

PRESS RELEASE

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Novel Nanovaccine halts tumour growth and reduces cancer recurrence

Singapore, 24 September 2025 — Researchers from the Yong Loo Lin School of Medicine, National University of Singapore (NUS Medicine) and National Center for Nanoscience and Technology, the Chinese Academy of Sciences (CAS), have jointly developed an approach to significantly reduce the risk of cancer recurrence and metastasis after surgery, by targeting both bulk cancer cells and the elusive cancer stem cells (CSCs) responsible for relapse.

One of the biggest challenges in cancer treatment is preventing the disease from returning or spreading to other parts of the body. Cancer recurrence happens when some cancer cells survive treatment (such as surgery, chemotherapy, or radiation) and begin to grow again at the original site or nearby.

What makes cancer recurrence especially problematic is the presence of CSCs – a small but powerful subset of cells within a tumour. These cells are more resistant to conventional treatments and are thought to be the root cause of both recurrence and metastasis. They can lie dormant for a period of time, evade detection by the immune system, and then reignite tumour growth later on.

“This nanovaccine approach is especially exciting because it tackles one of the biggest hurdles in cancer therapy – the ability of stem-like tumour cells to cause cancer relapse,” said Professor Shawn Chen Xiaoyuan, Nasrat Muzayyin Professor in Medicine and Technology from the Department of Diagnostic Radiology, and Director of the Nanomedicine Translational Research Programme at NUS Medicine. “Our results show that our nanovaccine not only activates the immune system to attack these cells, but also creates lasting memory to help prevent the cancer from returning.” Prof Chen is also from the Department of Diagnostic Radiology at NUS Medicine.

Published in [*Nature Nanotechnology*](#), the study describes a nanovaccine named NICER (Nanovesicle Integrating CSC-specific antigen display and epigenetic nano-regulator encapsulation), which delivers a dual blow to cancer: eradicating both the main tumour mass and the residual CSCs behind post-surgery.

“Cancer stem cells are a key reason why tumours can return and spread after treatment. They’re resistant to most therapies and hard to eliminate. NICER changes that,” said Dr Yanlian Yang, CAS Key Laboratory of Standardization and Measurement for Nanotechnology, CAS Key Laboratory for Biological Effects of Nanomaterials and Nanosafety, National Center for Nanoscience and Technology, Beijing, China. The NICER nanovaccine helps the immune system destroy cancers more effectively by eradicating both CSCs and cancer cells. The result is a potentially stronger and longer-lasting immune response that could help stop the cancer from coming back.

“In laboratory models which included breast cancer, melanoma, and highly invasive CSC-enriched tumours, NICER not only halted tumour growth but also reduced recurrence and lung metastasis following surgical tumour removal,” said first author Dr Qing You, Department of Diagnostic Radiology, NUS Medicine. “When combined with immune checkpoint inhibitors, the vaccine demonstrated synergistic effects, enhancing tumour control and survival outcomes.”

“While these findings are promising, further studies are needed to assess long-term safety across diverse laboratory models,” added Prof Chen. “Next-generation enhancements could further boost efficacy through precision immune cell targeting and improved antigen design.”

The study marks a major step forward in post-operative cancer immunotherapy, offering hope for more eventual, durable treatment outcomes and a new frontier in personalised cancer vaccines.

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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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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 2025 by subject and the Quacquarelli Symonds (QS) World University Rankings by subject 2025).

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

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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.