



PRESS RELEASE

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New treatment method reduces size and increases stability of atherosclerotic plaque on arterial walls, preventing heart diseases: NUS study

Direct injection of omega-3 fatty acids into the bloodstream may be a potential new treatment for atherosclerosis

Singapore, 7 August 2023 — Atherosclerosis is a disease in which fat, cholesterol, and other substances build up inside artery walls. This can lead to plaque formation, which can block arteries and cause heart attacks and strokes.

Atherosclerosis is the leading cause of coronary heart disease, and is responsible for an estimated 17.9 million deaths in 2020. In Singapore, 21 people die from heart disease and stroke every day, accounting for 32% of all deaths in 2021, making it the top disease burden in Singapore. Atherosclerosis is a chronic disease which takes years to develop, with no clinical symptoms manifested in the early stages. However, risk factors such as high blood cholesterol, high blood pressure and obesity can accelerate the progression of the disease. In patients with advanced-stage atherosclerosis, symptoms such as chest pain and breathlessness may be exhibited, indicating severe artery blockage.

Early interventions include lifestyle modifications and medications to lower blood cholesterol are desirable and effective for most patients. Docosahexaenoic acid (DHA), an omega-3 fatty acid, has been shown to have anti-inflammatory and antioxidant properties, which could help to prevent the buildup of fatty deposits in arteries-- a major cause of heart attacks and strokes. DHA supplements are often consumed orally, but most are poorly absorbed by the gut.

To improve the absorption of DHA in the bloodstream, a research team led by **Assistant Professor Wang Jiong-Wei from the Department of Surgery, the Nanomedicine Translational Research Programme, Centre for NanoMedicine and Cardiovascular Research Institute, at the Yong Loo Lin School of Medicine, National University of Singapore (NUS Medicine), and Professor Gerrit Storm from the Department of Surgery and Nanomedicine Translational Research Programme at NUS Medicine**, worked on laboratory models to deliver DHA to the bloodstream that could be more effective than oral consumption--via DHA liposomes, a form of nanomedicine. This study is published in the [*Journal of Controlled Release*](#).

DHA liposomes, are small vesicles made up of phospholipids, a major membrane lipid which acts as a barrier to protect the cell against various adverse environmental conditions. The

liposomes can help to reduce the size of plaques and the amount of inflammation in arteries. When delivered into the blood stream, DHA liposomes accumulate in the plaques on the arterial walls. The research team found that macrophages, a type of white blood cell, absorb the DHA liposomes, resulting in reduced inflammation and increased healing of the atherosclerotic plaques. These liposomes also help reduce the amount of lipids in the build-up and prevent its rupture.

In collaboration with Associate Professor Glenn Bonney, Senior Consultant, Division of Hepatobiliary & Pancreatic Surgery, and Director of Research, Department of Surgery, National University Hospital, the researchers employed a state-of-the-art mass spectrometry imaging technology to analyse the plaque. It revealed that DHA liposomes can restore the lipid balance in the artery to that of healthy arteries in which less harmful lipids are present. These results suggest that DHA liposomes could be a promising new treatment for atherosclerosis.

“This is the first study to demonstrate that an injectable nanoformulation can remarkably improve the therapeutic effects of DHA against atherosclerosis at a dose of 40,000 to 400,000 times lower than reported usage of oral DHA. We are optimistic about the clinical benefits it may bring to our patients, and are exploring clinical trials on patients in the near future,” said Asst Prof Wang.

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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, research centres of excellence, corporate labs and more than 30 university-level research institutes 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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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 2023 by subject and the Quacquarelli Symonds (QS) World University Rankings by subject 2023).

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