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STRENGTHENING HEALTH AND BIOMEDICAL RESEARCH EFFORTS TO IMPROVE HEALTH AND ECONOMIC OUTCOMES

Five research projects awarded $105 million

To continue to drive the translation of groundbreaking research into solutions that address Singapore's health challenges, the Ministry of Health, through the National Medical Research Council (NMRC) Office, MOH Holdings Pte Ltd, has awarded $105 million to five key research projects. Supported by the National Research Foundation (NRF) under the Research, Innovation and Enterprise (RIE) 2025 Open Large Collaborative Grant (OF-LCG), these research projects aim to strengthen health and biomedical efforts to improve health and economic outcomes. The result was announced at the NMRC Awards Ceremony and Research Symposium 2025 on 28 May.

2. Since 2000, Singapore's Biomedical Sciences (BMS) initiative has built a strong foundation of research capabilities and expanded beyond basic to translational and clinical research. In RIE2025, the Human Health and Potential domain continues to build on these capabilities and incorporates a new focus on furthering human potential. The vision is to make Singapore a leading hub that transforms and protects health, advances human potential, and creates economic value through excellence in research and its application for Singapore, Asia, and the world.

Five Projects Awarded under the OF-LCG Programme

3. The OF-LCG programme aims to advance the study of diseases, translate clinical findings into practice and policy, and provide opportunities for international partnerships and industry collaborations. Collaborations across disciplines, agencies and researchers are encouraged so as to capitalise on the full spectrum of research capabilities in Singapore. More details on the OF-LCG are provided in Annex A.

4. This year, $105 million was awarded to five research projects under the OF-LCG programme. All five projects address areas of importance in Singapore's healthcare and have strong potential to deliver health outcomes and economic value. More details are provided in Annex B.

a) **Mechanistic Investigation and Clinical Innovation for Sarcopenia Diagnosis and Therapy (MAGNET)**

Sarcopenia is a condition where muscle loses strength and mass, seen particularly amongst the elderly and people with metabolic disorders. The project aims to advance current mechanistic understanding of the pathogenesis of sarcopenia and to develop new diagnosis and treatment. This will fill gaps in current knowledge and address an unmet need in Singapore's ageing population.

b) **Advancing precision medicine for cardiovascular disease and diabetes in Asian populations**

Singapore has one of the fastest ageing populations in Asia. This is accelerating the emergence of type-2 diabetes, cardiovascular disease, chronic kidney disease, cancer, cognitive decline, and other age-related chronic diseases in the country. The project will follow up with the SG100K participants to identify how their health has changed since enrolling into the study. The information collected will be used to improve understanding of the risk factors and biological pathways that impact health in Singapore.

c) **Singapore Gastric Cancer Consortium – Therapeutic Interception of Gastric Cancer**

Gastric cancer (GC) is a major cause of global cancer burden, ranking fifth in both incidence and mortality worldwide [1][2]. Among the most common cancers in Singapore, GC has the third highest proportion of late-stage diagnoses and third lowest survival rate, contributing to a substantial healthcare burden. The project aims to focus on gastric cancer prevention and the role of the gut microbiome in gastric cancer development and treatment. It will identify better ways to treat gastric cancers that have spread to other organs and how to leverage single-cell genetics of gastric cancer for immunotherapy.

d) **Singapore Parkinson's Disease Programme (SPARKLE)**

Parkinson's Disease (PD) affects three in 1,000 above 50 years of age in Singapore [3]. The team's recent community study showed that 26.8% of their older subjects have mild parkinsonian signs and this is closely related to cognitive impairment and increasing age. With Singapore's rapidly aging population, neurodegenerative diseases involving the brain pose a significant burden on the healthcare system. The project aims to deliver better health outcomes through population screening of at-risk subjects and those with early signs of PD but who have yet to develop clinical symptoms. This will facilitate selection of healthy individuals who are at high risk of developing PD for interventions to protect nerve cells from damage.

e) **Conquering Lung cancer Across all stages with Research and InnovatiON (CLARION)**

Lung cancer is one of the leading causes of cancer-related deaths among adult men and women both in Singapore and worldwide[4]. Up to 60% of patients who develop lung cancer in Singapore - particularly East Asian ethnicity – are non-smokers. Despite the unprecedented pace of drug approvals in lung cancer, development of

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[1] Ferlay J, Ervik M, Lam F, Laversanne M, Colombet M, Mery L, Piñeros M, Znaor A, Soerjomataram I, Bray F (2024). Global Cancer Observatory: Cancer Today. Lyon, France: International Agency for Research on Cancer. Available from: https://ddei5-0-ctp.trendmicro.com:443/wis/clicktime/v1/query?url=https%3a%2f%2fgco.iarc.who.int%2ftoday&umid=E2552E5A-3573-3506-A0DA-1A7D312594AC&auth=803235fe10e369863a6ca1390ca71d34b2f8aba4-bbf4261bdd94fa1337442b339f331a605e9921ec, accessed [19 May 2025].

[2] National Registry of Diseases Office (2024). Singapore Cancer Registry Annual Report 2022. Available from: https://ddei5-0-ctp.trendmicro.com:443/wis/clicktime/v1/query?url=https%3a%2f%2fwww.healthxchange.sg%2fsites%2fhexassets%2fAssets%2fcancer%2fscr%2dar%2d2022%5fweb%2dreport.pdf&umid=E2552E5A-3573-3506-A0DA-1A7D312594AC&auth=803235fe10e369863a6ca1390ca71d34b2f8aba4-4c4268b0489520dbaf1d9eb3bf9e30f71acfa28e, accessed [19 May 2025]

[3] Tan LC et. al. Prevalence of Parkinson disease in Singapore: Chinese vs Malays vs Indians. Neurology. 2004 Jun 8;62(11):1999-2004. doi: 10.1212/01.wnl.0000128090.79756.10. PMID: 15184604.

[4] GLOBOCAN report, https://acsjournals.onlinelibrary.wiley.com/doi/10.3322/caac.21834

treatment resistance and rising cost of new drugs remain major obstacles. The project proposes to undertake comprehensive lung cancer profiling to understand disease biology of Asian lung cancer and uncover unique features to improve delivery of cost-effective therapies, design innovative clinical trials to understand how cancers adapt to combat treatment resistance as well as examine the population level impact of detecting lung cancer at earlier stages through screening.

About the National Medical Research Council (NMRC)

The NMRC was established in 1994 to oversee research funding from the Singapore Ministry of Health (MOH) 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.

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About the National Research Foundation

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

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Annex A

The Open Fund Large Collaborative Grant (OF-LCG)

Background	The OF-LCG is one of the Open Fund grants under the Human Health and Potential (HHP) domain in RIE2025. Background on Open Fund grants The objective of the Open Fund is to fund the best ideas, through competition, to support individual and collaborative research that is aligned with the Human Health and Potential (HHP) vision for RIE2025. In RIE2025, the HHP domain will build on our existing HBMS capabilities and incorporate a new emphasis on furthering human potential. Our vision is to make Singapore a leading hub that transforms and protects health, advances human potential, and creates economic value through excellence in research and its application for Singapore, Asia, and the world. Under RIE2025, NMRC administers the following Open Fund grants - Open Fund Large Collaborative Grant (OF-LCG) - Open Fund Individual Research Grant (OF-IRG) Sub-category: Open Fund Young Individual Research Grant (OF-YIRG)
Objective	OF-LCG aims to support the best teams of researchers from public institutions to advance human health and wellness, and create economic value for Singapore and Singaporeans, through the pursuit of excellence in health and biomedical research and its applications. Key Elements • Interdisciplinary collaboration across institutions is preferred and encouraged so as to integrate, coordinate and leverage on the full spectrum of research capabilities in Singapore, from basic science to clinical research. • LCG programmes should aim to make significant contributions to the advancement of study of therapeutic areas and help establish Singapore as a global leader. • They should facilitate the discovery and application of basic science ideas relevant to the advancement of health, as well as the translation of clinical findings into policy and practice. They should also provide opportunities for international partnerships and/or industry collaborations. • Pathway(s) to impact should be clearly articulated.
Funding Amount	There are two funding tiers for application: - **Tier 1**: Up to $10mil inclusive of indirect cost over up to 5 years - **Tier 2:** Up to $25mil inclusive of indirect cost over up to 5 years

	Indirect cost is provided at a fixed percentage of 30% of the project's qualifying direct cost.
Research Areas of Priority	OF-LCG is open to proposals of the highest quality across the breadth of disciplines relevant to its aims. To better realise the goals for HHP in Singapore, seven therapeutic areas, i.e. (a) cancers and neoplasms, (b) cardiovascular, (c) eye, (d) infection, (e) mental health, (f) metabolic/endocrine, (g) neurological have been identified as national priorities. The community is encouraged to address these therapeutic areas although proposals in other areas will also be considered.
Eligibility	OF-LCG is open to the public sector research community who are primarily appointed in a local public institution in Singapore. The Corresponding Principal Investigators (PIs) and the theme PIs must hold a primary appointment in a local publicly funded institution and be salaried by the institution. They should be independent PIs with a demonstrated track record of research, as evidenced by the award of nationally competitive funding, substantial publication record in the past three years. The criteria for selection are: i. High-quality scientific research focusing on patient-centric translational research, supplemented with basic and/or applied research (including Health Services Research). Proposed research must be well-differentiated and highly competitive. It should demonstrate a high potential to be world class. ii. Proposed research topic should address issues of national importance. These should typically be challenges that no single institution or discipline can solve and require collaborative and interdisciplinary approaches. Provided they are scientifically meritorious, proposals which address the emphasised therapeutic areas would be given priority consideration. iii. Proposed research team should have established track record and research productivity. Proposed governance to manage the programme should be feasible and sustainable. iv. Proposed programme should contribute to capacity development of human capital and research infrastructure. v. Proposed programme should demonstrate the potential to improve health outcomes and capture economic value with a clear indication of pathway(s) to impact. vi. For renewal applications, the proposal should demonstrate the good progress made in achieving health and economic outcomes, and demonstrate the potential to leverage these for implementation to achieve greater impact or value capture.

Annex B

Research Proposals Awarded under May 2024 OF-LCG Grant Call

Title of Research Programme	Description
Mechanistic Investigation and Clinical Innovation for Sarcopenia Diagnosis and Therapy (MAGNET)	Loss of muscle in both quantity and strength is a common occurrence in elderly people and people suffering from serious diseases, such as cancer, heart failure and overweight. Worsened muscle loss increases death and compromises normal health and life quality. Muscle loss is a major problem in Singapore because the overall population is ageing rapidly and frailty-related health issues becomes more significant. Although this is an important clinical problem, no effective solutions are available for clinicians to achieve early diagnosis, prevention and reversal of muscle loss. "Mechanistic Investigation and Clinical Innovation for Sarcopenia Diagnosis and Therapy (MAGNET)" is a national collaboration among leading physicians and scientists to jointly investigate why and how sarcopenia condition is triggered along with ageing or other disease states, and to test new ways to intercept the development of the disease in patients. Achieving these goals of this study will improve the quality of life and support Singapore as a global leader in this field. **Corresponding Principal Investigator (PI)** Name: Professor Yibin Wang Institution: Duke-NUS Medical School (Duke-NUS) Amount awarded: $9,999,999.10 <u>Theme PIs</u> Theme 1: Professor Teh Bin Tean, National Cancer Centre Singapore Associate Professor Chen Jinmiao, Duke-NUS Theme 2: Professor Han Weiping, Institute for Molecular and Cell Biology, Agency for Science, Technology and Research Associate Professor Veronique Angeli, National University of Singapore (NUS) Theme 3: Professor Yibin Wang, Duke-NUS Dr Hong Jing Han, Duke-NUS Theme 4: Associate Professor Frederick Koh Sengkang General Hospital (SKH) Associate Professor Laura Tay (SKH) Associate Professor Samuel Chew, Changi General Hospital Dr Justin Linghui Chew, Tan Tock Seng Hospital

Advancing precision medicine for cardiovascular disease and diabetes in Asian populations	Studying groups of individuals and monitoring their health trends is a powerful approach for identifying the factors that determine why some people, but not others, develop disease. These 'population studies' have proved to be invaluable for developing approaches to improve health and prevent disease. In our initial work, we created a population study comprising more than 100,000 Singaporeans – known as SG100K. We now propose to follow up with SG100K participants to identify how their health has changed since we enrolled them to the study. We will use the information collected to improve understanding of the risk factors and biological pathways that impact health in Singapore. We will focus on understanding the relationship of dietary factors to metabolic variation and health outcomes. We will develop new approaches to identification of people at risk of diabetes, heart attack and other important long-term conditions, including through analysis of readily available, non-invasive eye imaging. We will test whether the digitally delivered interventions that focus on key behavioural risk factors can be used to improve cardiovascular and metabolic health. Our work will thus contribute to the identification of new, effective approaches to risk stratification and prevention of diabetes, heart disease and other age-related long-term conditions in Singapore. **Corresponding Principal Investigator (PI)** Name: Professor John Chambers Institution: Nanyang Technological University, Singapore (NTU Singapore) Amount awarded: $20,000,000.00 <u>Theme PIs</u> Theme 1: Professor John Chambers, NTU Singapore Theme 2: Assistant Professor Marie Loh, NTU Singapore Theme 3: Professor Cheng Ching-Yu, National University of Singapore (NUS) Theme 4: Assistant Professor Sim Xueling, NUS
Singapore Gastric Cancer Consortium – Therapeutic Interception of Gastric Cancer	Gastric cancer is a major global health issue. Among cancers, it ranks fifth in both new cases and deaths. To address this, the Singapore Gastric Cancer Consortium (SGCC) was established in 2007. Through sustained collaborations and a multi-disciplinary approach, the SGCC has made substantial contributions in gastric cancer research globally with impactful scientific discoveries and real clinical applications. In the next five years, our research will focus on four main areas, each targeting an unmet challenge in gastric cancer: (1) To prevent gastric cancer from occurring by returning the stomach to healthy state (2) examining the role of the gut microbiome in gastric cancer development

	and treatment, (3) identifying better ways to treat gastric cancers that have spread to the peritoneum, the lining of our abdominal organs and inner abdominal wall, and (4) using state-of-the-art technology to leverage upon the genetics of gastric cancer at the single-cell level for immunotherapy. We aim to work together across our research themes with local and international partners in academia and health science industry to prevent gastric cancer and improve outcomes for our patients. **Corresponding Principal Investigator (PI)** Name: Professor Jimmy So Institution: National University of Singapore (NUS) Amount awarded: $25,000,000.00 <u>Theme PIs</u> Theme 1: Assistant Professor Jonathan Lee, NUS Professor Yeoh Khay Guan, NUS Theme 2: Associate Professor Wong Hei Sunny, Nanyang Technological University (NTU Singapore) Professor Joseph Sung, NTU Singapore Theme 3: Professor Jimmy So, NUS; Dr Johnny Ong, National Cancer Centre Singapore Dr Yong Wei Peng, National University Hospital Theme 4: Professor Patrick Tan, Duke-NUS Medical School
Singapore Parkinson's Disease Programme (SPARKLE)	Parkinson's Disease (PD) affects 3 in 1000 above 50 years of age in Singapore. The team's recent community study showed that 26.8% of older subjects have mild parkinsonian signs and this is closely related to cognitive impairment and increasing age. With Singapore's rapidly aging population, neurodegenerative diseases involving the brain pose a significant burden on the healthcare system. The project aims to deliver better health outcomes through population screening of at-risk subjects and those with prodromic PD without clinical symptoms, and to conduct risk stratification of subjects for behavioural intervention. The team plans to develop blood and other tests to identify PD in high risk and elderly individuals even before they develop symptoms and to determine who are likely to develop symptoms eventually. For those already affected with the condition, the team will develop tests to determine who are more likely to progress. In addition, we will use AI assisted scoring models to predict who are more likely to have loss of functions. We will conduct a clinical trial to evaluate the effectiveness of interventional digital platform involving physical activity supported by a home wireless monitoring system. We plan to optimise our stem

	cell sources and conduct neurotransplantation in patients using their own stem cells. **Corresponding Principal Investigator (PI)** Name: Professor Tan Eng King Institution: National Neuroscience Institute (NNI) Amount awarded: $24,999,999.70 <u>Theme PIs</u> Theme 1: Professor Tan Eng King, NNI Theme 2: Professor Louis Tan, NNI Theme 3: Professor Lim Kah Leong, Nanyang Technological University Theme 4: Professor Zhang Suchun, Duke-NUS Medical School Theme 5: Associate Professor Prakash Kumar, NNI
Conquering Lung cancer Across all stages with Research and InnovatiON (CLARION)	Lung cancer is the leading cause of cancer-related deaths among adult men and women both in Singapore and worldwide. While the majority of lung cancer in the West are tobacco-related, up to 60% of patients who develop lung cancer in Singapore - particularly East Asian ethnicity - are non-smokers. Despite the unprecedented pace of drug approvals in lung cancer, development of treatment resistance and rising cost of new drugs remain major obstacles. We have assembled a diverse team of experienced clinicians and scientists from major cancer centres, universities and research institutes in Singapore, to address several high-impact problems in lung cancer from early to late stage disease. Our programme proposes to undertake comprehensive lung cancer profiling to understand disease biology of Asian lung cancer and uncover unique features to deliver cost-effective therapies, design innovative clinical trials to overcome treatment resistance as well as evaluate the life-saving potential of detecting lung cancer at earlier stages through screening. By integrating the latest tools in genetic, experimental, and computational analyses together with the use of novel anti-cancer treatments, our goal is to expediently implement new technologies to improve the survival outcomes of lung cancer patients in Singapore. **Corresponding Principal Investigator (PI)** Name: Daniel Tan Institution: National Cancer Centre Singapore (NCCS) Amount awarded: $25,000,000.00 <u>Theme PIs</u>

	Theme 1: Associate Professor Daniel Tan, NCCS Dr Huang Yiqing, National University Hospital Theme 2: Dr Amit Jain, NCCS Dr Joe Yeong, Institute for Molecular and Cell Biology, Agency for Science, Technology and Research (A*STAR) Theme 3: Dr Anders Skanderup, Genome Institute of Singapore (GIS), A*STAR Adjunct Associate Professor Liu Yong, Institute of High Performance Computing, A*STAR Theme 4: Dr Tam Wai Leong, GIS, A*STAR Dr Tee Wee Wei, Institute of Molecular and Cell Biology, A*STAR Theme 5: Professor Darren Lim, NCCS Dr Gillianne Lai, NCCS