Media Release

SMART Finds New and Safe Method that Enhances Dengue Vaccination - Paving Way to Wide Use

- *Study proves that providing immunity shots in sequence offers strong and broad immunity against all four serotypes of dengue virus*
- *Finds a way to safely use the only licensed dengue vaccine available*
- *Over 100 million dengue infections a year with a surge in dengue cases in Singapore*

Singapore, 27 July 2020 - Researchers from Singapore-MIT Alliance for Research and Technology (SMART), MIT's research enterprise in Singapore, have found a practical way to induce a strong and broad immunity to the dengue virus based on proof-of-concept studies in mice. Dengue is a mosquito-borne viral disease with an estimated 100 million symptomatic infections every year. It is endemic in over 100 countries in the world, from the United States to Africa and wide swathes of Asia. In Singapore, over 1,700 dengue new cases were reported recently.

The study is reported in a paper titled "**Sequential immunization induces strong and broad immunity against all four dengue virus serotypes**" published in *NPJ Vaccines.* It is jointly published by SMART researchers Jue Hou, Shubham Shrivastava, Hooi Linn Loo, Lan Hiong Wong, Eng Eong Ooi, Jianzhu Chen from SMART's Infectious Diseases (ID) and Antimicrobial Resistance (AMR) Interdisciplinary Research Groups (IRGs).

The dengue virus (DENV) consists of four antigenically distinct serotypes and there is no lasting immunity following infection with any of the DENV serotypes, meaning someone can be infected again by any of the remaining three variants of DENVs.

Today, Dengvaxia® is the only vaccine available to combat dengue. It consists of four variant dengue antigens, one for each of the four serotypes of dengue, expressed from attenuated yellow-fever virus. The current three doses of immunisation with the tetravalent vaccine induces only suboptimal protection against DENV1 and DENV2. Furthermore, in people who have not been infected by dengue, the vaccine induces a more severe dengue infection in the future. Therefore in most of the world, the vaccination is only given to those who have been previously infected.

To help overcome these issues, SMART researchers tested on mice whether sequential immunisation (or one serotype per dose) induces stronger and broader immunity against four DENV serotypes than tetravalent-formulated immunisation - and found that sequential immunisation induced significantly higher levels of virus-specific T cell responses than tetravalent immunisation. Moreover, sequential immunisation induced higher levels of neutralising antibodies to all four DENV serotypes than tetravalent vaccination.

“The principle of sequential immunisation generally aligns with the reality for individuals living in dengue endemic areas, whose immune responses may become protective after multiple heterotypic exposures,” said Professor Eng Eong Ooi, SMART AMR Principal Investigator and senior author of the study. “We were able to find a similar affect based on the use of sequential immunisation, which will pave the way for a safe and effective use of the vaccine and to combat the virus.”

Upon these promising results, the investigators will aim to test the sequential immunisation in humans in the near future.

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About Singapore-MIT Alliance for Research and Technology (SMART) [新加坡-麻省理工学院科研中心]

Singapore-MIT Alliance for Research and Technology (SMART) is MIT’s Research Enterprise in Singapore, established by the Massachusetts Institute of Technology (MIT) in partnership with the National Research Foundation of Singapore (NRF) since 2007. SMART is the first entity in the Campus for Research Excellence and Technological Enterprise (CREATE) developed by NRF. SMART serves as an intellectual and innovation hub for research interactions between MIT and Singapore. Cutting-edge research projects in areas of interest to both Singapore and MIT are undertaken at SMART. SMART currently comprises an Innovation Centre and five Interdisciplinary Research Groups (IRGs): Antimicrobial Resistance (AMR), Critical Analytics for Manufacturing Personalized-Medicine (CAMP), Disruptive & Sustainable Technologies for Agricultural Precision (DiSTAP), Future Urban Mobility (FM) and Low Energy Electronic Systems (LEES). SMART research is funded by the National Research Foundation Singapore under the CREATE programme.

For more information, please visit http://smart.mit.edu

About Antimicrobial Resistance Interdisciplinary Research Group (AMR IRG)

The AMR IRG is a translational research and entrepreneurship program that tackles the growing threat of antimicrobial resistance. By leveraging talent and convergent technologies across Singapore and MIT, we aim to tackle AMR head-on by developing multiple innovative and disruptive approaches to identify, respond to, and treat drug-resistant microbial infections. Through strong scientific and clinical collaborations, our goal is to provide transformative, holistic solutions for Singapore and the world.

For more information, please log on to: http://amr.smart.mit.edu/

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