nus.edu.sg.

About the NUS Yong Loo Lin School of Medicine (NUS Medicine)

The NUS Yong Loo Lin School of Medicine is Singapore's first and largest medical school. Our enduring mission centres on nurturing highly competent, values-driven, and inspired healthcare professionals to transform the practice of medicine and improve health around the world.

Through a dynamic and future-oriented five-year curriculum that is inter-disciplinary and inter-professional in nature, our students undergo a holistic learning experience that exposes them to multiple facets of healthcare and prepares them to become visionary leaders and compassionate doctors and nurses of tomorrow. Since the School's founding in 1905, more than 12,000 graduates have passed through our doors.

In our pursuit of health for all, our strategic research programmes focus in innovative, cutting-edge biomedical research with collaborators around the world to deliver high impact solutions to benefit human lives.

The School is the oldest institution of higher learning in the National University Health System. It is one of the leading medical schools in Asia and ranks among the best in the world (Times Higher World University Rankings 2026 by subject and the Quacquarelli Symonds (QS) World University Rankings by Subject 2025).

For more information about NUS Medicine, please visit <https://medicine.nus.edu.sg/>

About the Monash Biomedicine Discovery Institute

Committed to making the discoveries that will relieve the future burden of disease, the [Monash Biomedicine Discovery Institute](#) (BDI) at Monash University brings together more than 120 internationally-renowned research teams. Spanning seven discovery programs across Cancer, Cardiovascular Disease, Development and Stem Cells, Infection, Immunity, Metabolism, Diabetes and Obesity, and Neuroscience, Monash BDI is one of the largest biomedical research institutes in Australia. Our researchers are supported by world-

class technology and infrastructure, and partner with industry, clinicians and researchers internationally to enhance lives through discovery.

About the National Medical Research Council (NMRC)

The NMRC was established in 1994 to oversee research funding from the Ministry of Health and support the development and advancement of biomedical research in Singapore, particularly in the public healthcare clusters and medical schools. NMRC engages in research strategy and planning, provides funding to support competitive research grants and core research enablers, and is responsible for the development of clinician scientists through awards and fellowships. The council's work is supported by the NMRC Office which is part of MOH Holdings Pte Ltd. Through its management of the various funding initiatives, NMRC promotes healthcare research in Singapore, for better health and economic outcomes.