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Australia-Singapore study advocates role of intranasal vaccine booster against sarbecoviruses

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The study offers a promising strategy to enhance immunity and inform future booster approaches

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.

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 Clec9AOMNI, 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 Clec9AOMNI. 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 Clec9AOMNI induced significantly stronger neutralising antibody responses, robust T-cell responses in the lungs and nasal tissues, and sustained immunity for at least six months.

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.