PRESS RELEASE

25 AUGUST 2026 | FOR IMMEDIATE RELEASE

Bioinspired nanoparticles deliver gene editing to lower “bad” cholesterol

Singapore, 25 August 2026 — Researchers from the Yong Loo Lin School of Medicine, National University of Singapore (NUS Medicine), and Tianjin Medical University General Hospital have developed a bioinspired lipid nanoparticle (LNP) that can deliver gene-editing machinery to the liver and reduce low-density lipoprotein (LDL) cholesterol, commonly known as “bad” cholesterol. The nanoparticles reduced LDL and total cholesterol by more than 20 per cent after two doses, while showing fewer signs of inflammation and toxicity than the comparator formulations. The findings were published in the *Journal of Controlled Release*.

The research team designed the LNP using materials inspired by molecules naturally found in the body, with the aim of improving the safety of messenger RNA (mRNA) delivery. mRNA is a temporary set of genetic instructions that tells cells how to make a specific protein. Once the instructions have been used, the mRNA is naturally broken down by the body.

LNPs protect mRNA and transport it into cells, but some conventional formulations contain laboratory-made lipids that may trigger inflammation as they break down. To develop a potentially more biologically compatible carrier, the researchers combined naturally occurring polyamines with oleic acid, a fatty acid found in the body. The strongest-performing candidate, agmatine-oleic acid, or Agm-oa, carried and protected about 98 per cent of its mRNA payload and delivered it effectively to cultured liver cells and laboratory models. Following administration, the nanoparticles accumulated mainly in the liver.

“Many studies focus primarily on the therapeutic cargo, but how that cargo is delivered is equally important,” said Assistant Professor Jiong-Wei Wang, Department of Surgery and Department of Physiology, and the Cardiovascular-Metabolic Disease Translational Research Programme at NUS Medicine, who led the research. “Our aim was to develop a delivery platform using building blocks inspired by endogenous metabolites, which are molecules our bodies naturally produce or use. By considering what happens to the nanoparticle after it has delivered its payload, we hope to create RNA delivery systems that are not only effective, but also more biologically compatible.”

Editing a cholesterol-regulating gene

The team used the nanoparticles to deliver an adenine base editor targeting PCSK9, a gene that regulates LDL cholesterol. Reducing PCSK9 activity allows more LDL receptors to remain on liver cells, helping the liver remove cholesterol from the bloodstream. In cultured cells, the nanoparticles edited about 68 per cent of the intended PCSK9 target. No unintended changes

were detected at the six most likely off-target sites examined, although broader genome-wide testing is still required. In high-fat-diet laboratory models, two intravenous doses given one week apart reduced LDL and total cholesterol by more than 20 per cent compared with untreated models and those given RNA without the nanoparticle carrier.

“PCSK9 is a well-established target for lowering LDL cholesterol, but effective gene editing depends on delivering the editor safely and efficiently to the liver,” said Professor Xin Zhou, a senior cardiologist in the Department of Cardiology, Tianjin Medical University General Hospital. “Our findings provide proof of concept that this bioinspired nanoparticle can transport the necessary gene-editing components, modify the PCSK9 pathway, and produce a measurable cholesterol-lowering effect in laboratory models.”

More than a passive delivery vehicle

The material may also do more than carry mRNA. In cell experiments, it reduced a molecule linked to inflammation in immune cells, while increasing the same molecule in blood-vessel-lining cells, where it may support healthy blood flow. The nanoparticles did not cause detectable additional liver damage, and no clear signs of toxicity were found in the other organs examined. They also produced lower levels of markers linked to cell damage and acute inflammation than the comparator LNP formulations.

The researchers stressed that the findings remain pre-clinical. Longer-term studies are needed to determine how long the effects last, assess possible unintended genetic changes, and confirm safety before the technology can be considered for human studies.

“While there is still considerable work ahead, this study shows that endogenous-metabolite-inspired materials can serve as functional building blocks for RNA delivery,” Asst Prof Wang added. “The broader opportunity is to design carriers that contribute positively to treatment rather than acting only as passive packaging.”

This research was supported by the

- *Singapore Ministry of Health (MOH) through the National Medical Research Council (NMRC) Office, MOH Holdings Pte Ltd under the NMRC Centre Grant (MOH-000986);*
- *National Research Foundation, Singapore (NRF) under the NMRC Open Fund-Individual Research Grant (MOH-002094) administered by the Singapore Ministry of Health through the NMRC Office, MOH Holdings Pte Ltd;*
- National University of Singapore NanoNASH Program (NUHSRO/2020/002/NanoNash/LOA);
- National Natural Science Foundation of China (82320108001).

For media enquiries, please contact:
Shaun YEE
Senior Executive, Communications
Yong Loo Lin School of Medicine,
National University of Singapore
DID: +65 9012 1928
Email: shaun.yee@nus.edu.sg

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 Education World University Rankings 2026 by subject and the Quacquarelli Symonds (QS) World University Rankings by Subject 2026).

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

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.

About the National Research Foundation (NRF)

The National Research Foundation, Singapore (NRF), set up on 1 January 2006, is a department within the Prime Minister's Office. The NRF sets the national direction for research and development (R&D) by developing policies, plans and strategies for research, innovation and enterprise. It also funds strategic initiatives and builds up R&D capabilities by nurturing research talent. Learn more about the NRF at www.nrf.gov.sg.