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PRESS RELEASE

$25 million boost for Singapore-led research to improve lung cancer treatment for Asian patients

- Lung cancer in Asia often affects non-smokers, making it biologically distinct from cases in Western countries
- Team led by the National Cancer Centre Singapore awarded S$25 million grant to do cutting-edge research and develop tailored treatments to improve outcomes for Asian lung cancer patients
- This is the 3rd consecutive major grant awarded to the team, following a $10m NMRC TCR grant in 2013 and a $10m NMRC Open Fund-Large Collaborative Grant in 2019 supporting research that identified novel biomarkers for lung cancer treatment, developed clinical programmes and studied the effectiveness of lung cancer screening in the population

Singapore, 16 July 2025 – In a national effort to transform lung cancer care, the National Cancer Centre Singapore (NCCS), in collaboration with the Agency for Science, Technology and Research (A*STAR) and National University Cancer Institute, Singapore (NCIS), has been awarded a S$25 million grant by the Singapore Ministry of Health through the National Medical Research Council (NMRC) Office, MOH Holdings Pte Ltd, under the NMRC Open Fund-Large Collaborative Grant (OF-LCG) programme.

The grant establishes **Conquering Lung cancer Across all stages with Research and InnovatiON (CLARION),** a research programme that brings together a multidisciplinary team of experts in medicine, genomics, and translational and data science to improve outcomes for lung cancer through studying methods for early detection, personalised treatment, and gaining a deeper understanding of why the disease behaves differently in Asian patients.

The urgent need to improve lung cancer outcomes

Lung cancer is the deadliest cancer globally, and in Singapore, three people die from the disease each day.[1] Most cases are detected only after the cancer has spread, making it much harder to treat. Unlike the West, where most lung cancer cases are linked to smoking, nearly half of lung cancer patients in Singapore have never smoked.[2] Many of these patients are diagnosed with a form of lung cancer called non-small cell lung cancer (NSCLC), which is often driven by genetic mutations in a gene known as *EGFR*.

In the past two decades, the advent of targeted therapies, like *EGFR*-tyrosine kinase inhibitors (TKIs) *osimertinib*, have greatly improved survival. However, most patients develop drug

[1] Singapore Cancer Registry Annual Report 2022. (2024) National Registry of Diseases Office (NRDO). Retrieved from: https://www.nrdo.gov.sg/docs/librariesprovider3/default-document-library/scr-ar-2022_web-report6c6e8522-cf39-416f-9390-5fe903065927.pdf?sfvrsn=3712e8bb_1

[2] Toh, C. K., Ong, W. S., Lim, W. T., Tan, D. S., Ng, Q. S., Kanesvaran, R., Seow, W. J., Ang, M. K., & Tan, E. H. (2018). A Decade of Never-smokers Among Lung Cancer Patients-Increasing Trend and Improved Survival. *Clinical lung cancer*, *19*(5), e539–e550. https://doi.org/10.1016/j.cllc.2018.03.013

resistance within 9 to 15 months, leading to cancer recurrence. Even patients with early-stage disease who undergo surgery are at risk of relapse. The reasons behind drug resistance remain poorly understood. Adding to the challenge, many clinical trials for lung cancers are conducted in Western populations, with results having limited applicability for Asian patients. In Asia, limited trial access and gaps in knowledge about which patients are most likely to benefit from targeted treatments mean that promising new therapies can take years to reach those who need them.

Collectively, these factors highlight the critical need to understand the disease biology of Asian lung cancer to improve and accelerate the delivery of cost-effective therapies, design innovative clinical trials to combat treatment resistance, and stratify patients to receive the most appropriate treatments.

Singapore leads the way in Asian lung cancer research

CLARION is a continuation of over 10 years of research done by the group – under the NMRC Translational and Clinical Research (TCR) Flagship programme (S$10 million awarded in 2013) and the **Next-Generation Clinical Trials and Integrative Research for Fighting Lung Cancer OF-LCG** programme (S$10 million support from the NMRC in 2019) – which established Singapore's leadership in Asian lung cancer research.

Earlier key outcomes include:

1. **Identification of novel biomarkers and therapeutic targets** – Through combining cutting-edge genomic tools, data science, and clinical studies, the team discovered the reasons underlying drug resistance in lung cancer patients. This enhanced understanding of lung cancer biology is now being used to develop new therapeutics and treatment approaches.

2. **Comprehensive molecular profiling** – The Integrated Mutation Profiling of Actionable Cancer Targets (IMPACT) Molecular Tumour Board was established to introduce molecular profiling for lung cancer patients in Singapore. It assigns patients to specific treatments, often on expanded access or clinical trial, based on their tumour molecular profiling results. This systematic implementation of comprehensive molecular profiling is a dynamic approach to treating lung cancer patients.

3. **Introduction of a multidisciplinary lung cancer clinic** – The team set up the Lung Multidisciplinary Clinic, a one-stop clinic that brings together different specialists to deliver optimal care and personalised treatment for patients with complex lung cancer. Complex lung cancer cases may benefit from a combination of different types of treatment in different sequences for improved outcomes.

4. **Launch of Singapore's first local study on lung cancer screening** – One of the most promising efforts is SOLSTICE (The SingapOre Lung cancer Screening Though Integrating CT with other biomarkErs), Singapore's first local lung cancer screening study. SOLSTICE uses low-dose CT scans (LDCT) to detect lung cancer early in at-risk groups, including smokers and non-smokers with a family history of the disease. The goal is to determine the feasibility and effectiveness of LDCT to screen for lung cancer in local populations.

CLARION: A unified approach to tackle lung cancer care at every stage

Building on the foundations of their earlier discoveries and effort, the multidisciplinary **CLARION** team of clinicians and scientists from NCCS, NCIS, A*STAR Genome Institute of Singapore (A*STAR GIS) and A*STAR Institute of Molecular and Cell Biology (A*STAR IMCB) will conduct research and clinical trials focused on Asian lung cancer to improve outcomes

across the entire lung cancer care continuum. The team now also includes A*STAR Institute of High Performance Computing (A*STAR IHPC).

The **CLARION** research programme will focus on **5 thematic areas**[3] to achieve its goals:

1. **Translational therapeutics for lung cancer** to address resistance in non-small cell lung cancer.
2. **Enhancing immunogenicity of lung cancer in never smokers (LCINS)** to identify druggable targets and develop therapies for this group.
3. **Biomarker discovery and predictive modelling** to guide precision oncology.
4. **Targeting cellular plasticity and resistance** to develop novel therapeutics.
5. **POPUlation-wide Lung cancer Screening (POPULUS)** to study the expansion of the use of LDCT screening for lung cancer at population-level.

CLARION Corresponding Principal Investigator **Professor Daniel Tan**, Senior Consultant at the Department of Lung, Head & Neck and Genitourinary Medical Oncology, Division of Medical Oncology, and Head of the Division of Clinical Trials and Epidemiological Sciences, NCCS said, “We are grateful for the grant funding support which allows us to push the boundaries of research to improve lung cancer care for Asian patients. Our earlier studies clearly indicated that a one-size-fits-all approach does not work. Our mission with CLARION is to predict, prevent and personalise care at every stage of the disease—from early detection to advanced treatment—so that patients diagnosed with lung cancer in Asia can live longer and live well.”

Associate Professor Tam Wai Leong, CLARION Theme 4 Co-Lead and Deputy Executive Director at A*STAR GIS said, “Lung cancer cells eventually develop mechanisms to evade targeted therapies. These drug persister cells, also known as cancer stem cell cells, form the basis for cancer relapse. Our studies will now begin to interrogate genetic pathways that give rise to these recalcitrant cells, with the goal of uncovering new vulnerabilities that can be targeted therapeutically. The deep collaboration between clinicians and biomedical scientists that is enabled by CLARION will accelerate clinical translation and move us closer to precision oncology for lung cancer patients in Singapore.”

Dr Tee Wee Wei, CLARION Theme 4 Co-Lead and Senior Principal Scientist at A*STAR IMCB said, “Patients often face relapse because current treatments cannot fully eliminate drug-resistant cells. By understanding the biology of these persister cells, we hope to develop therapies that can target and remove them before they take hold. This could shift the treatment goal from simply managing lung cancer to preventing its return — offering patients a more durable and potentially curative outcome.”

Dr Huang Yiqing, CLARION Theme 1 Co-Lead and Consultant, Department of Haematology-Oncology, NCIS said, “Our past work has given us unique insights into lung cancer in the Asian population. Through the five thematic areas in our upcoming programme, we hope to focus on critical challenges such as unravelling resistance mechanisms of targeted therapies in advanced lung cancer, uncovering predictive biomarkers of relapse in early-stage disease and improving population health by changing policy on lung cancer screening among never-smokers. With lung cancer being one of the most common cancers in Singapore, we hope that our work will significantly enhance patient survival and improve the quality of life for patients living with this common disease."

The Open Fund-Large Collaborative Grant (OF-LCG) Programme

The OF-LCG supports the efforts of the best research teams in Singapore to conduct patient-centric translational research with the goal of advancing human health and wellness and creating economic value. Cancer is one of the seven areas identified as national priorities for

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See Annex for more details

research in Singapore. **CLARION** is supported by the National Research Foundation, Singapore (NRF) under the NMRC Open Fund-Large Collaborative Grant (MOH-001795) and administered by the Singapore Ministry of Health through the NMRC Office, MOH Holdings Pte Ltd.

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About the National Cancer Centre Singapore
The National Cancer Centre Singapore (NCCS) is a leading national and regional tertiary cancer centre dedicated to advancing cancer care, research and education. With a comprehensive suite of specialties and services, NCCS treats all cancers and offers personalised and multidisciplinary care to ensure that patients receive holistic, compassionate care and support. Advanced and innovative treatments such as proton therapy at the Goh Cheng Liang Proton Therapy Centre, immunotherapy, and cell therapy are available at NCCS to give patients the best treatment outcomes.

Ranked among the top cancer centres in Asia, NCCS is globally recognised for its research expertise, with clinicians and scientists collaborating with local and international partners to conduct cutting-edge clinical and translational research that makes a real impact and offers hope of a cancer-free tomorrow. As an academic healthcare institution, NCCS is committed to nurturing future generations by delivering specialised training to local and overseas oncology healthcare professionals. For more information, please visit www.nccs.com.sg.

About the Agency for Science, Technology and Research
The Agency for Science, Technology and Research (A*STAR) is Singapore's lead public sector R&D agency. Through open innovation, we collaborate with our partners in both the public and private sectors to benefit the economy and society. As a Science and Technology Organisation, A*STAR bridges the gap between academia and industry. Our research creates economic growth and jobs for Singapore, and enhances lives by improving societal outcomes in healthcare, urban living, and sustainability. A*STAR plays a key role in nurturing scientific talent and leaders for the wider research community and industry. A*STAR's R&D activities span biomedical sciences to physical sciences and engineering, with research entities primarily located in Biopolis and Fusionopolis. For ongoing news, visit www.a-star.edu.sg.

About the National University Cancer Institute, Singapore

The National University Cancer Institute, Singapore (NCIS) is an academic, national specialist centre for cancer under the National University Health System (NUHS), and is the only public cancer centre in Singapore that treats both paediatric and adult cancers in one facility.

As one of two national cancer centres in Singapore, NCIS (pronounced as “n-sis”) offers a broad spectrum of cancer care and management from screening, diagnosis and treatment to rehabilitation and survivorship, as well as palliative and long-term care. NCIS’ strength lies in the multi-disciplinary approach taken by our clinician scientists and clinician-investigators to develop a comprehensive and personalised plan for each cancer patient.

NCIS provides the full suite of specialised oncology and haematology services at the NUH Medical Centre at Kent Ridge, Singapore, including those by the NCIS Chemotherapy Centre, NCIS Radiotherapy Centre and NCIS Cellular Therapy Centre.

NCIS also offers cancer services at other hospitals in Singapore:
• NCIS Cancer & Blood Clinic @ Ng Teng Fong General Hospital
• NCIS Radiotherapy Centre @ Tan Tock Seng Hospital
• NCIS Radiotherapy Clinic @ Khoo Teck Puat Hospital

To bring cancer care even closer to our patients, our NCIS on the Go programme delivers a range of cancer services at clinics within the community for their convenience.

For more information, please visit www.ncis.com.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.

Annex

Theme 1	**Translational therapeutics for lung cancer** will address resistance in non-small cell lung cancer (NSCLC) by performing real-time molecular profiling of patients' tumours and conducting a clinical trial to validate biomarkers of resistance in metastatic NSCLC patients. **Theme PIs:** • **Professor Daniel Tan**, Senior Consultant in the Department of Lung, Head & Neck and Genitourinary Medical Oncology, Division of Medical Oncology (DMO), and Head of the Division of Clinical Trials and Epidemiological Sciences, National Cancer Centre Singapore (NCCS) • **Dr Huang Yiqing**, Consultant in the Department of Haematology-Oncology, National University Cancer Institute, Singapore (NCIS)
Theme 2	**Enhancing immunogenicity of lung cancer in never smokers (LCINS)** will decipher the unique tumour immunobiology of LCINs, to develop cost-effective point of care immune diagnostic tests that guide clinical practice, identify druggable targets and develop T cell-based therapies for this group of patients. **Theme PIs:** • **Clinical Assistant Professor Amit Jain**, Senior Consultant in the Department of Lung, Head & Neck and Genitourinary Medical Oncology, DMO, NCCS • **Dr Joe Yeong,** Principal Scientist, A*STAR Institute of Molecular and Cell Biology (A*STAR IMCB) and Department of Anatomical Pathology, Singapore General Hospital
Theme 3	**Biomarker discovery and predictive modelling** will develop data-driven predictive models, leveraging multimodal clinical and molecular data, to guide clinical decision making in early-stage lung cancer recurrence risk and develop a genomic database for Asian lung cancer to guide precision oncology. **Theme PIs:** • **Associate Professor Anders Skanderup**, Assistant Director, Precision Medicine, A*STAR Genome Institute of Singapore (A*STAR GIS) • **Dr Liu Yong**, Deputy Department Director, Computing and Intelligence Department, A*STAR Institute of High Performance Computing (A*STAR IHPC)
Theme 4	**Targeting cellular plasticity and resistance** will investigate how cancer cells grow and adapt in Asian lung cancer, focusing on epigenetics and metabolic drivers of therapy resistance to develop novel therapeutics for patients for durable treatment responses. **Theme Pis:** • **Associate Professor Tam Wai Leong**, Deputy Executive Director, A*STAR GIS • **Dr Tee Wee-Wei,** Senior Principal Scientist, A*STAR IMCB
Theme 5	**POPUlation-wide Lung cancer Screening (POPULUS)** will expand the study of LDCT screening for lung cancer to additional recruitment sites in Singapore, targeting a cumulative enrolment of 2,000 participants, along with public outreach, education, and policy advocacy. **Theme PIs:** • **Professor Darren Lim**, Senior Consultant in the Department of Lung, Head & Neck and Genitourinary Medical Oncology, DMO, NCCS • **Assistant Professor Gillianne Lai**, Senior Consultant in the Department of Lung, Head & Neck and Genitourinary Medical Oncology, DMO, NCCS