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PRESS RELEASE

NUS-Monash University collaboration produces universal flu vaccine candidate

Singapore, 28 March 2022 — Influenza, commonly referred to as “flu”, is a major global public health concern and a huge economic burden to societies. Seasonal influenza epidemics afflict between 13 to 100 million individuals annually, including three to five million cases of severe illness and 300,000 to 600,000 deaths worldwide. This represents a top global public health concern and an extraordinary economic burden to all societies. Pandemics are less frequent, but are generally more severe and pose a greater threat. Over the past century, there have been at least four devastating pandemics caused by the Influenza A virus which took the lives of hundreds of millions of individuals.

Although vaccination arguably represents the most effective way to prevent influenza, current vaccination strategies suffer from certain limitations, chief of which require current influenza vaccines to be updated annually to match circulating strains. This results in low vaccination take-up rates and poor coverage due to inaccurate prediction of circulating strains. Broadly protective, “universal” flu vaccines that do not need to be updated annually have therefore been pursued.

The highly conserved M2e peptide is a leading universal flu candidate; this peptide shares a conserved sequence with nearly all known human Influenza A strains. However, its limited ability to trigger a strong and long-lasting immune response has represented a major roadblock in its clinical development.

Researchers from the Yong Loo Lin School of Medicine at the National University of Singapore and Monash University in Melbourne have published a paper in the latest issue of *Proceedings of the National Academy of Sciences of the United States of America* where they successfully leveraged on a novel vaccine platform to deliver M2e to immune cells. This allowed them to prove that a single shot immunisation containing M2e was able to trigger long-lasting immune responses that could protect effectively against multiple strains of the flu.

The team was also able to demonstrate that this vaccination approach significantly enhanced protective immune responses in the context of pre-existing flu immunity. This scenario is particularly relevant in adult and elderly populations, where individuals have been exposed to flu viruses multiple times in the past and have low levels of M2e-specific antibodies in their blood circulation.

This vaccine approach has the potential to minimise the amount of M2e vaccine antigen (substance that triggers the body’s immune response against that itself) and the number of injections required for effective and long-lasting protection. It also removes the need for strong

adjuvants (a substance which enhances the body's immune response to an antigen), reducing potential side-effects, particularly in more vulnerable populations.

Beyond the flu, this vaccine platform could be employed to tackle a multitude of diseases, including infectious diseases such as COVID-19. The current COVID-19 pandemic has highlighted the importance of developing versatile, powerful platforms for the rapid deployment of vaccines against any highly virulent diseases. This new finding could lend itself to further development of vaccines for this, or any future, novel diseases. The team is currently working on a COVID-19 vaccine candidate using the same strategy.

“This journey has been very exciting. All of this work is the result of a long-standing and strong partnership with A/Prof Mireille Lahoud at Monash University’s Biomedicine Discovery Institute (BDI), and the support from both institutions,” said Associate Professor Sylvie Alonso from NUS Medicine. Assoc Prof Alonso is the co-Director of the Infectious Diseases Translational Research Programme (ID TRP) at the School and has a keen interest in vaccines and therapeutics.

“We are excited to continue our strong collaboration with A/Prof Sylvie Alonso at NUS. In the world we live in, this vaccine platform provides a key opportunity for developing vaccines and immunotherapies to meet future global health threats”, said Associate Professor Mireille Lahoud, who leads the Dendritic Cell Receptors Laboratory at Monash BDI.

"A Single Shot Vaccine Approach for the Universal Influenza A Vaccine Candidate M2e" is published online at: <http://www.pnas.org> with DOI number 10.1073/pnas.2025607119.

About the 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 17 faculties 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.

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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 on 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 of Singapore and a founding institutional member of 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 Education World University Rankings 2022 by subject and the Quacquarelli Symonds (QS) World University Rankings by subject 2021).

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

About the Monash Biomedicine Discovery Institute at Monash University

Committed to making the discoveries that will relieve the future burden of disease, the Monash Biomedicine Discovery Institute 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.