

ANNUAL REVIEW 2021

TRANSFORMING MEDICINE

IMPROVING LIVES



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ASCENDING TO GREATER HEIGHTS

While the world continued to grapple with COVID-19 last year, an unprecedented united global effort helped pave the way for life to return to normal. Working with national and global partners, Duke-NUS Medical School's experts rapidly translated new ideas into effective innovations, and I am immensely proud that our novel diagnostic assays, vaccines and therapeutics augmented the global war chest against the pandemic.

Many of these world-leading contributions were only possible because of our peacetime commitment to investing in emerging infectious diseases. Concurrently, we have continued to support research programmes in non-communicable diseases prevalent in Asia, in health services research and through multidisciplinary experts in dedicated research centres. With many ground-breaking discoveries and increasing success in commercialisation, the high-impact research from our scientists will enhance treatment outcomes while shaping policies that enable better health in ageing societies.

These accomplishments are testimony to the research-focused education model on which Duke-NUS was founded, and to the collaborations we have built with our parent universities—Duke University and the National University of Singapore—and our academic medicine partner, SingHealth.

To strengthen our partnership, SingHealth and Duke-NUS launched the Academic Medicine Innovation Institute as well as several joint centres which aim to nurture a rich pipeline of clinician-scientists, clinician-educators and clinician-innovators.

Through the SingHealth Duke-NUS Academic Medical Centre, we have created a vibrant environment that enables our professionals to combine academic pursuits with clinical excellence as they tackle the most pressing healthcare challenges affecting patients here in Singapore and around the world. To recognise the vital role played by our clinical faculty in nurturing the next generation of doctors and achieving our academic medicine mission, I had the pleasure of launching Duke-NUS' Hall of Master Academic Clinicians—our highest honour for outstanding clinicians.

We also created new focal points that bring together experts from across the campus to develop leadership in the key growth areas of regenerative medicine and stem cell technologies that will underpin future advances in cancer, ageing and neurodegenerative diseases.

I am proud of the many accomplishments of the School and delighted by our growing reputation as a small but very impactful research-intensive medical school focused on the major healthcare challenges of our time. On behalf of the Governing Board, I express my heartfelt thanks to our management, faculty, scientists, staff, students and alumni, partners and collaborators for their steadfast dedication, especially through the difficult conditions of the recent past.

In particular, I would like to express my deepest gratitude to our donors, stakeholders and the Singapore Government for their unwavering support and generosity to the School. With their support, we remain committed to strive for ever greater heights in delivering a world-class medical education alongside cutting-edge research that will transform medicine and improve lives.

Mr Goh Yew Lin

Chairman, Governing Board, Duke-NUS Medical School



EXCEPTIONAL TIMES EXCEPTIONAL EFFORT

This pandemic was always going to be an endurance race. While 2021 started with the finishing line seemingly in sight, the virus instead extended the marathon, demanding more grit, tenacity and determination. And during this second year of the pandemic, Duke-NUS Medical School delivered another formidable performance.

We continued to be a world leader in COVID-19 research, with innovation in T-cell testing as well as discoveries of new therapeutic strategies and third-generation coronavirus vaccine approaches—each attracting significant commercial interest.

But our impact spans beyond pandemic science. The researchers from our Signature Research Programmes, Centres and the SingHealth Duke-NUS Academic Medical Centre (AMC) continued to advance research across many fields, including ageing, cancer, health services, palliative care, neurodegenerative and cardiometabolic diseases as well as regenerative medicine, delivering many innovations that will impact health.

The stellar performances of our researchers were widely recognised in rankings of the world's top scientists and with national and international honours, from the President's Science and Technology Awards to prestigious associations including the American Society for Microbiology.

Immersed in the thriving environment of our AMC, our students also excelled. With firm support from SingHealth and the Ministry of Health, our education team made certain that in-person clinical training in the hospitals continued uninterrupted while simultaneously rolling out an expanded panel of medical simulation exercises. Adding to this exceptional effort, they created immersive

learning opportunities that support students' study of the human anatomy through augmented, virtual reality and gaming tools.

Before we welcomed our 15th cohort of MD students—among whom are the first students admitted via our conditional admissions pathways—we saw the Class of 2021 graduate and join a frontline still battling SARS-CoV-2. They left us, inspired to grow into “Clinicians Plus” by the many excellent mentors within our AMC. To recognise the pivotal role of these clinician mentors in nurturing the next generation, we inducted our inaugural cohort of outstanding master clinicians into the newly created Duke-NUS Hall of Master Academic Clinicians.

Each accomplishment highlighted in this Annual Review marks the steadfast effort and collaborative spirit of our people—students, staff, faculty, alumni and benefactors—who helped propel us to new heights.

But in any endurance sport, mental resilience is especially crucial. We place great emphasis on maintaining a work environment that nurtures and supports the mental wellbeing of our people, and I am proud of the successful implementation of the Staff Peer Support System that offers our staff safe and confidential assistance from trained peers.

As you read this Annual Review, I invite you to share our pride in the accomplishments of our people because this would not have been possible without your support. Looking ahead to 2022, I am confident that we will build on these achievements and deliver on our vision of transforming medicine and improving lives for patients here in Singapore and beyond.

Professor Thomas M Coffman
Dean, Duke-NUS Medical School



GOVERNING BOARD



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HIGHLIGHTS OF 2021

Top national science honours for Duke-NUS researcher and Governing Board member

On 10 December 2021, Singapore President Madam Halimah Yacob bestowed two prestigious awards to well-recognised professors at Duke-NUS.

Duke-NUS Governing Board member and SingHealth Group CEO, Professor Ivy Ng, received the President's Science and Technology Medal. This medal commemorates her outstanding leadership in the advancement of academic medicine in Singapore through developing health and biomedical sciences research and innovation, nurturing clinical research talent and establishing strategic partnerships among academia, healthcare and industry to improve healthcare infrastructure.

Professor Wang Linfa from the Emerging Infectious Diseases Programme received the President's Science Award. Prof Wang received his award in recognition of his stellar contributions to the field of bat biology and emerging viral diseases and the successful translation of his discoveries into biomedical innovations and pandemic responses that have helped combat several viral outbreaks, including COVID-19.



From left: President's Science Award (Prof Ivy Ng), President's Science and Technology Medal recipient (Prof Wang Linfa), and President's Science and Technology Award recipient (Prof Tobi Bin Team).

President's Science Award Scientist who traced Sars virus to bats gets top accolade

Zoonotic disease expert also worked on Covid-19 antibody test kit

Subhasis Bhagat

A "battler" who helped to trace the severe acute respiratory syndrome (Sars) outbreak in 2003 to bats, and is now involved in the Covid-19 antibody test kit, Professor Wang Linfa, a top zoonotic disease expert, is a faculty member of Duke-NUS Medical School's emerging infectious disease programme. Prof Wang received his award in recognition of his stellar contributions to the field of bat biology and emerging viral diseases and the successful translation of his discoveries into biomedical innovations and pandemic responses that have helped combat several viral outbreaks, including COVID-19.

Prof Wang and his team developed a test kit last year that detects whether someone has antibodies that recognise the coronavirus, as well as whether work, check and preventions of the population has been affected, help with contact tracing and disease identification. The kit is now being used to detect whether someone has antibodies that recognise the coronavirus, as well as whether work, check and preventions of the population has been affected, help with contact tracing and disease identification. The kit is now being used to detect whether someone has antibodies that recognise the coronavirus, as well as whether work, check and preventions of the population has been affected, help with contact tracing and disease identification.

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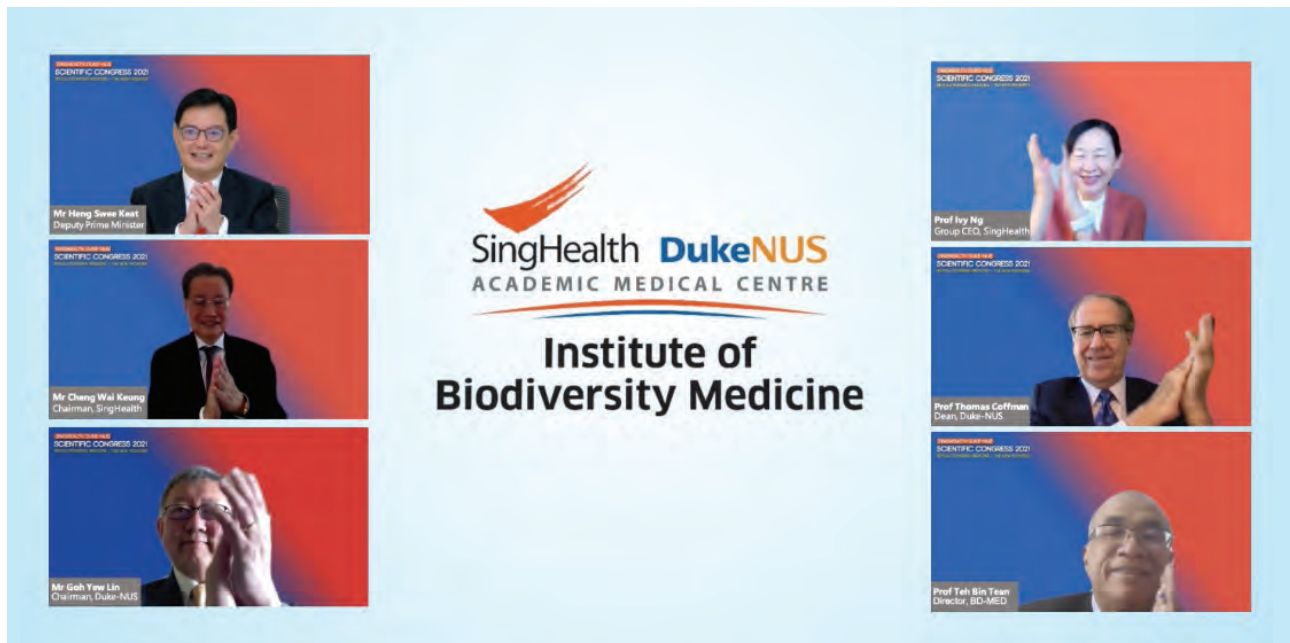
SingHealth and A*Star leaders lauded for advancing research

Two scientific "architects" who helped to mould and advance the research landscape in their respective institutions received medals under the 2021 President's Science and Technology Awards.

Professor Ivy Ng, SingHealth's group chief executive since 2012, and Professor Tobi Bin Team, Director of the nation's largest healthcare cluster, were named recipients of the President's Science and Technology Awards. Prof Ivy Ng, SingHealth's group chief executive since 2012, and Professor Tobi Bin Team, Director of the nation's largest healthcare cluster, were named recipients of the President's Science and Technology Awards.

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Deputy Prime Minister Mr Heng Swee Keat (top left) and senior management from Duke-NUS and SingHealth officially launched the SingHealth Duke-NUS Institute of Biodiversity Medicine on 17 September 2021.



(From L-R): Assistant Professor Rena Dharmawan, Entrepreneur-in-Residence, Centre for Technology and Development; Associate Professor Ong Sin Tiong, Cancer and Stem Cell Biology Programme; Mr Mohammad Faris Mohd Ibrahim, Executive, Health Services and Systems Research Programme, Professor Thomas Coffman, Dean of Duke-NUS and Ms Karen Chang, Senior Vice Dean & Group Director of Corporate Services.

New frontiers for the SingHealth Duke-NUS scientific congress

The sixth SingHealth Duke-NUS Scientific Congress was hosted virtually on 17 and 18 September 2021, providing a platform for the global healthcare and scientific community to exchange ideas and forge collaborations. Themed “Revolutionising Medicine—The New Frontier”, the conference hosted 170 local and international speakers who spoke about the latest medical advances, including digital health, precision medicine and immunotherapy.

In his opening address, Singapore’s Deputy Prime Minister and Coordinating Minister for Economic Policies, Mr Heng Swee Keat, who was the Guest-of-Honour for the event, took the opportunity to recognise the contributions made by the scientific community in Singapore to COVID-19 research, citing the development of kits such as cPass™ and Singapore’s participation in the GISAID initiative.

At the congress, a new institute—SingHealth Duke-NUS Institute of Biodiversity Medicine (BD-MED)—was launched,

witnessed by Mr Heng and senior management from Duke-NUS and SingHealth. The BD-MED Institute is supported by a generous gift of \$5 million from the Verdant Foundation.

Furthering excellence as an employer of choice

In a testament to the School’s dedication to make Duke-NUS a great place to work in, Duke-NUS was ranked among Singapore’s top 200 employers.

The 2021 ranking by *The Straits Times* and Statista was based on more than 200,000 recommendations made by more than 9,000 participants about employers of choice and takes into consideration their ratings on a wide range of topics such as career development, company image, working conditions and remuneration. This ranking is a culmination of the School’s ongoing efforts to ensure a diverse and collaborative environment emphasising staff welfare and the value of open discussion.



OFFICE OF RESEARCH

BLAZING THE TRAIL





message from
**PROFESSOR
PATRICK
CASEY**

SENIOR VICE-DEAN FOR
RESEARCH

While last year presented the world with unprecedented challenges, the pandemic also triggered a flood of creativity and innovation at Duke-NUS. Scientists from our Emerging Infectious Diseases Programme continued to further our understanding of SARS-CoV-2 by building on the foundations of their groundbreaking discoveries to develop new and better tools to fight the virus.

Their outstanding contributions have been recognised with a slew of awards, the latest being the prestigious President's Science Award 2021 conferred on Professor Wang Linfa for his stellar contributions to the field of bat biology and emerging viral diseases.

Teams from our other Signature Research Programmes similarly continued to push the boundaries of what we know about cancer, neurodegenerative diseases, cardiovascular and metabolic health and develop more efficient health systems. Their research ranged from targeting prominent diseases like Parkinson's, Alzheimer's, hypertension and diabetes to using advanced techniques like machine-learning and integrating imaging capacities in areas ranging from drug translation to ambulance efficiency. Their excellent work helped to strengthen our basic research, drive fundamental biological discoveries and improve patient care.

Even as our scientists advance cutting-edge biomedical science to tackle the most pressing diseases and medical problems in the region, we also focus on research that improves health systems and informs national policies. For example, our Health Services & Systems Research Programme delivered outstanding insights on the impact of loneliness on longevity and end-of-life care, informing policymakers on ways in which they can improve the lives of increasingly older populations around the region.

Such high-impact research enables Duke-NUS to continue attracting competitive external funding as well as shine in research rankings, adding to our reputation as a research powerhouse on the little red dot. We have achieved particular success in the National Medical Research Council's Open Fund Large Collaborative Grant call; in addition, three members of our research and clinical faculty were recognised by Clarivate to be among the most cited researchers in the world while a further 80 scientists from across our SingHealth Duke-NUS community were recognised in Stanford's ranking of the world's top two per cent of scientists.

I am extremely proud of our researchers and their hard work which is making an impact on the biomedical industry in Singapore and beyond.

CANCER AND STEM CELL BIOLOGY (CSCB) PROGRAMME



Cancer and Stem Cell Biology Programme laboratories held up well while coping with the SARS-CoV-2 pandemic that began in early 2020. Our researchers continued their impressive productivity across a broad range of areas, ranging from hypothesis-driven basic science and disease-oriented investigation to drug discovery and innovative clinical trials. The impact of our scientific investigations is greatly enhanced by our collaborations with colleagues from including the Experimental Drug Discovery Centre and Genome Institute of Singapore, A*STAR, with diverse disciplines. I look forward to seeing more great work and partnerships in the future.

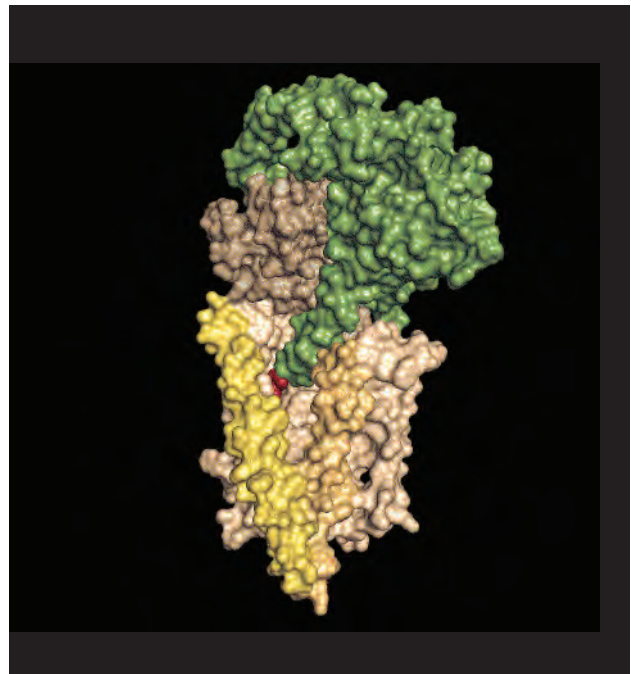
Professor David Virshup

Director, Cancer and Stem Cell Biology Programme

Wnt as a gene activator and repressor in cancers

In a joint study, Professor David Virshup and Associate Professor Enrico Petretto discovered that the Wnt-signalling pathway—a major regulator of cell proliferation—promotes cancer growth by suppressing another important signalling pathway, the RAS-MAPK pathway, thus preventing RAS-mediated cell death.

Their findings, published in *Cancer Research* in January 2021, provided the basis for the development of a new cancer treatment strategy that can target these pathways to promote cell death.



Wnt in complex with its transporter WLS. Wnt (green) modified by an attached lipid (red) is transported by the carrier protein Wntless (shades of light brown) from its site of synthesis to the plasma membrane. The attached lipid is buried deep in the Wntless structure. © 2020 David M. Virshup

Targeting Wnt signaling to treat drug-resistant cancers

A study team, led by Professor David Virshup along with collaborators from A*STAR, reported that the anti-cancer drug ETC-159, which is currently in early phase clinical trials for use in a subset of colorectal and gynecological cancers, can prevent drug resistance in some cancers by blocking a key DNA repair mechanism.

Excessive Wnt signalling in these cancers drive overactive DNA repair mechanisms, which leads to resistance against a specific type of anti-cancer drug called PARP-inhibitors. The study findings, published in *EMBO Molecular Medicine* in March 2021, showed that a low dose of ETC-159, administered along with PARP inhibitors, blocked excessive Wnt signalling and thus reversed cancer cell resistance to PARP inhibitors.

Leveraging machine-learning to identify predictive biomarkers

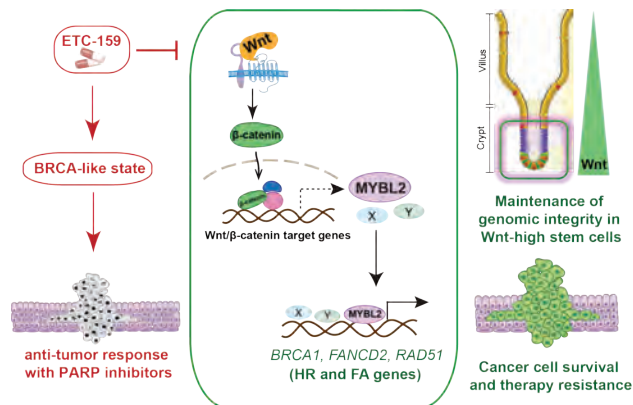
Through the use of machine-learning techniques on genomic data from the large Stomach Cancer Adjuvant Multi-Institutional Group Trial, Professor Patrick Tan and his team have identified a first predictive biomarker that can help clinicians identify patients who may benefit from Paclitaxel treatment thus paving the way for developing personalised treatments strategies for the disease.

The AI-based strategy described in the study, published in *Gut* in May 2021, can be adopted to identify other gene signatures that may similarly function as predictive biomarkers.

Driving glioblastoma research through a large collaborative grant study

In a major collaborative effort, researchers from Duke-NUS, the National Neuroscience Institute and NUS are developing new diagnostic and treatment strategies for glioblastoma (GBM), a rare but aggressive form of brain cancer.

Supported by a National Medical Research Council Open Fund Large Collaborative Grant, the multi-institution research



ETC-159 can prevent drug resistance in some cancers by blocking a key DNA repair mechanism.

Kaur, A. et al., "WNT Inhibition Creates a BRCA-like State in Wnt-Addicted Cancer." *EMBO Molecular Medicine* 13 (4): e13349, <https://doi.org/10.15252/emmm.202013349>.

team is developing unique precision medicine technologies and processes to manage this kind of tumour.

Duke-NUS researchers from the CSCB Programme are fronting two out of the four main themes. Professor Patrick Tan is leading data-mining studies that can identify genes linked to GBM, analyse the pattern in which these genes are turned on or off across patient populations and determine its consequences on the spread and recurrence of tumours. Associate Professor Ang Beng Ti is leading investigations into the molecular mechanisms driving GBM and the identification of drug targets.

World's largest gastric cancer atlas enables scientists to plan better treatments

A study led by Professor Patrick Tan, along with scientists from the Genome Institute of Singapore, A*STAR, has produced the world's largest single-cell atlas of gastric cancer, one of the most common cancers in Asia.

The in-depth map of gastric cancer cell types generated in this study, which was accepted by *Cancer Discovery* in October 2021, offered fresh insights into the diverse nature of this

Atlas of gastric cancer cells maps path to better treatment

Research by local scientists offers insight into how these can spread within the body



Members of the team involved in the gastric cancer research include (from far left) Duke-NUS Medical School research fellow Vikrant Kumar and senior research associate Kalpana Ramnarayanan, as well as Dr Raghav Sundar, a consultant at the National University Cancer Institute, Singapore. ST PHOTO: JASON QUAH

Cheryl Tan

To have a more sophisticated understanding of gastric cancer, scientists here have created an intricate atlas of the cancer cells to offer more insight into how they can spread within the body.

The map goes into granular detail on how specific molecular pathways can drive cancer growth, while also providing insight on how the disease can be better treated, said Dr Raghav Sundar, a consultant at the Department of Haematology-Oncology at the National University Cancer Institute, Singapore.

"For example, using Singapore as an analogy, the cancer cell wants to go from home to the airport. We know that it could take these major expressways, and we have drugs to

block these roads. But using our analysis, we are able to identify that the cancer cells also can take other small roads to get to their destination," said Dr Sundar.

In a similar vein, while gastric cancer is caused by changes in the genes of epithelial cells that line the surface of the stomach, it is important to think about all the other interactions between the cancer cells and their surrounding cells that help to proliferate cancer growth, he added.

For instance, some types of gastric tumours were found to contain immune cells - particularly B-cells, which control the generation of antibodies.

"We found a specific interaction between the cancer cell and the B-cell, which prevents these B-cells from doing their job to attack the cancer cell," Dr Sundar said.

The research was led by Duke-NUS Medical School and the Agency for Science, Technology and Research's Genome Institute of Singapore (GIS), and involved collaborators from the National University Health System, among other institutions.

It was published in the *Cancer Discovery* scientific journal on Oct 7.

The study was part of work done by the Singapore Gastric Cancer Consortium, a national body of clinicians and scientists conducting research work on the cancer. It is supported by the National Medical Research Council.

From 2018 to last year, tumour samples were taken from 31 patients, who were being treated at the National University Hospital, at various stages of their disease.

From these samples, the scientists analysed a total of 200,000

separate cells and discovered more than 30 different cell types involved in gastric cancer, some of which have never been detected in the cancer before.

Professor Patrick Tan of Duke-NUS' Cancer and Stem Cell Biology Programme and GIS, who was principal investigator of the study, said one example would be the role of fibroblasts - cells that are important for wound healing - in driving gastric cancer.

"Fibroblast cells are hijacked by the cancer cells to provide an optimal supporting environment for tumour sustenance and tumour cell migration and spread," he said.

"While a role for fibroblasts in gastric cancer has been suggested by previous studies, it was not known how many different sub-populations of fibroblasts there are, and which are directly involved in sup-

porting tumour growth," he added.

The study revealed four different types of fibroblasts, of which one particular type may be the most important for driving gastric cancer, he added.

Dr Sundar noted that these cells tended to be in higher numbers in late-stage cancers.

Prof Tan said the study reinforces the fact that every tumour is unique - just like every patient - explaining that this is why similar treatments can yield very different outcomes in patients.

"One day, tumours may be routinely profiled at the single-cell level to provide a better understanding of the composition of the cancer, and guide clinicians on the sort of treatment for their patients," he added.

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tumour across patient populations—a key characteristic that has made its treatment quite challenging. Through the identification of cancer-associated cell types and the unique markers that they express, the research paved the way for the development of novel therapeutic strategies that could target some of these markers. The research also provides an important reference point for experts tackling gastric cancer, allowing for the identification and targeting of tumour vulnerabilities. All of these breakthroughs may lead to early cancer detection and drug development.

A structural model of human PORCN

Professor David Virshup has developed and validated a structural model of human PORCN, an enzyme that adds an acyl group to the Wnt signalling proteins that are implicated in normal development as well as cancers. The model, published in the *Journal of Cell Science* in December 2021, provided the mechanistic details of PORCN inhibition through drug binding, which could help in the development of improved cancer drugs. It also predicted how previously-uncharacterised PORCN variants may be implicated in other diseases.

CARDIOVASCULAR AND METABOLIC DISORDERS (CVMD) PROGRAMME

An upgraded hypertension model

The long-standing Mosaic Theory of Hypertension developed in the 1940s has been updated with a new model constructed by Professor Thomas Coffman, Dean of Duke-NUS.

The revised model, published in *Circulation Research* in April 2021, incorporated a new understanding of the cellular, environmental and genetic mechanisms underlying hypertension. It emphasised how an interplay of factors, like inflammation, oxidative stress and the microbiome, contribute to high blood pressure, with alterations in renal, neural and vascular functions. As research in the field keeps evolving, the updated Mosaic Theory will undoubtedly serve as a strong foundation for future studies on hypertension.

Anti-IL11 therapy as a possible treatment for liver failure

Professor Stuart Cook and Assistant Professor Annisa Widjaja have shown that the signalling protein interleukin 11 (IL-11) has a damaging effect on liver cells—overturning a prior hypothesis that it helps in the regeneration of livers damaged by paracetamol poisoning. The study team found high IL-11 serum levels in mice with paracetamol toxicity, where it activated signalling pathways that led to liver cell death. Surprisingly, mouse livers responded differently to human versus mouse IL-11 treatments: treatment with human IL-11 leading to competitive blocking of endogenous mouse IL-11, thus protecting the liver against damage, whereas same-species IL-11 is damaging to the liver.

The findings of this study, which were published in *Science Translational Medicine* in June 2021, suggested that blocking IL-11 with anti-IL-11 therapy can treat paracetamol poisoning and drug-induced liver failure in cases where liver transplants are not possible.

The Cardiovascular and Metabolic Disorders (CVMD) Programme at Duke-NUS Medical School is dedicated to advance our fundamental understanding of cardiovascular and metabolic health and diseases. In 2021, major progress from CVMD faculties uncovered novel players in lipid, glucose and amino acid metabolic regulations, as well as novel modulators to improve post-injury tissue remodelling and regeneration. A record level of extramural funding and research awards were obtained by CVMD faculties despite the challenges posed by COVID-19. New diagnostic and therapeutic strategies are being tested for major human diseases, particularly chronic kidney diseases, metabolic syndrome, pulmonary fibrosis and heart failure. These cardiovascular and metabolic diseases have increasingly become the biggest health burdens to our society, with increasing prevalence as a result of population ageing. Moving forward, CVMD will make significant new investment in both talent recruitment, training and research infrastructure, so our team will continue to lead and positively impact cardiometabolic health in Singapore and beyond.

Professor Wang Yibin

Director, Cardiovascular and Metabolic Disorders Programme



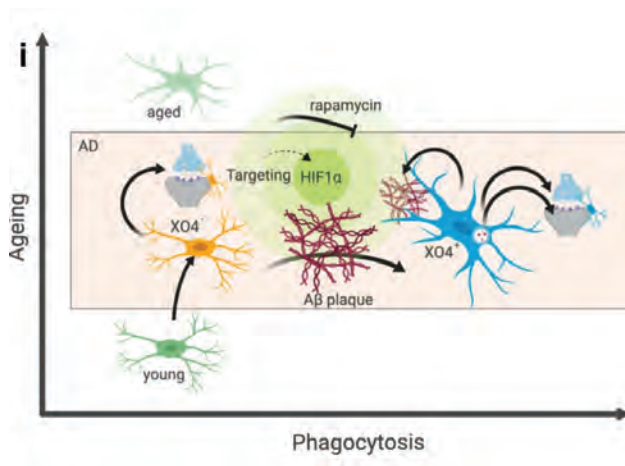
Uncovering MFSD2A's atomic-level structure

In 2014, Professor David Silver discovered the protein MFSD2A and its role in transporting Omega-3 fatty acids, such as docosahexaenoic acid (DHA), to the brain.

Building on his previous work, Prof Silver shed light on atomic-level details of MFSD2A's structure, lending key insights into how the lysophosphatidylcholine transporter mediates the uptake of Omega-3 fatty acids in the brain at a molecular level. The study, published in *Nature* in June 2021, can help researchers better design neurotherapeutics that can be transported by MFSD2A across the blood-brain barrier.

Targeting Hif1a to treat Alzheimer's Disease

Associate Professor Enrico Petretto has elucidated the expression signatures of Hif1a, a gene involved in microglial phagocytosis of beta-amyloid (A β) plaques in Alzheimer's disease. The findings, published in *Nature Communications* in May 2021, emphasised the importance of single-cell genetics in identifying potential drug targets and provide avenues for the development of microglia-specific therapeutics that modulate Hif1a expression.



Targeting Hif1a to clear beta-amyloid plaques in Alzheimer's disease.

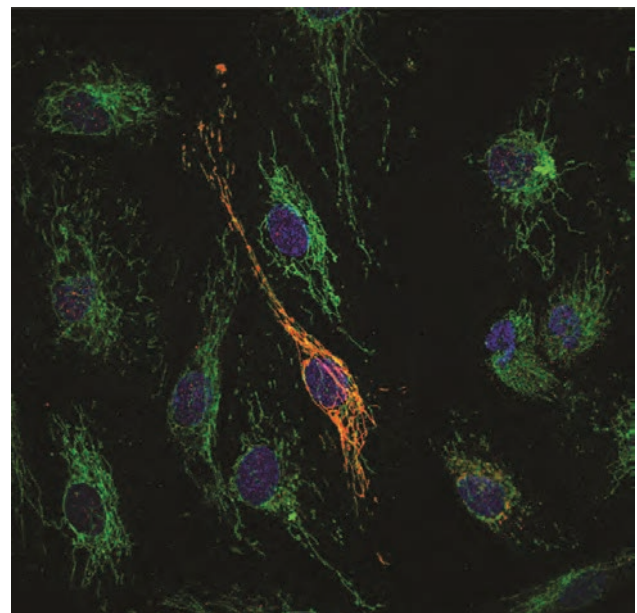
Grubman Alexandra et al. 2021. "Transcriptional Signature in Microglia Associated with A β Plaque Phagocytosis." *Nature Communications* 12 (1): 3015. <https://doi.org/10.1038/s41467-021-23111-1>.

Newly identified peptide protects tissues against vascular inflammation

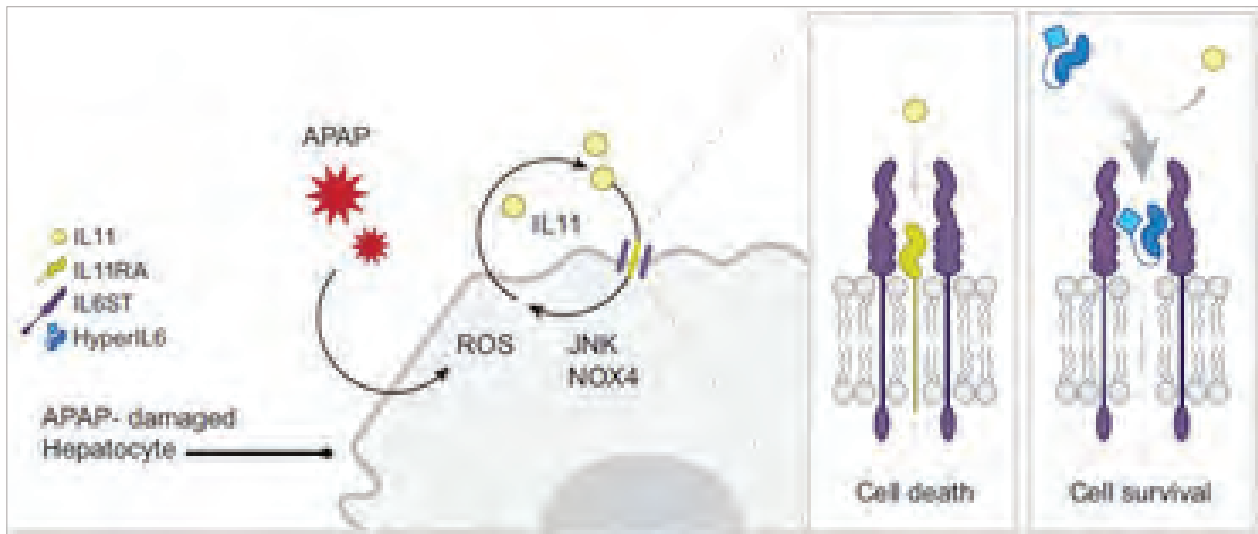
Assistant Professor Leno Ho led a multidisciplinary team of scientists from Duke-NUS and A*STAR to identify a new mitochondrial peptide called MOCCI, which works in tandem with the microRNA, miR-147b to regulate blood vessel inflammation and immunity.

The team found that while both molecules exerted anti-inflammatory effects, miR-147b also simultaneously prevented viral replication. The combined effect of these two molecules prevented excessive and potentially tissue-damaging inflammation during infections, such as the cytokine storm seen in COVID-19 and colitis.

The results, published in *Nature Communications* in April 2021, provided researchers with the opportunity to develop targeted pharmacological treatments for inflammatory diseases that mimic the anti-inflammatory effects of MOCCI and miR147b.



Microscope image showing colocalisation of MOCCI (red) with a mitochondrial protein (green) (C) 2021 Lena Ho



Proposed mechanism of how Hyper-IL-6 promotes liver cell regeneration.

Dong, et al. 2021. "The Pro-Regenerative Effects of HyperIL6 in Drug-Induced Liver Injury Are Unexpectedly Due to Competitive Inhibition of IL11 Signaling." *eLife* 10 (August). <https://doi.org/10.7554/eLife.68843>.

IL-6 vs. IL-11 in liver regeneration

In a study published in *eLife* in August 2021, Professor Stuart Cook demonstrated that the IL-6 gene does not directly promote liver regeneration, as has been generally accepted in the published literature, although it inhibits liver cell damage.

It is well-known that Hyper-IL-6, a synthetic protein formed by the fusion of IL-6 with soluble IL-6 receptor, IL-6R, is a potent activator of downstream signalling pathways that promote repair processes in damaged liver cells. In this study, Prof Cook's team postulated that Hyper-IL-6 indirectly mediated such pro-regenerative effects by competing with and inhibiting the activity of IL-11, another signalling molecule that leads to liver cell toxicity.

The results suggested that the role of Hyper-IL-6 in liver cell regeneration should not be assumed as direct, on-target effects but should instead be interpreted in context with its effects on other signalling molecules such as IL-11.

Discovery of genetic factors causing dilated cardiomyopathy

Professor Stuart Cook was part of a collaborative study carried out by researchers from the US and Australia that has unravelled the contribution of splice variants of unknown significance in causing idiopathic dilated cardiomyopathy (DCM), a heart muscle disease. DCM is a progressive disease of the cardiac muscle characterised by systolic dysfunction, ventricular enlargement and heart failure. Variants in *TTN*, a gene that codes for titin, the largest human protein, are known to be the leading genetic cause of idiopathic DCM.

The results of the study, published in *Circulation: Genomic and Precision Medicine* in August 2021, showed that unknown variants that cause alternate splicing of *TTN* account for one to two per cent of DCM and lead to a 10 to 20 per cent increase in the potential of *TTN* sequencing for diagnosing DCMs.

Improving clinical translations of cardioprotective interventions

Professor Derek Hausenloy published two studies in September 2021 on novel approaches that could improve the clinical translation potential of cardioprotective interventions, which have shown promising results in pre-clinical studies.

In his review paper in *Basic Research in Cardiology*, Prof Hausenloy proposed the use of IMPACT (Improving Preclinical Assessment of Cardioprotective Therapies) approach, which comprises an *in vivo* set of criteria that could be applied to assess the efficiency of preclinical cardioprotective interventions and, thus, increase the likelihood of their translation for clinical use. The availability of effective cardioprotective interventions will greatly benefit myocardial infarction and heart failure patients.

In a second position paper published in *Cardiovascular Research*, Prof Hausenloy showed how circadian rhythms might play an important role in the incidence, development and treatment of ischaemic heart disease in preclinical studies. Many studies have not adequately incorporated this parameter into their study design and data analysis, leading to suboptimal research results. The publication suggested that its inclusion might improve the efficacy of ischaemic heart disease interventions and increase their chances of clinical translation.



Research interest in adipocyte biology and its role in aging is growing, coinciding with the upsurge of obesity and ageing rate in Singapore. Understanding the functional role of long non-coding RNA (lncRNA), an emerging regulator involved in various biological processes, in adipose tissue during ageing is a crucial step for developing new therapeutic and healthcare strategies for an ageing population.

Our research aims to understand the molecular mechanism of lncRNA regulation by investigating the effect of loss/gain-of-lncRNAs on adipocytes and examining their molecular mechanism. This will help us identify novel lncRNA regulators that are pivotal for developing cures against ageing and ageing-associated disease.

Throughout my research, the support from Duke-NUS and my mentor has been invaluable, enabling me to carry out physiology and molecular experiments. With a high-performance computing server, I can also perform data analysis easily.

I am also very honoured to receive the Khoo Postdoctoral Fellowship which provides me with the opportunity to start an independent project and develop capabilities that an independent principal investigator should possess, such as managing funding.

Khoo Postdoctoral Fellow Dr Zhou Qiuzhong

Senior Research Fellow, Cardiovascular and Metabolic Disorders Programme

EMERGING INFECTIOUS DISEASES (EID) PROGRAMME

Characterising adaptive changes during zoonotic transmission

To understand how avian influenza viruses acquired transmissibility in mammalian hosts, Professor Gavin Smith and Assistant Professor Yvonne Su have applied the ancestral sequence reconstruction method – reconstruction of ancestral viruses that represent the various adaptive stages of the European avian-like swine influenza viruses, during their transition from avian to swine hosts. They inferred that sequential changes in haemagglutinin receptor-binding specificity of the viruses as well as mutations in viral polymerase protein and nucleoprotein contributed to efficient viral transmission in mammalian hosts. The findings, published in *Nature Microbiology* in November 2021, highlighted the importance of surveillance studies in predicting and preventing interspecies virus transmission.

A step closer to tracing SARS-CoV-2 origin

A joint study by scientists from Duke-NUS and Chulalongkorn University in Thailand found that SARS-CoV-2-related coronaviruses are actively circulating in bats and pangolins in Southeast Asia. The study, co-authored by Duke-NUS Senior Research Fellow Dr Tan Chee Wah and published in *Nature Communications* in February 2021, expanded the geographic



The COVID-19 pandemic naturally continued to be a focus and priority of research in the Programme for Emerging Infectious Diseases (EID) during the past year, where our scientists engaged in fundamental research to further our understanding of SARS-CoV-2 and its variants and translational innovations to turn scientific discoveries into useful tools, impacting positively the fight against the COVID-19. In the meantime, just as with the broader Singapore community, the EID Programme has been returning to normal, with significant advances made in non-COVID research, especially on diseases affecting Southeast Asia. These include the identification of a new class of antibodies that can neutralise both dengue and Zika viruses at different efficacies, as well as studies to reduce the impact of Zika virus infections on foetal development. Moving forward, EID will continue our cutting-edge research while forging new partnerships with national and international institutions and partners as we strive to contribute to the enhancement of the regional capacity for genomic surveillance and epidemiology of infectious diseases, as well as the prevention and treatment of flavivirus-associated diseases. I am confident that our Programme will continue to excel due to the hard work and dedication of our excellent staff.

Professor Gavin Smith

Director, Emerging Infectious Diseases Programme



SARS-CoV-2 related coronaviruses were found in animals such as bats in Southeast Asia

distribution of SARS-CoV-2-related coronaviruses and substantiated the World Health Organisation's initial findings that SARS-CoV-2-related coronaviruses might have spread to several regions beyond China.

Although the immediate progenitor of SARS-CoV-2 remained unidentified, the genetic diversity of SARS-CoV-2-related coronaviruses observed in this study increased the likelihood, making this important discovery through ramped-up surveillance efforts. By reporting the active cross-border transmission of infectious disease agents, the research highlighted the importance of surveillance studies in better preparing us to combat future pandemics.

Snapshot of cellular immunity holds the key to avoiding COVID-19 symptoms

Professor Antonio Bertoletti and his team published two more high impact papers on T-cell responses to SARS-CoV-2 infection, building on their ground-breaking work published in *Nature* in July 2020 where the team analysed SARS-CoV-2 specific T-cell responses in COVID-19 patients after convalescence.

In the first study, published in *Cell Reports* in January 2021, Prof Bertoletti and his team showed that severe disease is less likely to develop in patients mounting an early and robust SARS-CoV-2-specific T-cell response. The findings from this study, led by Senior Research Fellow Dr Anthony Tanoto Tan, highlighted the important role played by T cells in controlling the progression of COVID-19 and the clinical management of COVID-19 patients.

In the second study that focused on the cellular immunity developed in asymptomatic versus symptomatic patients infected with SARS-CoV-2, the researchers showed that asymptomatic COVID-19 patients also mount a virus-specific T-cell immune response. In addition, although the frequency of T cells that recognise different SARS-CoV-2 proteins was similar in both cohorts, asymptomatic patients produced higher quantities of IFN gamma and IL-2, which are important for controlling viral infection.

The results, published in the *Journal of Experimental Medicine* in May 2021, indicated that asymptomatic individuals mount a highly functional, virus-specific immune response and suggested that a balanced T-cell response is key to avoiding COVID-19 symptoms.

Dual-mode antibodies and a novel virus neutralisation mechanism

Flavivirus infections are a major global health concern and include arthropod-borne diseases such as dengue and Zika.

A new class of antibodies, which could neutralise both dengue (DENV) and Zika (ZIKV) viruses at different efficacies, was identified in a recent study conducted on individuals who had recovered from dengue fever. This study, led by Professor Lok Shee-Mei, showed that the antibodies neutralise the two viruses via two distinct mechanisms: while the antibodies reduced ZIKV particle dynamics, they enhanced DENV particle dynamics and caused virus surface distortion.

The study, published in *Cell* in December 2021 and led in collaboration with Professor Ganesh Srinivasan Anand from the Pennsylvania State University, can facilitate further studies on the newly-described virus particle distortion mechanism.

Regional collaborations to guide more informed COVID-19 re-opening strategies

Duke-NUS is collaborating with Brunei's Ministry of Health and Universiti Brunei Darussalam to compare long-term immune responses to vaccination and infection and the efficacy of COVID-19 vaccines.

This project leverages the novel surrogate virus neutralisation test (sVNT) invented by Professor Wang Linfa and his research team, which can determine the



A researcher working with the *Aedes* species of mosquito in the Duke-NUS insectary

level of neutralising antibodies in human blood samples, without the need for complex equipment.

Based on the data gathered, the researchers will be able to infer the level of herd immunity as well as the extent of protection conferred by vaccines. The information will also enable various stakeholders to adjust COVID-19 control strategies, including safe-distancing measures, travel policies, quarantine periods and policies on booster vaccines, in the region.

New insights hold the key to mitigating Zika's devastating impacts

Since its most recent outbreak in 2016, the Zika virus has continued to plague communities around the world.

A study conducted by Professor Ooi Eng Eong and his team sought answers to how the Zika virus causes congenital Zika syndrome, a group of birth defects caused

by Zika infection during pregnancy. This information will help enhance prevention and formulate treatment strategies against the disease in pregnant women. The research team discovered that the virus disrupts the glucose metabolism pathway that is vital for nerve development, leading to cell inflammation and death. Further investigations using pre-clinical models showed that supplementing with a compound called pyruvic acid—a readily available supplement—can reduce the impact of Zika virus infections on foetal development.

This study, published in *Cell Reports* in December 2021, offered new insights into a potential intervention strategy that can protect developing foetuses against Zika virus infections. It also opened doors to further research questions on whether dengue viruses, which are genetically similar to Zika viruses, might cause disease by affecting the glucose metabolism pathway as well.

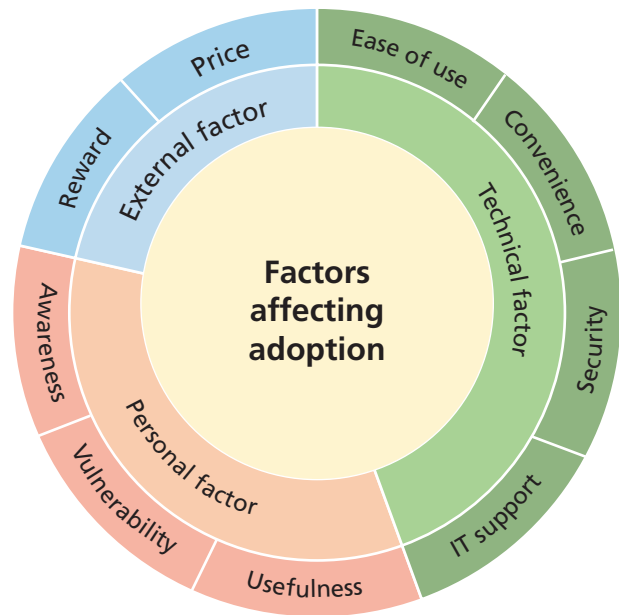
HEALTH SERVICES AND SYSTEMS RESEARCH (HSSR) PROGRAMME

Research to guide healthcare workers' wellbeing improvement

A study led by Assistant Professor Yoon Sungwon highlighted the importance of developing a non-intrusive, personalised mobile health app to support and improve the wellbeing of healthcare workers during the COVID-19 pandemic. The app should include features such as in-app counselling, peer support to improve wellbeing and tangible, extrinsic rewards to encourage its continued use. Several factors, including ease of use, awareness and security need to be considered to encourage adoption of the app, which can enable policymakers to better manage stress in healthcare workers during the current and future public health emergencies. The findings were published in the *Journal of Medical Internal Research* in May 2021.

Landmark study explores more accurate diagnosis of early liver cancer

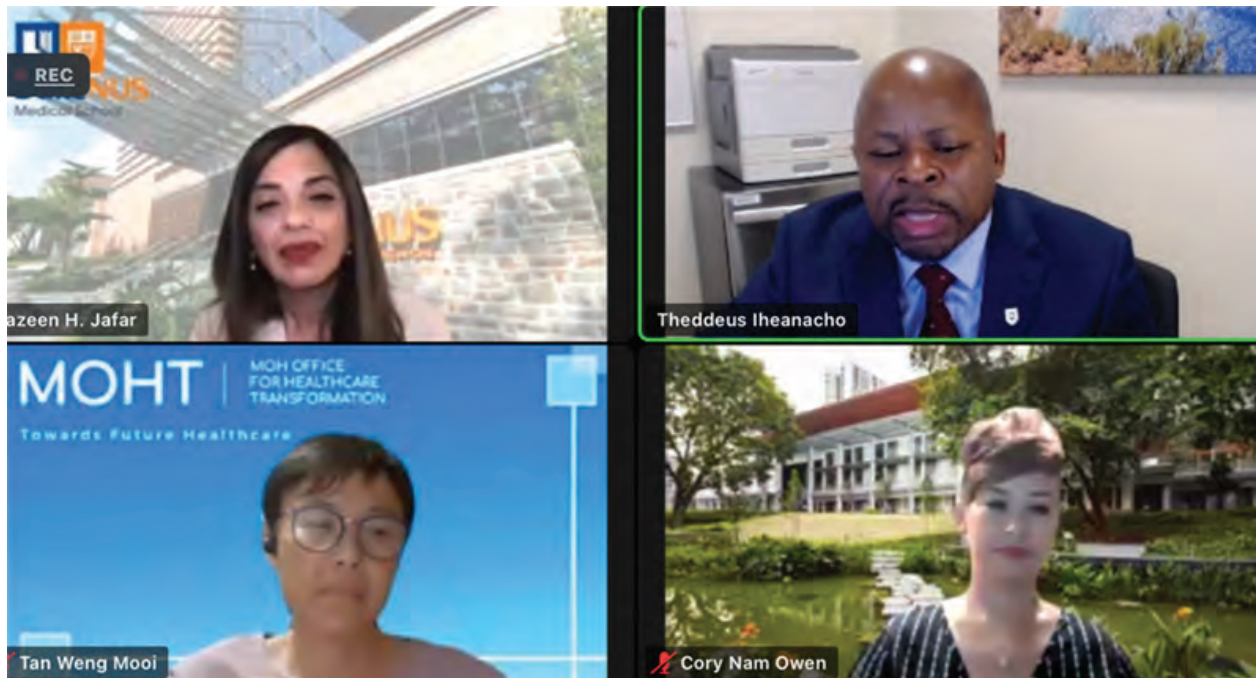
At present, only 20 per cent of hepatocellular carcinoma cases, the main type of primary liver cancer, are diagnosed at an early stage. To address the need for early diagnosis of liver cancer, a first-of-its-kind multi-institutional cohort



During the last two years, the COVID-19 pandemic posed many challenges to our society and our health system. However, it is these challenging times that have underscored the value of Health Services and Systems Research (HSSR) even more. In the early period of the pandemic, we assembled a multidisciplinary team across Duke-NUS and SingHealth to use HSSR methods to address issues related to the pandemic and advise on policy. These included pandemic modelling, health services capacity, emergency services, impact on vulnerable populations, health economic impact, vaccine hesitancy and the need for booster doses. As we work to address the underlying structural issues while living with the virus, HSSR will be more relevant than ever to build a resilient health system.

Professor Marcus Ong

Director, Health Services and Systems Research Programme



On 10 October 2021, Prof Jafar (top left) moderated an interactive virtual panel discussion organised by Yale-NUS College on the long-term mental health impact of COVID-19.

study was launched in May 2021 to enroll 2,000 participants at high risk of developing liver cancer across six healthcare institutions and eight polyclinics in Singapore.

Designed by Assistant Professor Mihir Gandhi and his team, the study can potentially generate in-depth and multi-faceted data on the prognosis of liver cancer. Such information will be valuable for developing effective diagnostic and prognostic tools for the disease.

Exploring the impact of COVID-19 on mental health

To shed light on the adverse psychological effects of COVID-19, Professor Tazeen H Jafar and her team performed a meta-analysis of 68 studies conducted during the pandemic to assess risk factors associated with anxiety and depression. The findings, which were published in *PLOS ONE* in December 2020, suggested that high-risk population groups, such as women, younger adults and those of lower socioeconomic status, might need additional support to cope during the pandemic.

As the world continued to grapple with the pandemic, addressing mental health issues has become increasingly

important. Commemorating World Mental Health Day on 10 October 2021, Prof Jafar moderated an interactive virtual panel discussion organised by Yale-NUS College on the long-term mental health impact of COVID-19. Featuring distinguished experts and policymakers in the areas of medicine, higher education and social advocacy, the panel emphasised the need to focus on self-care and destigmatisation of mental health issues to enhance wellbeing in the community.

Assessing the Singapore government's response to the pandemic

A simulation study, led by Assistant Professor John P Ansah, assessed the Singapore government's response to the COVID-19 pandemic. The study team reported that early implementation of public health measures, including targeted, aggressive containment through swift and effective contact tracing and quarantining, were likely responsible for suppressing COVID-19 infection numbers in Singapore.

Published in *PLOS ONE* in March 2021, the study explored how a bigger outbreak with an early peak in infections and

an increase in both confirmed and actual infections and deaths would have resulted, if mitigation interventions were instead implemented.

Quantifying the impact of loneliness in old age

A first-of-its-kind study that quantified the impact of loneliness on life expectancy and health status has shown that lonely older adults not only lived at least three years less long but were also less healthy and active than their peers who didn't perceive themselves as lonely.

The joint study led by Assistant Professor Rahul Malhotra and Associate Professor Angelique Chan and published in the *Journal of the American Geriatrics Society* in July 2021, highlighted the serious need for addressing loneliness that has been further accentuated during the COVID-19 pandemic in an increasingly ageing global population. Asst Professor Malhotra also shared the study findings in *The Straits Times* podcast series 'Health Check'.

DocTalk

Helping older folk stay connected

Ensuring older people have smart devices and access to the Internet as well as the ability to use them can alleviate the loneliness felt from social distancing



Rahul Malhotra

The advice in many countries is for those aged above 60 to remain at home because they have a higher risk of severe Covid-19 disease. On March 24, Singapore issued an advisory for older people to avoid social gatherings and crowded places as far as possible and to go out only for essential purposes such as to buy food. Then, on March 31, Singapore urged extra precautions to be taken while interacting with older family members. For instance, users with individuals should avoid visiting older family members. Additionally, consequent to local evidence of the transmission of Covid-19 during social activities and gatherings among older people, all older person-centric activities conducted by government agencies are suspended till April 30.

It is important to note that while broad physical or safe-distancing advisories apply to all individuals, many are targeted at older people. A likely consequence of the Covid-19 control measures will be the voluntary or involuntary physical separation of older people. The former is when older people do as the movers and/or at the advice of their family members, subsequent to advisories, while involuntary separation is done consequent to formal government orders.

Given what is known about the epidemiology and transmission dynamics of Covid-19, the physical separation of older people may be a sound public health strategy.

However, it is important to consider the psychosocial impact of such a strategy on older people and take pre-emptive steps to mitigate it. Already, older people are more likely to have a lower extent of connections with family members outside the household or with friends, and to feel lonelier. Data from a national survey of 4,549 older Singaporeans, conducted by the Centre for Ageing Research and Education (Care) at the Duke-NUS Medical School, Singapore, in 2016 to 2017, clearly shows a sharp fall in social network and an increase in loneliness with age. The proportion of those who have a weak social network increased from nearly 30 per cent in those aged 60 to 69 years to about 45 per cent in the group aged more than 80 years. The proportion of those who are lonely further reduced their social network and increase their loneliness. Those aged above 70 years, who are even more likely to be socially isolated, are worse off. Weak social connections and loneliness are linked to a multitude of bad health outcomes, including cognitive decline, anxiety, heart disease and mortality, among older people.

From research done by Care, we know that older Singaporeans with a lower extent of social network are more likely to be depressed, and loneliness increases the risk of mortality among them. These are not light consequences. Yet, we tend to ignore them as they may not always be immediate and obvious. People must be mindful of not only the immediate, but also the long-term well-being of older people. Making use of technology, be it landline or mobile phones and/or Internet-based communication tools, such as messaging apps, conferencing platforms or online social networks, is the key way forward.

In that same national survey conducted by Care mentioned earlier, we found that 58 per cent of older Singaporeans reported that they did not use the Internet at all. And a per cent reported that they did use the Internet, but faced difficulty in doing so due to their health condition. Again, these numbers were greater for those of higher age.

Older people may need help with procuring devices and learning how to use them and to navigate the Internet. Communication apps or platforms may be new to them and thus they may need to be guided to use these in a safe and effective manner.

Family members can ensure older family members have access to Internet-enabled devices and are familiar with the common device features and settings. They should reach out and stay in touch with older family members. Of course, this should be done while observing device hygiene, personal hygiene and safe-distancing precautions recommended in the context of Covid-19.

Community organisations can provide medium-to-long-term rental of Internet-enabled devices. They can also provide online links to simple, lite-sized Internet or communication-app or platform user guides in the four official languages of Singapore as well as commonly spoken dialects.

Equipping older people with safe Internet use will have collateral benefits, such as ability to perform routine banking or financial transactions online and to maintain continuity of care for their chronic health conditions through video consultations.

Collectively, we will have to make sure older people have safe access to Internet-based communication tools and are able to navigate such tools. This is a concrete way to ensure their physical separation does not lead to undesirable psychosocial outcomes.

ST ILLUSTRATION: CEL GULAPA



Collectively, we will have to make sure older people have safe access to Internet-based communication tools and are able to navigate such tools. This is a concrete way to ensure their physical separation does not lead to undesirable psychosocial outcomes.

• Dr Rahul Malhotra is head of research at the Centre for Ageing Research and Education as well as an assistant professor for health services and systems research at the Duke-NUS Medical School, Singapore

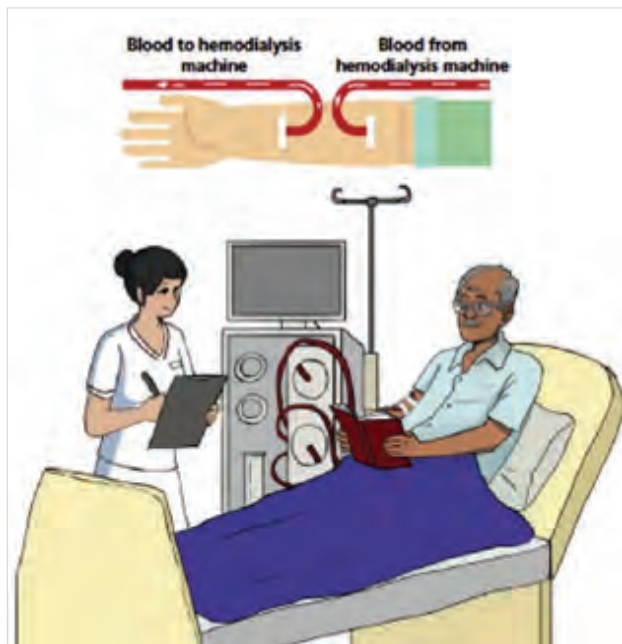
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Improving hypertension management in low- and middle-income countries

A multi-country trial spanning Bangladesh, Pakistan and Sri Lanka identified a cost-effective hypertension intervention led by community health workers that could be scaled up in low- and middle-income countries to reduce the overall vascular disease burden.

The study, published in *The Lancet Global Health* in May 2021, was led by Professor Tazeen H Jafar and Professor Eric Finkelstein in collaboration with health authorities in the three countries.

In another study published in *The Lancet Global Health* in September 2021, Professor Jafar and Professor Marco Peres, along with the NCD Risk Factor Collaboration Network, demonstrated the feasibility of using primary prevention as well as enhanced treatment and control strategies to reduce hypertension prevalence in middle- and low-income countries.



Helping end-stage renal disease patients to make informed choices with the use of illustrations in the patient decision aid tool

Ozdemir, S et al. 2021. "Patient Decision Aid Development for Older Adults With End-Stage Kidney Disease in Singapore." *Kidney International Reports* 6 (11): 2885–96. <https://doi.org/10.1016/j.ekir.2021.08.027>.

The study informed healthcare policymakers globally that universal health insurance should be complemented with additional measures, such as strengthening primary care, updating hypertension management guidelines based on evidence and country-specific contexts, training the healthcare workforce and providing a robust system of drug procurement and distribution.

A new and improved emergency risk prediction tool

Associate Professor Bibhas Chakraborty and Associate Professor Liu Nan have developed the Score for Emergency Risk Prediction (SERP) tool to provide an early and accurate estimate of patients' risk of death in the emergency department. The study, published in *JAMA Network Open* in August 2021, demonstrated that the SERP tool has better prediction performance than existing triage scores. The tool was also easy to implement to ascertain patients' risk levels in the emergency department, with the potential to be applied as a valuable risk stratification tool under a wide range of circumstances and healthcare settings.

End-stage treatment decision tool helps empower elderly patients

Assistant Professor Semra Ozdemir has developed a new patient decision aid to help end-stage renal disease patients make more informed choices by systematically reviewing available treatment options.

Targeted at elderly patients in an Asian cultural context, the tool provides a balanced overview of available treatment options by taking into consideration factors like expected survival, quality of life, medical cost and caregivers' preferences. As a result, patients will feel empowered to make decisions that are most in line with their values and needs and communicate them with family and physicians. The caregivers would also be better able to support and respect patient decisions.

With their findings published in *Kidney International Reports* in September 2021, the team is currently designing a web-based aid that can be used during counselling sessions in renal clinics across Singapore.

The importance of addressing end-of-life care and death

Researchers from Duke-NUS, Duke University Global Health Institute and their collaborators conducted a study where they ranked 81 countries on how well their health systems provide for the physical and mental wellbeing of patients at the end of life. Six countries earned an A grade and 36 earned grades D or F; Singapore ranked 23rd globally with a B grade.

The study, led by Professor Eric Finkelstein from HSSR and Director of the Lien Centre for Palliative Care, aimed to spur action from policymakers to improve conditions for dying patients, such as loosening restrictions on pain medications given to comfort those at the end of life. The findings from the study were outlined in three papers published in the *Journal of Pain and Symptom Management* in November and December 2021.



Lung cancer is one of the leading causes of cancer-related deaths in Singapore, with approximately 70 per cent of the patients diagnosed at advanced stages. Early detection of lung cancer through screening is potentially an effective strategy to improve patient outcomes.

My research aims to address the question of whether it is cost-effective to use low-dose computed tomography (LDCT) technology to establish a national lung cancer screening programme, which is currently not available in Singapore. By looking into which high-risk populations to screen and at what intervals, the research has the potential to influence screening guidelines and subvention decisions, which may ultimately improve prognosis for lung cancer patients through early diagnosis and treatment.

As cost-effectiveness analysis was a new area for me after completing my PhD, the support given by my mentor, Professor Eric Finkelstein proved to be instrumental. He gave insightful advice based on his deep expertise and refined approach to health technology assessment, and I was able to tap on his network of local oncologists and biostatisticians for input.

The Khoo Postdoctoral Fellowship has further enabled my research by providing salary support for the duration of the study. The Fellowship has also enabled me to develop in-demand skills in health technology assessment. I am grateful for the opportunity to pursue a meaningful research question, which has the potential to have an impact on healthcare outcomes.

Khoo Postdoctoral Fellow Dr Chay Junxing

Research Fellow, The Lien Centre for Palliative Care

NEUROSCIENCE AND BEHAVIOURAL DISORDERS (NBD) PROGRAMME

The NBD faculty and staff made significant contributions to research and education in 2021. We have identified a gene complex that regulates brain development. We have created mini-brains in a Petri dish that mimic critical aspects of Parkinson’s disease, offering an invaluable tool for studying neurodegeneration and developing therapeutics. Furthermore, we have developed a cell therapy strategy for Parkinson’s disease and revealed how it works, leading to the preparation for a clinical trial for treating the debilitating illness. These achievements owe largely to the outstanding work delivered by our graduate students and postdoctoral fellows, several of whom were awarded the Young Individual Research Grant from the National Medical Research Council and Khoo Postdoctoral Fellowship. I am also delighted to see the programme’s infrastructure such as the Stem Cell and Genome Editing (SCAGE) core facility supporting investigators across Singapore to do research. Joined by two new faculty members, NBD is poised to make further progress in the coming years.”



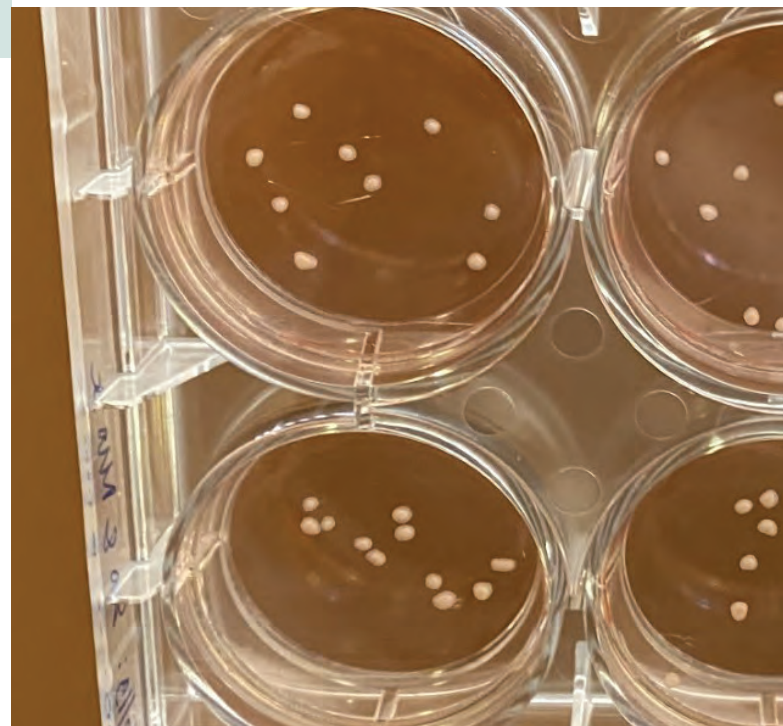
Professor Zhang Suchun

Director, Neuroscience and Behavioural Disorders Programme

Activating fruit fly brain stem cells using Histone lysine methyltransferase Pr-Set7

In a study conducted using *Drosophila* (fruit fly) larvae, Professor Wang Hongyan has revealed how histone lysine methyltransferase (Pr-Set7), an enzyme important for maintaining genome stability, helps activate dormant brain stem cells into functional neurons—a critical step in brain development.

Defects in this activation process are associated with several neurodevelopmental disorders, including autism and Alzheimer’s disease. By identifying the key proteins involved in the process, this study, published in *EMBO Reports* in February 2021, paved the way for the development of enhanced therapeutic interventions against such disorders.



Mini-brains that mimic the major pathological features of Parkinson’s disease

Fused-in sarcoma mutations lead to cognitive deficits in neurological disorders

In her previous study published in *PNAS* in 2020, Assistant Professor Wong Peiyan demonstrated how dysfunctions in specific proteins lead to neurological disorders, including amyotrophic lateral sclerosis (ALS) and frontotemporal dementia (FTD).

Building on this, Asst Prof Wong has shown more recently how disease-causing mutations in the protein Fused-in Sarcoma (FUS), which is involved in the regulation of gene expression, lead to cognitive deficits. ALS-linked FUS mutations disrupt protein homeostasis and mitochondrial functions, which result in abnormal brain structure and connectivity. The findings, published in *Acta Neuropathologica Communications* in January 2021, allow scientists to better understand the etiologies of severe neurological disorders.

Mini-brains that mimic Parkinson's disease

In a study published in the *Annals of Neurology* in September 2021, Associate Professor Shawn Je and

Assistant Professor Alfred Sun recreated Lewy bodies—a hallmark of Parkinson's disease in human patients' brains—for the first time in the laboratory.

The team, including researchers from the Genome Institute of Singapore and National Neuroscience Institute, have created mini-brains, which mimic the major pathological features of Parkinson's disease that cannot be recreated in laboratory models. This built upon their success in culturing human midbrain-like organoids in a dish in 2016.

The three-dimensional and multicellular mini-brains grown from human stem cells will enable further investigations into why and how Lewy bodies form in human brain cells and screening for drugs that can potentially stop disease progression.

Importance of m6A and Ythdf in learning development

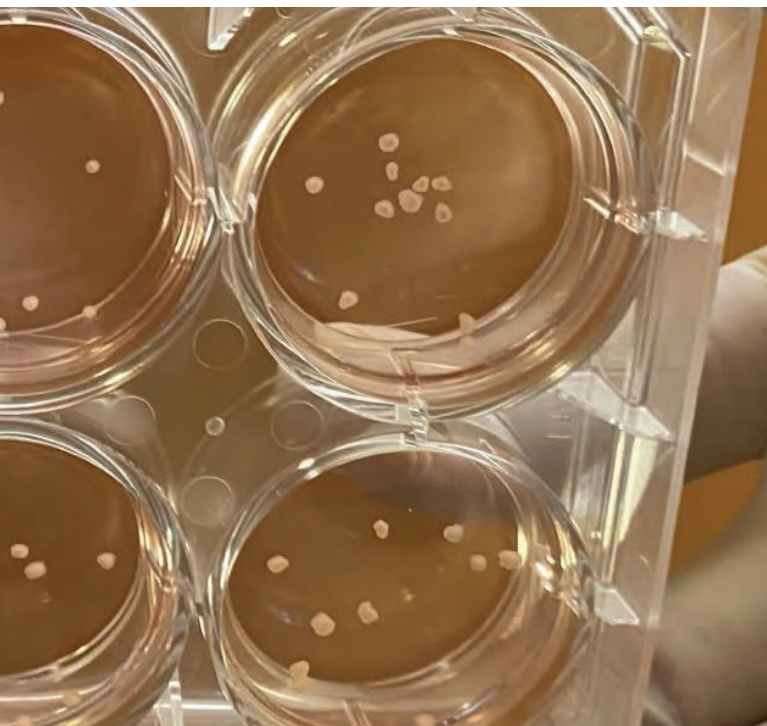
Associate Professor Adam Claridge-Chang and his team have revealed that mRNA N6-methyladenosine or m6a modification and its recognition by the cytoplasmic reader, Ythdf, are important for supporting normal memory formation. They also demonstrated that m6a was preferentially deposited on genes with low translational efficiency in *Drosophila*.

The results, published in *Nature Communications* in March 2021, highlight the importance of m6A and Ythdf in promoting the translation of neural genes that are critical for the development of normal learning.

Identification of mechanisms governing the reactivation of neural stem cells

In a study published in *The EMBO Journal* in August 2021, Professor Wang Hongyan and her team identified the molecular mechanisms responsible for the reactivation of dormant neural stem cells (NSCs) into functional neurons.

This was among the first studies to show that microtubules in the primary protrusions of dormant NSCs are oriented plus-end outwards, and are largely acentrosomal. The team also demonstrated that Mini Spindles-dependent assembly of acentrosomal microtubules and kinesin-2-dependent E-cadherin localisation at NSC-neuropil contact sites are essential for NSC reactivation.



The findings serve as a general paradigm that can be applied to understand activation mechanisms in other types of dormant stem cells in both *Drosophila* and mammals.

Advances made in stem cell treatment for Parkinson's disease

In a study published in *Stem Cell* in January 2021, Professor Zhang Suchun demonstrated how human embryonic stem cell-derived neuron subtypes grafted into mouse Parkinson's brain models reset the host neuronal circuitry and restored lost motor function.

In another study published in *Nature Medicine* in March 2021, Prof Zhang and his collaborators from the University of Wisconsin-Madison described a successful, personalised stem cell therapy leading to a robust improvement in motor and behavioural symptoms. Owing to its high efficacy and other advantages, this therapy holds great potential for clinical translation.

New partnerships and programmes open doors for pioneering opportunities

Leveraging the School's strong local collaborations—in particular, with SingHealth Principal Investigators and NUS faculty—Duke-NUS successfully launched major research programmes, including the SingHealth Duke-NUS Regenerative Medicine Institute and the SingHealth Duke-NUS Cell Therapy Centre in May 2021.

The SingHealth Duke-NUS Institute of Biodiversity Medicine was launched in September 2021 to promote human health and wellness by focusing on three key research programmes: Herbal Biodiversity and Medicine, Food Biodiversity and Nutrition and the Urban Biodiversity and Wellness.

Separately, the SingHealth Duke-NUS Institute of Precision Medicine and SingHealth Duke-NUS Genomic Medicine Centre will be integrated to strengthen the SingHealth Duke-NUS Academic Medical Centre's position as a world leader in genomic clinical care.

The School also launched new educational and training programmes such as the Graduate Certificate in Health Services Innovation and Data Science and Analytics courses. These programmes will not only equip the next generation of researchers with valuable skill sets but also support research grant funding.



Managed by Dr. Gunaseelan (left), Duke-NUS' Stem Cell and Gene Editing Core Facility provides services based on two Nobel Prize winning technologies – induced pluripotent stem cell (iPSC) reprogramming and CRISPR gene editing enabling advances to be made in stem cell treatment and other applications.

FROM OUR RESEARCH CENTRES

In 2021, faculty and staff in the Centre for Aging Research & Education (CARE) continued to contribute to research and education that have furthered the Centre's vision of enabling our ageing population "to achieve health, social inclusion and a high quality of life".



CARE's research aims to provide evidence for formulation, adaptation and implementation of policies and programmes for the benefit of older adults and their caregivers. In the period April 2021—March 2022, CARE garnered three research grants amounting to \$675,000, published 21 research papers and three policy/research briefs, and made 23 presentations at research, practice or policy fora. One of the research papers, published in the *Journal of the American Geriatrics Society*, quantified the years of life and the years of healthy life lost due to loneliness among older adults, and attracted considerable media attention locally and internationally.

CARE's educational initiatives aim to update policymakers, researchers and practitioners with the latest and relevant research in the field of ageing, and equip them with tools to understand and conduct research. In 2021, CARE delivered six expert lectures, six research method workshops, trained three interns, and organised two symposia.

Looking ahead, we remain committed to making a positive change on the lives of older Singaporeans and their caregivers. One major project will be additional rounds of a foundational longitudinal survey, called THE SIGNS study, which aim to inform ageing-related policy and practice in Singapore.

Assistant Professor Rahul Malhotra

Deputy Director, Centre for Ageing Research & Education



Pre-hospital & Emergence Research has great potential to impact outcomes for patients, as we deal with patients at their greatest point of need. Very often, outcomes are time-sensitive, and it is important to use best evidence and science to advise the right treatment, for the right patient, at the right time. At PERC, we aim to build a multidisciplinary research team, making use of cutting-edge Health Services Research approaches to address critical emergency care issues to save more lives, and improve outcomes for our patients.



Professor Marcus Ong

Director, Pre-hospital & Emergence Research Centre



The language of medicine and discovery is becoming increasingly complex as imaging data, multi-omics, and massive patient and consumer health data sets dominate the medical information landscape.



CQM develops novel statistical methods that empower investigators to interpret and demystify these complexities, and our triple arms of Research, Education, and Service help enable the rapid discovery of therapies, devices and interventions that will improve medical care and population health.

In the past year, we have doubled the number of incoming PhD students, to help train the next generation of data scientists; transformed the Duke-NUS medical student research education curriculum to help prepare medical students to recognise and pursue exciting research opportunities; and created analytic platforms to enable multi-site collaborations in the pursuit of novel therapeutics.

Professor Roger Vaughan

Director, Centre for Quantitative Medicine



The Centre of Regulatory Excellence (CoRE) aims to develop future-ready regulatory professionals through our education programmes and thought leadership to enhance health products and systems regulation and policy innovation.



Despite the challenges of the pandemic's second year, CoRE education and think-tank activities flourished through virtual platforms. We reached a wider geographic range of overseas participants than before and launched workshops in medical devices and facilitating Good Reliance Practices among national regulatory authorities.

The inaugural Sir Alasdair Breckenridge lecture, honouring CoRE's first Chairman, was delivered by Sir Jeremy Farrar, Director of the Wellcome Trust. This was in conjunction with the launch of the Alasdair Breckenridge education fund and the graduation of our Graduate Certificate Programme's 2020/21 cohort. We hosted our third regional multi-stakeholder roundtable after the successful launch of the Coalition to Accelerate Patient Engagement (CAPE) in Asia-Pacific in 2020.

The Centre also actively contributed to COVID-19 discussions through webinars, thought pieces and interviews.

Professor John Lim

Director, Centre of Regulatory Excellence



Despite, or perhaps because of, the challenges brought on by COVID-19, LCPC had another successful year. COVID forced us to rethink how we conducted our research and education activities.

On the research front, we transitioned from in-person to on-line data collection for several projects and increased our focus on designing and evaluating interventions that do not require in-person visits. We also increased our regional and global footprint. We published the Cross Country Comparison of Expert Assessments of the Quality of Death and Dying 2021, contributed to the Lancet Commission's Value of Death report, and published dozens of other manuscripts focusing end-of-life care in Singapore and the region.

On the education front, we delivered all courses online, including new courses focusing on palliative care in the emergency department, nursing homes, and in advanced kidney disease patients. Many of these courses were over-subscribed and all received positive feedback from participants.

Next year we will continue to focus on serving the needs of the local community but will further expand our research and educational footprint beyond Singapore in efforts to improve the end-of-life experience both locally and regionally.

Professor Eric Finkelstein

Director, Lien Centre for Palliative Care



To transform healthcare and biomedical research, “expert AI” systems alone are not enough.

We need to become the “expert” users and developers of AI systems in medicine, and here at the Centre for Computational Biology at Duke-NUS, we form the next generation of scientists who will do exactly that. Our expertise and training in computational biology, bioinformatics, machine learning and AI is always inspired by the need to address important clinical and biomedical questions relevant to the Singaporean population and beyond. Notably — in 2021 the Centre expanded its already vast repertoire of knowledge and expertise to include systems genetics applied macrophage immunometabolism led by Associate Professor Jacques Behmoaras, and machine learning/AI applied to single-cell transcriptomics which is led by Principal Research Scientist John Ouyang. This will further boost the opportunities for new cross-disciplinary collaborations and ambitions for cutting-edge medical research in Singapore, which build on Duke-NUS’ core strengths in molecular, cellular and biomedical science.

Associate Professor Enrico Petretto

Director, Centre for Computational Biology



AWARDS AND ACCOLADES

Principal investigators receive prestigious grant funding

Duke-NUS scientists continue to garner major national funding awards, establish key partnerships and initiate new research programmes.

Five Duke-NUS principal investigators from three signature research programmes were awarded Large Collaborative Grant funding from the National Medical Research Council. Their work will advance research in infectious diseases, vascular cognitive impairment and glioblastoma,

an aggressive cancer affecting the brain. This is the School's our strongest performance in this prestigious grant call to date.

Two Duke-NUS scientists receive Competitive Research Programme grant

Professor Derek Hausenloy from the Cardiovascular and Metabolic Disorders Programme and Professor Ooi Eng Eong from the Emerging Infectious Diseases Programme, each secured a position as a Lead Principal Investigator for the National Research Foundation - Competitive Research Programme.

Recipients of Large Collaborative Grant funding from the National Medical Research Council



Professor David Matchar
Health Services and
Systems Research
Programme

Project:

Prevention of and biomarkers for vascular cognitive impairment



Professor Patrick Tan
Cancer and Stem
Cell Biology
Programme

Project:

Implementing precision medicine in clinical practice: the approach for glioblastoma, a neurological disease with unique spatiotemporal complexity



Project:

Integrated Innovations in
Infectious Diseases (I3D)

(From L-R) Professors Gavin Smith | Wang Linfa | Ooi Eng Eong
Emerging Infectious Diseases Programme

THE STRAITS TIMES

Front-line fighters against Covid-19 collectively named The Straits Times Singaporean of the Year 2020



Singaporean of the Year finalists with President Halimah Yacob (first row, centre) at the Istana during The Straits Times Singaporean of the Year 2020 award ceremony sponsored by award presenter UBS. ST PHOTO: DESMOND WEE



Shabana Begum

PUBLISHED FEB 2, 2021, 4:43 PM SGT

SINGAPORE - Covid-19 front-liners, who worked long hours and often went beyond the call of duty to keep Singaporeans safe amid the pandemic, have collectively been named The Straits Times Singaporean of the Year 2020.

This year, the recognition goes not to an individual but to all the selfless workers and volunteers in healthcare, security and other areas who stepped forward in the past year.

Shaking off fear of being exposed to possible risks of infection, many of these heroes worked long hours in personal protective equipment - sweat dripping from their hair, and faces marked by the tight goggles and N95 masks.

Source: The Straits Times © SPH Media Limited. Permission required for reproduction

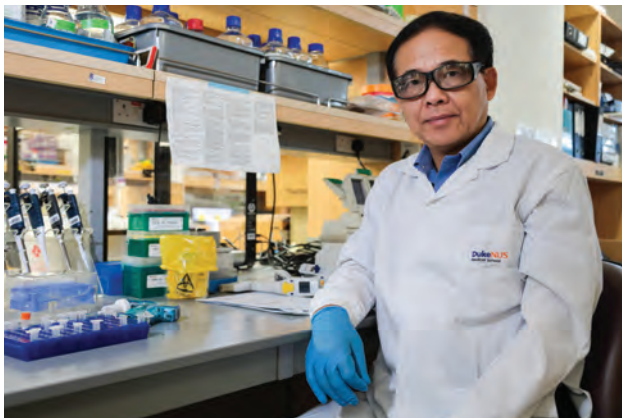
Professor Ooi Eng Eong receives two awards from The Straits Times

Professor Ooi Eng Eong from the Emerging Infectious Diseases Programme was among five frontline healthcare workers who received *The Straits Times'* Singaporean of the Year award in 2020. He was also among six heroes who were named *The Straits Times'* Asians of the Year 2020 for their devotion to resolving the pandemic.

These awards are recognition of the hard work and dedication to vaccine development displayed by Prof Ooi and his team in the fight against the pandemic.

Professor Wang Linfa elected to the American Academy of Microbiology

In 2021, Professor Wang Linfa from the Emerging Infectious Diseases Programme was elected to the American Academy



Professor Wang Linfa was elected to the American Academy of Microbiology in 2021.

of Microbiology, the honorific leadership group within the American Society for Microbiology. He was among 65 newly elected fellows last year who were chosen following a highly selective, peer-review process, based on their records of scientific achievement and original contributions that have advanced microbiology.

Prof Wang is an expert in zoonotic diseases, bat immunology and pathogen discovery whose award-winning work has resulted in more than 400 scientific papers—including top publications in *Science*, *Nature* and *Lancet*. Prof Wang has also accelerated the understanding and testing of the SARS-CoV-2 virus, having delved into the likely origins of the pandemic and invented a novel SARS-CoV-2 serological test, cPass™, the first and only such test authorised in the US. The testing technology has also received a notice of allowance for the patent application. His contributions offer a new vantage point to view the COVID-19 pandemic and the field of microbiology as a whole.

Duke-NUS clinician-scientist and his team win highly-celebrated international awards

Professor David Matchar and his team from the Health Services and Systems Research Programme received two awards at the International Stroke Conference 2021 in recognition of their efforts to enhance primary care services for patients with chronic health conditions.

The randomised controlled trial investigated the effect of incentives on improving the uptake of outpatient rehabilitation services among stroke patients in Singapore, highlighting the potential of providing incentives in health



Professor David Matchar and his team clinched two awards at the International Stroke Conference 2021.

policies to better manage patients with chronic conditions such as strokes.

As a result of the study, Prof Matchar received the Stroke Rehabilitation Award from the American Stroke Association, which recognises the best original research in clinical rehabilitation and recovery strategies. His team also received the Paul Dudley White International Scholar Award for submitting the highest ranked abstract from Singapore.

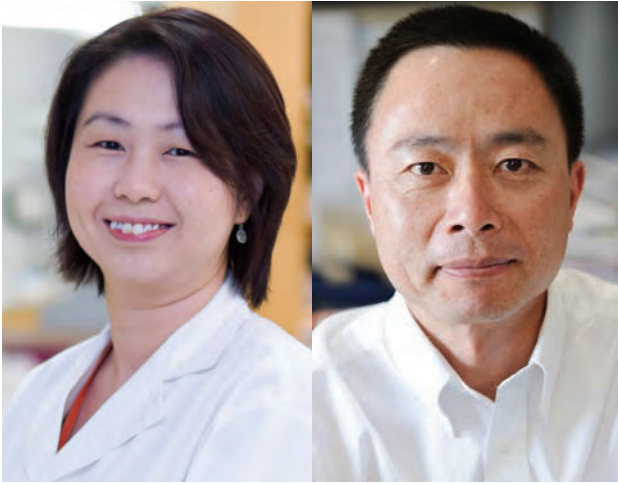
Celebrating academic excellence with appointments to Provost's Chair Professorships

Professor Lok Shee Mei from the Emerging Infectious Diseases (EID) Programme and Professor Zhang Suchun from the Neuroscience and Behavioural Disorders Programme have been awarded the prestigious NUS Provost's Chair Professorships.

Both faculty members received the Professorship in recognition of their outstanding research and impactful academic contributions at an international level.

Prof Lok has played a key role in placing Duke-NUS' EID Programme on the global map for infectious diseases research, through extensive work that uses advanced structural biology methods to characterise viral infections. Her group was among the first to determine the structure of the Zika virus during the recent global outbreak.

In 2001, Prof Zhang was the first in the world to differentiate neural stem cells (NSCs) from human embryonic stem cells and induced pluripotent stem cells (iPSCs). He currently spearheads the Duke-NUS Stem Cell and Gene Editing



Professor Lok Shee Mei (left) and Professor Zhang Suchun (right) were awarded the prestigious NUS Provost's Chair Professorships.



(SCAGE) Core Facility that provides iPSC extraction and genome editing (CRISPR) services to create knockout stem cell lines and transgenic models for studies in Singapore.

Winning the Japanese Cancer Association International Award 2021

Professor Teh Bin Tean from the Cancer and Stem Cell Biology Programme won the Japanese Cancer Association International Award 2021, which honours foreign researchers stationed in the Asia and Oceania, who have made outstanding contributions to the Cancer Society of Japan.

Prof Teh was recognised for his research on “carcinogenic mechanisms of cholangiocarcinoma by fluke and urothelial

cancer by aristocholic acid” and his contributions to the field of Asian cancer genomics. The award was presented on 2 October 2021 at the Association’s annual meeting.

Multidisciplinary COVID-19 Research Workgroup earns top honours at the National Medical Excellence Awards

Four teams from the SingHealth Duke-NUS Academic Medical Centre were recognised at the 2021 National Medical Excellence Awards. The national-level award from the National Medical Research Council recognises clinicians and healthcare professionals who made outstanding contributions to the advancement of healthcare.



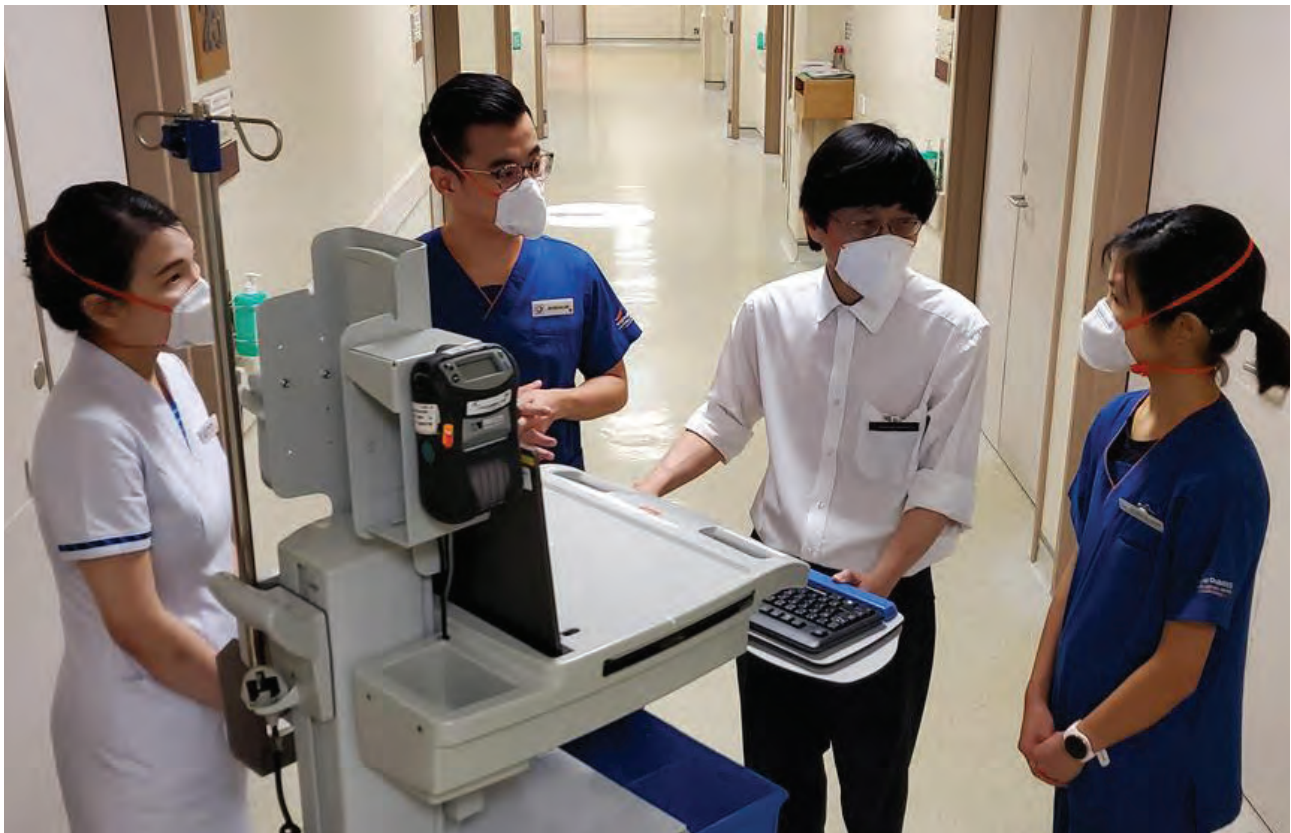
Among them was the COVID-19 Research Workgroup (RWG), comprising scientists and clinicians from Duke-NUS, A*STAR and the National Centre for Infectious Diseases, who have contributed significantly to COVID-19 research and the effective management of the pandemic response in Singapore.

The COVID-19 RWG along with a team from Changi General Hospital received National Clinical Excellence Team Awards. Duke-NUS Associate Dean of Residency Education Professor Tan Hak Koon received the National Outstanding Clinician Educator Award while Clinical Associate Professor Wong Kok Seng was named National Outstanding Clinician Mentor.

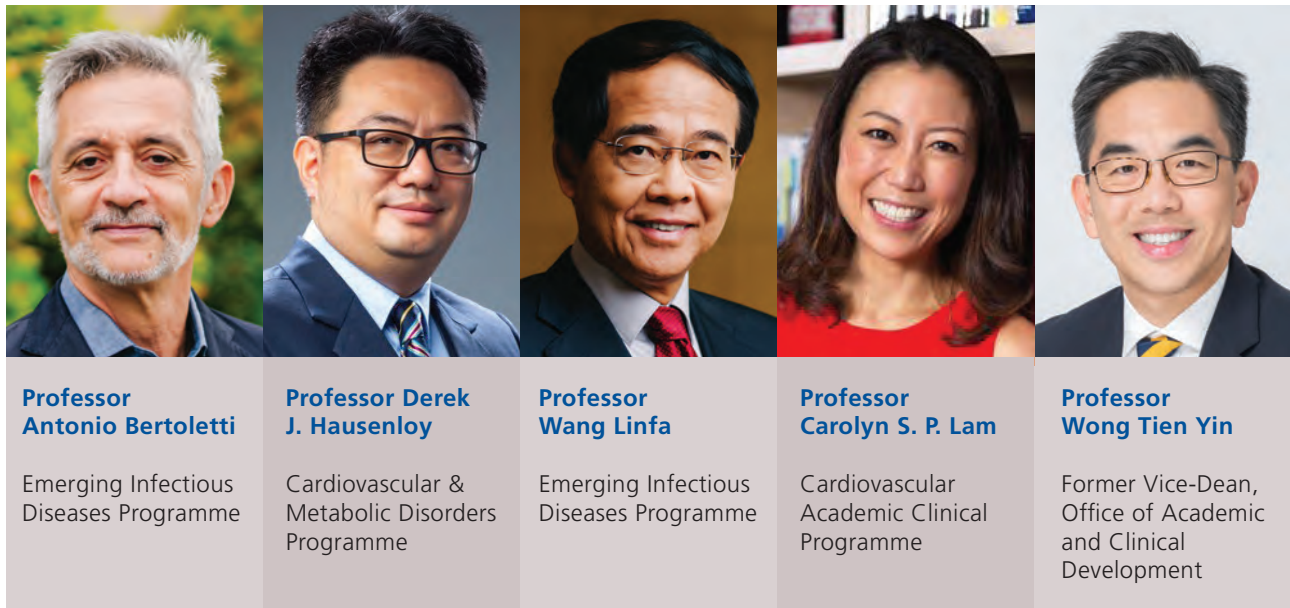
Duke-NUS scientists make another strong showing among world's highly cited researchers

In 2021, five Duke-NUS scientists were ranked among the world's Highly Cited Researchers by data analytics firm Clarivate. The names on this list of 6,602 researchers from 70 countries were drawn from their publications that rank in the top one per cent by citations for field and publication year in the Web of Science citation index.

In addition to this recognition, more than 80 researchers from the SingHealth Duke-NUS Academic



Duke-NUS Associate Dean of Residency Education Professor Tan Hak Koon (second from right) received the National Outstanding Clinician Educator Award 2021.



Duke-NUS researchers from the Clarivate list

Medical Centre ranked among the World's Top Two Percent Scientists List created by Stanford University. The list, launched in October 2021, identified more than 186,000 top scholars in their areas of specialty whose publications are most frequently cited by other authors around the globe.

Scientist from Duke-NUS joins EMBO Young Investigator Programme

Assistant Professor Lena Ho from the Cardiovascular & Metabolic Disorders Programme is among 26 new members of the EMBO Young Investigator Programme in 2021.

EMBO Young Investigators benefit from a variety of networking and training opportunities and have access to core facilities at the European Molecular Biology Laboratory in Heidelberg, Germany.



Assistant Professor Lena Ho was selected for the EMBO Young Investigator Programme in 2021

BREAKING NEW GROUND IN COVID-19 INNOVATIONS

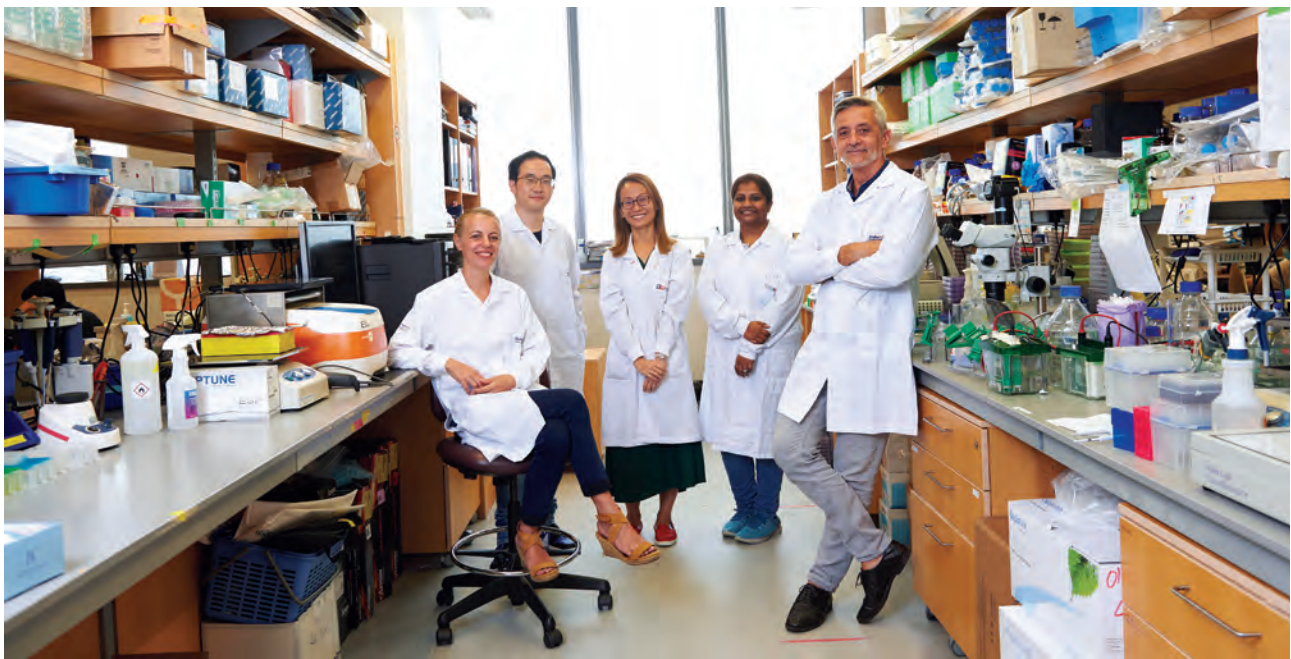
As a world-class research powerhouse, Duke-NUS' scientists tackle the most pressing healthcare challenges for the benefit of Singapore and beyond. During the COVID-19 pandemic in particular, experts from the Emerging Infectious Diseases Programme worked with the School's Centre for Technology and Development to collaborate with local and international partners to promptly translate cutting-edge research into a full suite of products to combat COVID-19, including innovative diagnostic assays, vaccines and therapeutics.

Adding a new dimension to vaccine strategies: A simple T-cell test to show immune response to COVID-19

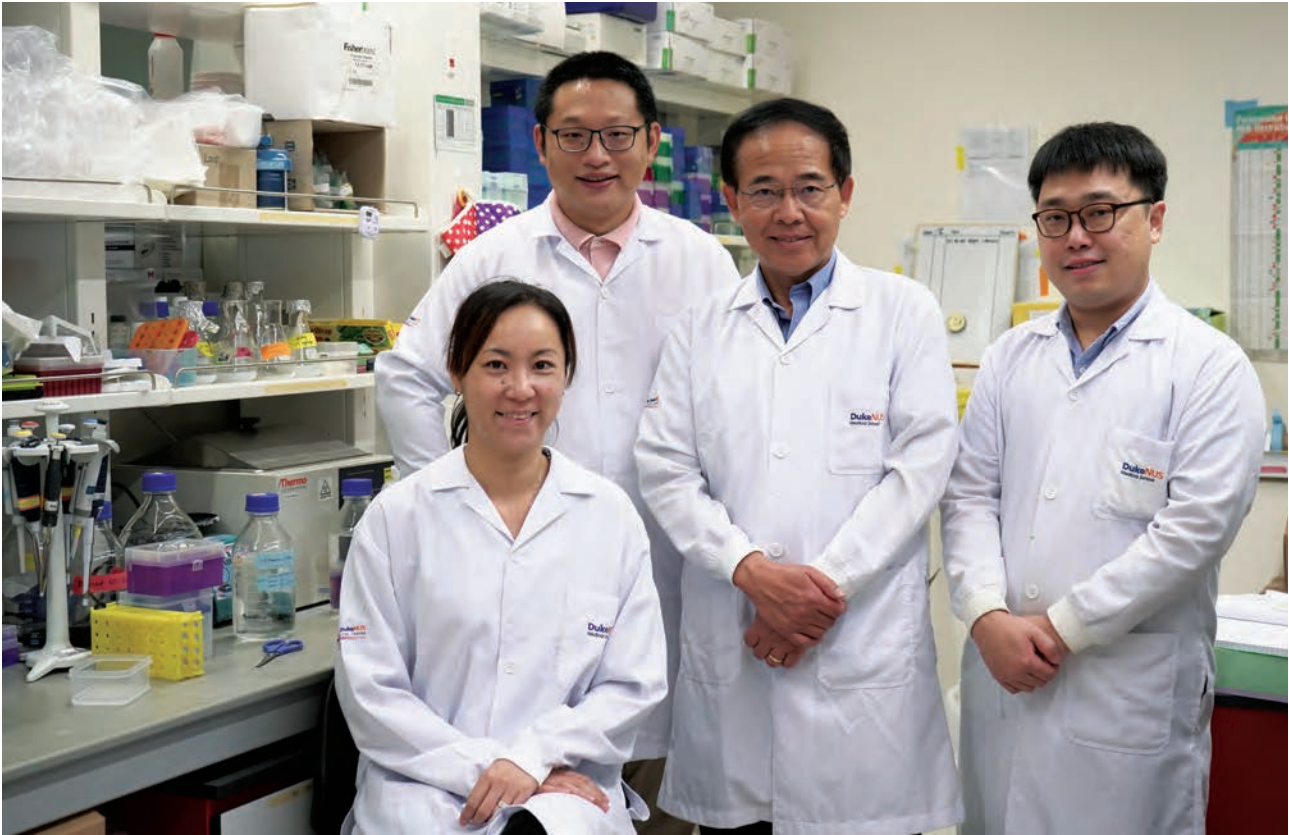
A growing body of data now demonstrates the importance of both T cells and antibodies in the coordinated immune response against SARS-CoV-2. But measuring SARS-CoV-2 spike-specific T-cell responses has not been easy or convenient as it requires specialised or expensive equipment.

To address this need, a team, led by Professor Antonio Bertoletti, showed that a simple and rapid test called Cytokine Release Assay (CRA), which identifies chemical signals released by T cells, can reliably identify and quantify SARS-CoV-2-specific T cells present in the blood of people who have been vaccinated against COVID-19 or have recovered from SARS-CoV-2 infection. Working with different blood samples from more than 200 people, the researchers demonstrated that the CRA test was as sensitive as existing methods used to find and measure T-cell activity. The team made their discovery in collaboration with researchers from the National Centre for Infectious Diseases and Singapore General Hospital and the findings were published in the *Journal of Clinical Investigation* in September 2021.

The development of the assay allows for a rapid and large-scale expansion of studies to track T-cell activity across the world and adds a new dimension to testing and vaccine strategies as the world continues to battle SARS-CoV-2 and the threat of new and emergent variants.



To make T cells more accessible to researchers, Professor Antonio Bertoletti and his team validated a method that can analyse T cells in less than a day, with less than three hours of work.



Professor Wang Linfa and his team are developing a new generation of vaccines that aims to provide protection against all known and unknown SARS-CoV-2 variants of concern, as well as future sarbecoviruses.

To bring this discovery to market, Duke-NUS partnered with Hyris, an innovation-based biotechnology company, to further develop this rapid SARS-CoV-2 T-cell test for clinical use globally.

A broad-spectrum vaccine for preventing future pandemics

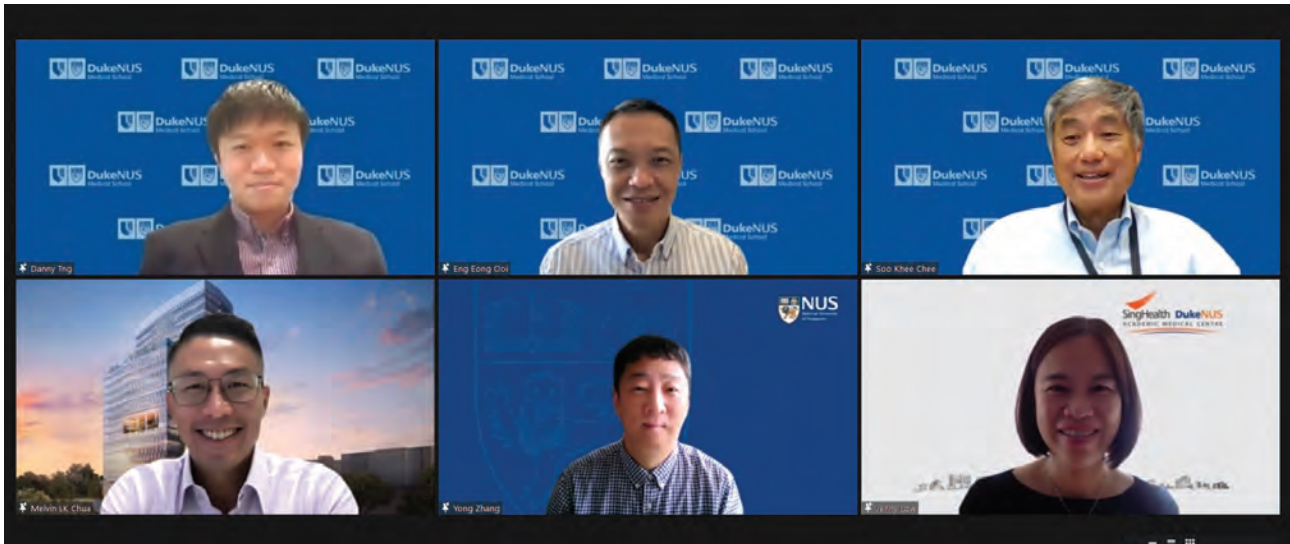
Having a vaccine that can protect against existing and new SARS-CoV-2 variants is an ambitious goal, but it's not entirely impossible and once available, it could be a powerful tool to possibly end the pandemic and reduce the impact—or even prevent—future ones.

A discovery by Professor Wang Linfa and his team boosted such hopes for a broad-spectrum vaccine that covers not only SARS-CoV-2 and its known variants of concern (VOCs)

but also future VOCs and other animal coronaviruses with known potential to cause severe disease in humans.

In this ground-breaking study, Prof Wang and his team, as well as scientists from the National Centre for Infectious Diseases, found that 2003 SARS survivors who had been vaccinated with the Pfizer-BioNTech mRNA vaccine produced highly potent functional antibodies that are capable of neutralising not only all known SARS-CoV-2 VOCs but also other animal coronaviruses that have the potential to cause human infection.

This group of viruses, called sarbecoviruses, relies on the ACE2 molecule to enter human cells. Both SARS-CoV-1 and SARS-CoV-2, as well as a number of coronaviruses circulating in animals such as bats, pangolins and civets, belong to this group.



Scientists from the SingHealth Duke-NUS Academic Medical Centre and NUS held a virtual media conference for the new COVID-19 saliva test.

The team explored the possibility of inducing pan-sarbecovirus neutralising antibodies that could block the common human ACE2-virus interaction to protect against all known and unknown SARS-CoV-2 VOCs, as well as future sarbecoviruses. The team published the findings in *The New England Journal of Medicine* in August 2021.

Commercialisation efforts are underway to develop a new generation of vaccines based on this discovery.

New COVID-19 saliva test a possible game changer for rapid screening

A potentially game-changing Antigen Rapid Test (ART) technology to diagnose COVID-19 has been developed by scientists from the SingHealth Duke-NUS Academic Medical Centre and NUS.

Dubbed the Parallel Amplified Saliva Rapid Point-of-Care Test, or PASPORT, the technology leverages a proprietary on-kit amplification technique to produce results from a saliva sample in minutes. Early clinical testing shows the kit outperforms existing ARTs, with nearly comparable sensitivity to the gold standard Polymerase Chain Reaction test.

The invention was borne out of a research collaboration between Duke-NUS, Singapore General Hospital (SGH) and National Cancer Centre Singapore—collectively member institutes of the SingHealth Duke-NUS Academic Medical Centre—and the National University of Singapore (NUS). Dr Danny Jian Hang Tng, a Duke-NUS alumnus and a Medical Officer at the Department of Infectious Diseases, SGH, and an adjunct Research Fellow at Duke-NUS' Emerging Infectious Diseases Programme, is the lead inventor. This research was published online in *Microchimica Acta* in December 2021.

Duke-NUS and SingHealth have filed intellectual property protection for the invention and have entered into a license agreement with Digital Life Line, a Singapore-based company. The inventors hope that through close collaboration with commercial partners, the product can be out in the market as soon as possible as countries around the world move to making treatments available faster and in primary healthcare settings.



PASPORT leverages a proprietary on-kit amplification technique to produce COVID-19 test results from a saliva sample in minutes.

Partnering with Duke University, Sen-Jam Pharmaceutical for new COVID-19 treatment

Associate Professor Ashley St. John is collaborating with Duke University Professor in Surgery Alexander Limkakeng and Sen-Jam Pharmaceutical, a start-up based in New York, USA, to test whether a novel combination of two proven drugs can be a safe and effective oral treatment for COVID-19.

When confronted with the virus, the immune system can enter a hyper-inflammatory state known as a “cytokine storm”, producing uncontrolled inflammation throughout the body leading to acute respiratory distress syndrome and death. The collateral damage to the lung tissue caused by inflammation is a major obstacle to recovery from COVID-19.

The therapeutic that Assoc Prof St. John is working on with her collaborators is a combination of a non-steroidal anti-inflammatory drug and an antihistamine that can potentially curtail runaway inflammation.

Having advanced into Phase II clinical trials in Nepal, the therapeutic hopes to offer a targeted approach to reduce inflammation, prevent progression of COVID-19 and improve COVID-19 outcomes.



Assoc Prof Ashley St. John collaborated with Duke's Professor Alexander Limkakeng and a US start-up Sen-Jam on a clinical trial to test the effectiveness of an oral treatment for the COVID-19.

OFFICE OF INNOVATION
AND ENTREPRENEURSHIP

PIONEERING INNOVATION







message from
**ASSOCIATE
PROFESSOR
CHRISTOPHER
LAING**

**VICE-DEAN FOR
INNOVATION AND ENTREPRENEURSHIP**

Innovation is a hallmark of Duke-NUS. Despite our relatively young age, we have made a name for ourselves in translating rigorous scientific research into real-world patient care, with more than 30 licences awarded and 20 start-ups spun off since the School was established.

And 2021 was another remarkable year when it comes to innovation at Duke-NUS. I am excited by the number of research projects that have been launched from the bench on their way to bedside, notably, a number of ground-breaking discoveries from the Emerging Infectious Diseases Programme that have already benefitted the world in combatting COVID-19 and will continue to have impact well into the future.

Our scientists from other Signature Research Programmes and Centres have also forged important partnerships with local and multinational industry partners, culminating in novel clinical tools and therapeutics that will ultimately enhance treatment outcomes for patients suffering from some of society's most impactful and chronic diseases such as cancer and heart diseases.

The strong innovative spirit of our scientists is underpinned by the School's close partnership with SingHealth. Together,

we create a seamless continuum to drive systematic translations of research from bench to bedside. Our longstanding collaboration with SingHealth was further strengthened last year by the establishment of the Academic Medicine Innovation Institute, which provides a virtual framework that connects innovators to facilitate collaboration and the sharing of best practices and pitfalls across the SingHealth Duke-NUS Academic Medical Centre (AMC). These networks and connections are critical to fostering a culture of innovation in our academic community.

To further grow our entrepreneurial ecosystem, we have streamlined processes to more efficiently enable scientists and clinicians to work collaboratively with industry partners. On the education front, we piloted a new Health Innovator Programme that gives our medical students a unique, immersive and hands-on entrepreneurial experience, further positioning our graduates for bright futures as the next generation of clinician-innovators, thought-leaders and creative carers.

With our strong research capabilities and close partnership with SingHealth, Duke-NUS is well positioned to translate cutting-edge biomedical discoveries into better health. I look forward to seeing innovation flourish at the School and the larger AMC ecosystem.

DUKE-NUS AND SINGHEALTH JOINTLY LAUNCH THE ACADEMIC MEDICINE INNOVATION INSTITUTE



The SingHealth Duke-NUS Academic Medicine Innovation Institute was launched virtually on 28 June 2021.

From a novel coronavirus immunity test to harnessing the medical benefits of video game consoles, innovations across the SingHealth Duke-NUS Academic Medical Centre (AMC) have been flourishing.

In a further boost to innovators across the AMC, Duke-NUS and SingHealth jointly launched the Academic Medicine Innovation Institute (AMII) through a virtual event on 28 June 2021.

Co-led by Associate Professor Christopher Laing, Vice-Dean for Innovation and Entrepreneurship, Duke-NUS, and Ms Lee Chen Ee, Group Director, Innovation and Transformation, SingHealth, the new Institute will provide a virtual framework to foster a culture of innovation and facilitate the sharing of best practices at the AMC.

Five priority areas were identified by AMII to support innovators across the AMC ecosystem.

These include:

- Eco-system building and strategic partnerships
- Co-development and test-bedding
- Adoption and scaling
- Culture building and developing human capital
- Emerging technologies and data

Highlighting the event's tagline of "Let Today's Ideas Take Flight for Tomorrow's Care", a panel comprising Professor Kenneth Kwek, Advisor to the AMII and SingHealth Deputy Group CEO (Innovation & Informatics), and the priority area leads answered questions from the audience to help the AMC's innovators better understand the new institute.

The virtual launch event was graced by Guests-of-Honour Professor Thomas Coffman, Dean of Duke-NUS, and Professor Ivy Ng, Group CEO of SingHealth, and attended by guests from across the AMC, as well as partners from Singapore's healthcare ecosystem.

ENHANCING HEALTH THROUGH TRANSLATIONAL RESEARCH

Singapore's first-in-man clinical trial for stem cell technology

Institutes and centres under the SingHealth Duke-NUS Academic Medical Centre and Cordlife Group partnered to test a novel technology that expands the number of blood-forming stem cells from stored umbilical cord blood (UCB) in a clinical trial. This is the first time a home-grown UCB cell therapy is being tested in humans.

The technology to be tested in this trial uses a laboratory-synthesised compound called C7 for *ex-vivo* expansion of haematopoietic stem and progenitor cells (HSPCs), which, in turn, enables specific cell therapy products to be manufactured for use in patients. This approach has the potential to improve treatment options for patients suffering from blood cancers and blood-related conditions.

Duke-NUS and SingHealth manage the patent for the application of C7 in expanding UCB HSPC through their Joint Centre for Technology and Development, which sealed the industry partnership with Cordlife to enable this clinical trial.

The study has received support from the Singapore Ministry of Health's National Medical Research Council under its Clinical Trials Grant-Industry Collaborative Trials Scheme.

Pivotal collaboration with Lion TCR brings hope to liver transplant patients

Duke-NUS and Singapore biotechnology company Lion TCR signed an exclusive licensing agreement to develop an innovative method of using gene-edited T cells to treat recurring cancers in donated organs, bringing hope to liver transplant patients around the world.

A common treatment for hepatocellular carcinoma—the most common type of primary liver cancer and the sixth most common cancer worldwide—is to completely remove the liver and replace it with a healthy one from a donor. However, hepatitis B-related hepatocellular carcinoma can recur in some patients following transplantation. To kill the cancer, doctors can inject T cells, which are specially designed to target hepatitis B material found in the cancer cells. However, liver transplant patients must take drugs that suppress their immune systems to prevent their bodies from attacking the transplants. This significantly hinders the effectiveness of T-cell therapy.

To overcome this limitation, Professor Antonio Bertoletti and his team from the Emerging Infectious Diseases Programme performed gene editing on the T cells to disrupt the functions



Upon collection after the delivery of a baby, cord blood is processed to extract stem cells and to prepare them for long-term cryopreservation. (Credit: Cordlife Group Limited)



From left: Dr Jinhyuk Chung, Xylonix's Chief Science Officer; Dr Chaw Su Yin, Research Fellow at Duke-NUS, and Asst Prof Ann-Marie Chacko from Duke-NUS' Cancer and Stem Cell Biology.

of enzymes involved in the metabolism of immunosuppressant drugs. Based on findings from their study, these “armoured” T cells were effective at killing liver cancer cells for up to four days even in the presence of immunosuppressive drugs.

By combining this novel gene-editing technology with the company's proprietary library of T-cell receptors (TCRs), Lion TCR aims to further enhance TCR therapy for liver cancer and other diseases. The modified T cells can also be used to treat other common conditions associated with immunosuppressant treatments, such as the reactivation of Epstein Barr Virus or cytomegalovirus in patients receiving immunosuppressants after stem cell or organ transplantation.

Partnership with Xylonix to integrate immunity drug translation and imaging capabilities

The research team led by Assistant Professor Ann-Marie Chacko from the Cancer and Stem Cell Biology Programme partnered with Xylonix—a Singapore-based biotechnology company—to optimise liposome drug formulations and

develop companion diagnostics for the latter's novel cancer immunity drug, called 010DS-Zn.

Through the collaboration, the team aims to enhance uptake of 010DS-Zn by tumours using a nanoscale drug delivery system, where specially designed liposomes carry both the drug and radioisotopes to permit real-time detection in living systems.

Enabled by *in vivo* nuclear medicine imaging, the physiochemical properties of liposomes can be optimised so that they are stable, have balanced drug-loading and drug-release profiles, and can be delivered to the tumour for a therapeutic effect that is comparable, if not superior, to the drug when given alone.

The team also explored opportunities to use multi-functional 010DS-Zn-loaded liposome as *in vivo* companion diagnostics to guide targeted delivery and dosing strategies at the clinical development stage.



Duke-NUS researchers can deposit their research tools with Ximbio, making these research tools available to a global audience.

Liposomes—a classic drug delivery system—are spherical vesicles composed of non-toxic phospholipid bilayers that closely resemble cell membranes. They can carry different types of drugs to more effectively treat diseases like cancer. But the potential application of liposomes as a drug-delivery system spans well beyond the field of cancer therapy. The technology can also significantly impact areas including infectious diseases and vaccine development, with the novel mRNA SARS-CoV-2 vaccines already relying on similar lipid-based nanoparticle delivery.

Collaboration with Ximbio extends the reach of novel research tools

Duke-NUS' novel research tools and antibodies became available to researchers around the world through a new

collaboration between the School's Centre for Technology and Development and Ximbio. Ximbio is the research tool trading arm of Cancer Research Technology UK and the world's largest non-profit organisation dedicated to life science research tools.

As the first medical school in Singapore to partner with Ximbio, Duke-NUS joins a group of prestigious universities and institutions from around the world. Under the collaboration, researchers at Duke-NUS can deposit their research tools including cell lines, antibodies and mouse models with Ximbio, making these research tools available to a global audience.

The partnership will make it easier for life science research tool companies and public sector researchers across the

world to source new products to augment their portfolios. Scientists can also use Ximbio's searchable database, extensive datasheets and supplier options to look for specific research tools.

Development of innovative cell therapeutics for cardiovascular diseases

Almost one in every three deaths in Singapore is caused by heart disease. Many patients live with weakened hearts that can no longer pump blood effectively or with heart muscles scarred stiff from a heart attack. The holy grail is to regenerate heart muscle and restore heart function.

Professor Karl Tryggvason from Duke-NUS' Cardiovascular and Metabolic Disorders Programme and principal research scientist, Dr Lynn Yap from Professor Tryggvason's team are spearheading a translational study to develop laminin-coated stem cells into new heart muscle cells. The team managed to regenerate the damaged heart muscle and significantly enhance the heart function in heart disease models. The Centre for Technology and Development is working with the team to explore collaborations with industry partners to further develop this transformational cell therapy product.



Centre for Technology and Development (CTeD) made great strides on many fronts last year, from building a stronger team to streamlining operation and increasing outreach to scientists and clinicians across the SingHealth Duke-NUS Academic Medical Centre to expanding collaborations with SingHealth in innovation management. 2021 marks one of the most fruitful years for our technology commercialisation efforts, with intellectual property transactions more than doubling compared with the prior year. We have built a robust pipeline of translational research to develop novel products with industry partners for combating society's most challenging diseases such as cancers, heart disease and COVID-19.

Looking forward, CTeD aims to continue to unleash the commercialisation potential of Duke-NUS' cutting-edge research through creating and completing high-impact transactions, expanding our offerings including the management of material transfer agreements and strengthening the partnership with SingHealth to promote bench-to-bedside study. We also plan to explore incubation and acceleration programmes to promote commercialisation for early-stage research and solidify Duke-NUS' position as a world powerhouse in translating academic discoveries into healthcare products and services.

Dr David Wang

Director, Centre for Technology and Development



OFFICE OF EDUCATION

REDEFINING MEDICINE







message from
**PROFESSOR
IAN CURRAN**

VICE-DEAN FOR
EDUCATION

Despite the ongoing challenges caused by COVID-19, the Office of Education has continued to provide the best possible learning experiences for our students without compromising clinical standards or educational quality.

Our unique curriculum remains at the cutting edge of medical education, attracting the brightest and most talented students here and abroad. In keeping pace with the evolving healthcare landscape and patient needs, we are embedding clinical encounters into the very first moments of our students' journey. Combined with a content refresh, this will further advance our educational philosophy of nurturing "Clinicians First, Clinicians Plus". Equally importantly, our students exude our Duke-NUS values of integrity, courage, collaboration and, particularly, compassion. By doing so, we place patients and their care, at the heart of students' learning right from the start of their medical education.

To harness the power of new digital approaches, we have created a bespoke Immersive Learning Space, where students can explore three-dimensional (3D) integrated visualisations of anatomical structures through our Anatomage Tables and Virtual Reality platforms. In addition, the Digital Printing

and Prototyping Laboratory is collaborating with SingHealth Radiology and other clinical faculty groups, as well as the Singapore University of Technology and Design, to explore the use of 3D modelling and printing to support anatomy and procedural skills teaching.

While safe management restrictions made in-person gatherings challenging, we endeavoured to celebrate our students' accomplishments regardless. A virtual graduation ceremony was held for the Class of 2021 in May 2021 and we inducted the newest cohort of medical students, our Class of 2025, through a virtual White Coat Ceremony in September. The Alumni Relations group organised the tenth year reunion for the Class of 2011, our very first graduates, who were joined by Dean and founding faculty members of the School from around the globe.

In support of our students' wellbeing during the ongoing pandemic, we also stepped up efforts in providing additional mental health support, as well as new financial assistance. Moving ahead, I am confident that these new initiatives and improvements will further strengthen Duke-NUS' teaching and learning experience as we pursue our vision of transforming medicine and improving lives.

CELEBRATING EDUCATION IN SPITE OF ADVERSITY

In 2021, the Office of Education celebrated current and future students of Duke-NUS by hosting several noteworthy events.

For the Class of 2020, graduates celebrated with a physical graduation ceremony in April 2021 when the COVID-19 situation in Singapore improved and safety measures were adjusted accordingly. Guest-of-Honour Dr Janil Puthucheary, Senior Minister of State, Ministry of Communications and Information and Ministry of Health, and a prominent founding Duke-NUS faculty member, graced the event to celebrate this important milestone for the graduates, alongside leaders from Duke-NUS and SingHealth. Having graduated at the height of the COVID-19 pandemic, the Class of 2020 had previously marked the end of their extraordinary journey at Duke-NUS with a virtual Hippocratic Oath ceremony in 2020.

On 29 May 2021, the School virtually celebrated the graduation of Duke-NUS' Class of 2021, which saw 56 newly-minted MD and MD-PhD doctors join Singapore's healthcare workforce. Graduands, their families and invited guests were joined over Zoom by Guest-of-Honour Dr Tan See Leng, Minister for Manpower and Second Minister for Trade and Industry, with a livestream on Facebook enabling well-wishers to also tune in to this special occasion. Awards were given to students who excelled academically and in their extracurricular contributions, leadership and community service.

To induct the newest cohort of 72 medical students, Duke-NUS held its traditional White Coat Ceremony, a rite of passage for all aspiring clinicians, as a fully produced online event on 18 September 2021. Alongside students' families and friends, the School's Governing Board Members, deanery, SingHealth leaders and clinical faculty joined the event to welcome the School's 15th intake. The audience heard from a selection of students about their motivation and experiences that led them to enter Duke-NUS.

Among this cohort are the first students admitted via the School's Conditional Admissions pathways. These pathways provide select students with opportunities to pursue diverse academic interests while also actively engaging with the medical community at Duke-NUS.



The Office of Education organised physical and virtual events in 2021 to celebrate the graduation of Class of 2020 (top right) and Class of 2021 (bottom left) and induct the 15th cohort of medical students.

NURTURING CLINICIANS FIRST

Graduates of Duke-NUS exemplify the School's 'Clinicians First, Clinicians Plus' educational philosophy. This is backed by a unique curriculum that ensures that students are competent, capable and compassionate 'Clinicians First' while also priming them with the potential to develop into 'Clinicians Plus' as they progress through their careers after medical school. In so doing, the School equips students to become agents of change who are able to respond to the ever-evolving needs of patients and the healthcare system.



PHASE I (12 MONTHS) BASIC SCIENCES

- A twelve-month, streamlined, clinically orientated, basic medical sciences curriculum focused on the fundamentals of biomedical sciences, clinical skills and professionalism
- Delivered via the TeamLEAD (Learn, Engage, Apply and Develop) approach that enables students to actively engage in problem-solving and promotes the development of communication and teamwork skills
- Well-supported by a dedicated teaching faculty that is drawn from Duke-NUS and clinical affiliates

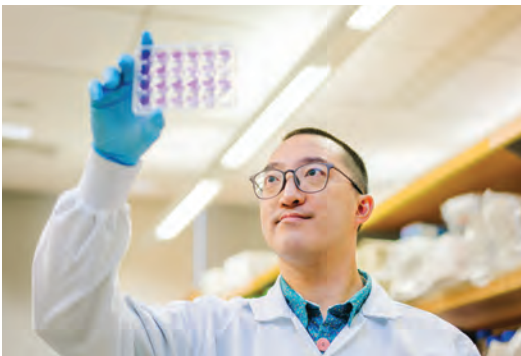
Year 1



PHASE II (12 MONTHS) CORE CLINICAL CLERKSHIP

- The first clinical year of training for Duke-NUS students lays the foundations for our students as 'Clinicians First'
- Allows students the opportunity to learn from—and for—patients across the core clinical clerkships of Paediatrics, Obstetrics and Gynaecology, Neurology, Psychiatry, Surgery and Medicine
- Clinical skills are developed through a spiral curriculum whereby students focus on history taking, physical examinations and diagnosis in the initial stage and a greater focus on patient management in the later stage

Year 2



Students are awarded the Doctor of Medicine (MD) degree jointly by Duke University and the National University of Singapore (NUS) after successfully completing an intensive four-year MD programme



Year 3

PHASE III (8 MONTHS) THE SCHOLARLY DEVELOPMENT PERIOD

- An eight-month, mentored, immersive experience focussing on finding solutions to authentic healthcare problems
- Students with highly qualified mentors to conduct original research or other scholarly activities to address patients' unmet healthcare needs
- This builds the fundamental critical thinking skills for becoming clinician researchers, scientists, innovators, entrepreneurs, leaders and change agents in healthcare, supporting our 'Clinicians Plus' philosophy

Year 4

PHASE IV (15 MONTHS) ADVANCED CLINICAL TRAINING

- Fifteen months of advanced clinical rotations that broaden and deepen our students' clinical insights and prepare them to serve patients safely and effectively, consolidating their capabilities as 'Clinicians First'
- Exposure to key primary, secondary and tertiary medical disciplines to help them understand and address the healthcare needs of Singaporeans today
- Ensures that students are highly prepared for graduation and the responsibilities they will face in Post-Graduate Year 1 and beyond

SHAPING TOMORROW'S CLINICIANS

Enhancing the curriculum in Phase I

The MD programme has enhanced its first-year curriculum through a greater integration of topics and increased exposure to patients. Patient encounters anchor the learning of basic scientific concepts, drawing stronger links to the clinical context and role of the clinician. These enhancements ensure that students not only understand the science but also develop the professional competencies of a physician and healer, and are well prepared to enter their core clinical clerkships in Phase II.

Building skills and confidence through experiential learning at the Clinical Performance Centre

In an effort to hone our students' clinical skills, the education team further expanded training activities at the Clinical Performance Centre (CPC). Simulations were introduced into the first year of Connect, Assimilate, Reflect, Explore (CARE),



A student interacting with a simulated patient during a simulation session.

an integrated programme that runs throughout the four-year MD programme.



Simulation activities for Duke-NUS medical students have increased more than fourfold.

Simulations proved vital during the pandemic when access to clinical environments was restricted. Over the last year, simulation activities have increased over fourfold, with the School transitioning in-person simulated patient encounters into virtual ones where appropriate. Simulated patients were trained virtually to ensure that they could play their role and provide constructive feedback to students—even over a virtual platform.

The annual simulated patient workshop was held between 26 and 29 November to introduce the programme to new applicants. These simulated patients were carefully selected and trained by a Standardised Patient Programme Trainer to portray real situations that allow students to hold virtual clinic consultations in a safe and standardised way.

In addition to simulated patient encounters, the CPC proved invaluable in supporting training for procedural, technical and communication skills, as well as professional

encounters such as telemedicine consultation training for our students. The CPC was also a critical venue in conducting important formative and high-stakes clinical examination activities.



Students learn anatomy through the use of virtual reality.

As a graduate of biomedical sciences, I have always been passionate about medical sciences and biology. However, after embarking on my PhD in oncology and immunology, I began to think of a career switch to medicine, where I can have a more direct and immediate impact, helping people in a frontline role, and make a direct contribution to medical improvements by merging my expertise in research with clinical knowledge.



I applied to Duke-NUS as I was attracted by its innovative education and impactful research which were the perfect fit for my career aspirations. Duke-NUS not only offers an excellent academic clinical programme but also has world-class faculty who are very approachable and answer our queries promptly.

The School also places emphasis on soft skills such as empathy, teamwork and professionalism through its TeamLEAD educational pedagogy and CARE programme. This leads to a holistic education that supports my dream of becoming a clinician-scientist.

My family and I are thankful for the generous financial support from the Ngee Ann Kongsi Distinguished Scholars Programme which greatly alleviated our financial concerns and allowed me to embark on this dream. I am also inspired to pay this generosity forward by providing support to other aspiring medical students in the future.

Adeline Lam Runyi
(Class of 2023)

Ngee Ann Kongsi Scholar

DEVELOPING CLINICIAN-SCIENTISTS

The Duke-NUS MD-PhD programme emphasises translational bioscience and health services, building a solid education that advocates a bench-to-bedside approach to research. This hands-on experience exposes students to the process of identifying and addressing unmet patient or healthcare system needs.

By combining medical education with research training to develop clinician-scientists who can serve as a bridge between medicine and science, Duke-NUS offers three distinct but complementary, PhD programmes: Integrated Biology and

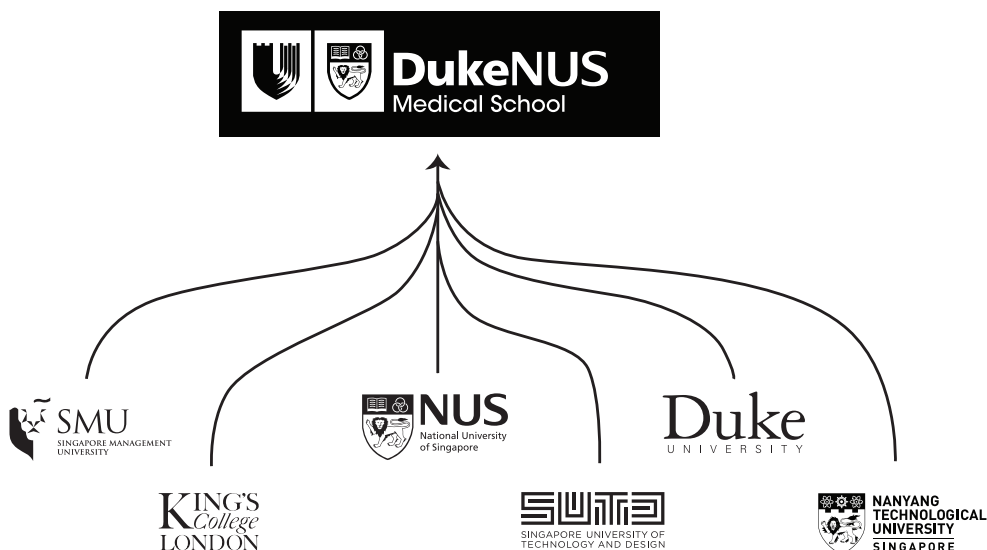
Medicine (IBM), Quantitative Biology and Medicine (QBM) and Clinical and Translational Sciences (CTS).

IBM is a joint degree programme between NUS and Duke University, which provides students with training in translational bioscience and allows them to work in the laboratories of Duke-NUS' world-class faculty. QBM is centred on deep dives into biostatistics and health data, as well as computational biology. CTS provides the opportunity to focus on translational and clinical patient-oriented research projects.

MD-PhD Programme

		In lieu of MD YEAR 3 Research Year				
YEAR 1	YEAR 2	YEAR 3	YEAR 4	YEAR 5	YEAR 6	YEAR 7 AND BEYOND
MD	MD	Start PhD	PhD	PhD	PhD	MD
Basic science	Clinical rotations	Coursework, labs, choose mentor	Identify thesis topic, qualifying exam	Research	Research	Clinical rotations

Conditional Admission Pathways





Combining medical education with research training, Duke-NUS' MD-PhD programme aims to nurture clinician-scientists who can serve as a bridge between medicine and science.

Since secondary school, research has been an interest of mine. As I subsequently gained exposure to the clinical world through internships and volunteering opportunities, I started to think more about building a career that integrates clinical medicine with research. An MD-PhD gives me the opportunity to do exactly that! It also provides a platform for me to improve diagnostics and therapeutics, filling gaps where current treatment options may be inadequate for patients.

While the MD-PhD programme takes a longer time than the MD programme, in my opinion, these additional years are a worthwhile investment as they allow me to acquire additional knowledge and skills that will be applied throughout my career over the next 30 to 40 years at least. The integrated MD-PhD programme also allows me to see the translatability and real-life applications of the research we perform in the lab and appreciate the work done on both the clinical and research fronts.

I think that the School's 'Clinicians Plus' educational philosophy trains clinicians with skill sets beyond that of medicine. I also

feel that the MD-PhD programme inculcates valuable skills such as adaptability, analytical thinking and independence, which can be applied in many other areas. These skills will come in handy as the healthcare landscape continues to evolve.

Katherine Nay Yaung
(6th-year MD-PhD student)
Ngee Ann Kongsi Scholar



RAMPING UP TECHNOLOGY-ENHANCED LEARNING AND INNOVATION

To mitigate the impact of COVID-19 on medical learning, Duke-NUS significantly increased the use of simulations and technology-enhanced learning.

Digital Learning Centre

The Digital Learning Centre (DLC) provides ongoing support to the integrated teaching and learning platform, Elentra. As the dedicated learning management system, Elentra now hosts all pre-clerkship modules. Clinical clerkships were also successfully migrated to Elentra, with geo-location attendance-taking introduced to simplify tracking of student attendance.

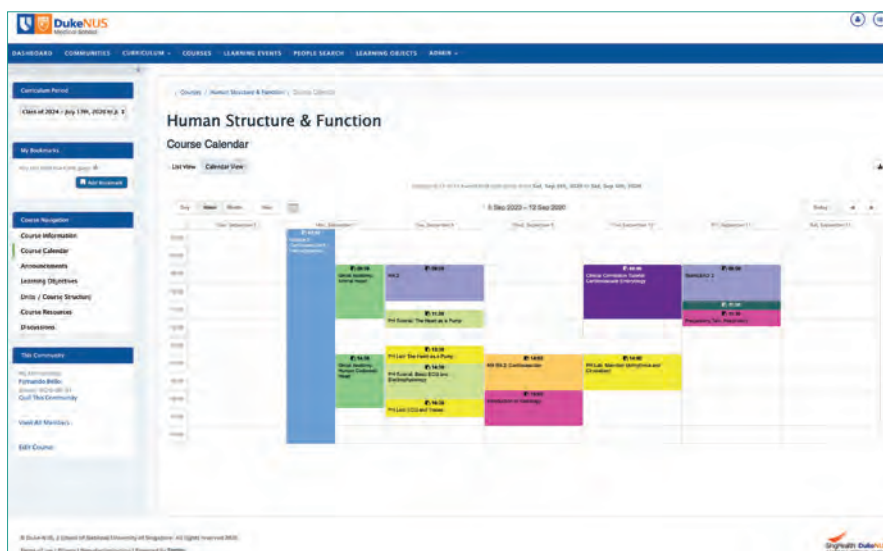
Other new features include:

- An individual development plan function under ePortfolio that helps students with career planning and setting of personal and professional goals
- A central access point for Clinical Performance Centre (CPC) resources
- A booking system, called Elentra CPC Community, for procedural skills and simulation activities
- The Elentra mobile app to help students better coordinate workplace-based assessments in clinical training as part of their ePortfolio and experience log

Our newest cohort, the Class of 2025, has benefited from this digitalisation strategy, splitting their time between virtual and in-class activities in adherence to safe management



Students can explore integrated visualisations in the School's bespoke Immersive Learning Space and 3D printing at the expanded Printing and Prototyping Laboratory (below).



Elentra, the integrated teaching and learning platform, now hosts all pre-clerkship modules.





measures. They have also participated in human cadaveric dissection augmented by three-dimensional (3D) and virtual anatomy training, including the new Anatomage Tables in the recently-completed Immersive Learning Space. Work on the new Procedural Skills Learning Laboratory and the expanded 3D Printing and Prototyping Laboratory commenced in December 2020. The two facilities will be in commission by April 2022. When completed, the increased capacity will meet the expanded simulation strategy and growing demand for procedural skills training, patient safety scenarios and simulated team practice and debriefs.

Immersive Learning Space

Officially handed over on 6 January 2021, the new Immersive Learning Space (ILS) has been outfitted with Virtual/Augmented Reality (VR/AR) headsets, computer workstations and visualisation screens.

ILS also houses two Anatomage Tables for training and has conducted six Human Structure and Function virtual dissection sessions so far. VR anatomy visualisation is now also available for self-directed learning.

The ePortfolio

The ePortfolio, which enables students to record learning and reflect on workplace-based assessments during clinical clerkships, is now implemented across all phases of the MD programme. Positive feedback has been received from students and assessors.

In particular, improving actionable assessor feedback has greatly helped students in accelerating their professional and clinical development. The system of proactive performance monitoring identifies underperforming or weaker students and allows additional support, counselling or remediation to be offered in a timely fashion.

The ePortfolio has now been extended to the newest Class, with the primary goal of facilitating reflective practice, self-awareness, professional identity development and aiding in the early identification of issues and improvement of their developing professionalism.

CARING FOR STUDENTS' EMOTIONAL WELLBEING AND MENTAL HEALTH

In light of the challenges posed by the COVID-19 pandemic, Duke-NUS has adopted a comprehensive and holistic approach to support students' mental health and wellbeing. The support programme provides enhanced academic support, student counselling, psychological and psychiatric support, financial support and enhanced student advocacy and wellbeing activities.

All new students received a special welcome pack with health essentials curated by the Student Affairs team. Our international students also received an additional welfare pack upon their arrival in Singapore to support them during their Stay Home Notice period.



The seed of inspiration to pursue medicine was planted by my parents, who have been very committed to community service back home in India as doctors themselves. As a graduate medical school, Duke-NUS allowed me to pursue this dream even after I received a Master's degree in another field. The quick responses from the Duke-NUS admissions department made the process very easy and some seniors also conducted Zoom sessions to answer any questions, from purchasing books to living in Singapore. That gave me a sneak peek into the Duke-NUS student community and how we look out for one another.

While serving my Stay Home Notice in Singapore, it felt nice to receive welcome packages from Student Affairs. Also, staff were in touch via email to help with basic necessities such as buying SIM cards and finding accommodation.

The news of me receiving the Shaw Foundation Scholarship was a source of immense pride and joy to my family. Particularly during the pandemic, the Foundation's support gave my family the confidence that I would not face any difficulties here in Singapore. The journey ahead is certainly challenging. But the support of my parents, School and organisations such as the Shaw Foundation, gives me confidence to chase my dreams.



Ramalakshmi Gayathri Vinjamuri
(Class of 2024)

Shaw Foundation Scholar

THE DUKE-NUS X FACTOR

Duke-NUS aims to nurture students into outstanding, compassionate and capable clinicians. Through the School's unique medical school curriculum and learning experiences, students are exposed to research, scholarship, innovation and entrepreneurship through interdisciplinary projects. They can also connect to the medical community, not just in Singapore but also abroad.

As an example of how the School has been focusing on providing experiential learning to students, a 'COVID-19 Master Class' was organised for the Class of 2023. This master class enabled MD students to explore the COVID-19 pandemic through various lenses, including that of patients, clinicians, researchers, and policy makers, bringing the notion of "Clinicians First, Clinicians Plus" to life. This event was well received by students and was an excellent opportunity to value-add to their educational experience while sharing learning points from the pandemic.

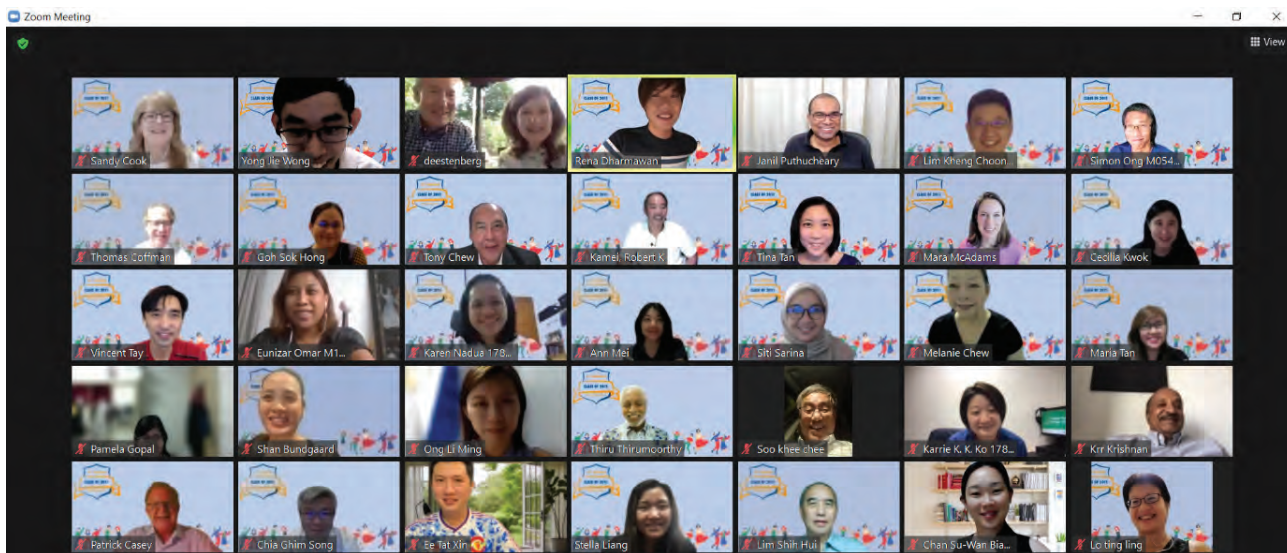
Developing visionary educators

The Professional Development Committee continued to drive efforts at the Academic Medical Education Institute (AMEI) in the pursuit of educational excellence. The Educator Development Framework was updated to support educators across the Academic Medicine Centre in developing their skills and becoming engaging, inspiring and reflective teachers.

Building a global network

Through AMEI's Fellowship in Team Based Learning, the School has been reaching out to local and international participants to encourage learning and knowledge sharing among medical educators. After a successful series of workshops in 2019, the programme continued despite the pandemic, with another series of virtual workshops organised in January 2021. Attended by participants from China's Zhejiang University School of Medicine, this series focused on a different set of topics, such as peer evaluation, advanced facilitation, programme evaluation and scholarship in education. Following the positive feedback received, the first series of the programme was re-organised in August 2021. It was attended by 20 participants from the Nanyang Technological University, Singapore, and the Public Utilities Board, as well as 17 participants from numerous SingHealth institutions.

Duke-NUS is also participating in an International Medical Education Exchange Programme with world-renowned institutions, including the Karolinska Institute, Sweden; George Washington University, US; Uniformed Services University of the Health Sciences, US; University of Leeds School of Medicine, UK; and University of Utrecht, Netherlands, to develop our educator faculty and share best practices in medical education.



The School's deanery and founding faculty members joined a virtual gathering that marked the tenth year reunion for the Class of 2011, Duke-NUS' very first graduates.

Launch of the TriMedSoc Alliance

On 12 June 2021, student leaders from Singapore's three medical schools—Duke-NUS, NUS Yong Loo Lin School of Medicine and Nanyang Technological University, Singapore's Lee Kong Chian School of Medicine—convened online for the signing ceremony to officially launch the TriMedSoc Alliance. Acting as the legitimate student representative body of all

local medical students, the TriMedSoc Alliance aims to better represent and further the interests of all medical students in Singapore. On 19 December 2021, Student Affairs worked closely with TriMedSoc leaders as well as the Ministry of Health for a virtual engagement session with Senior Ministers of State for Health, Dr Janil Puthuchery and Dr Koh Poh Koon, which saw strong attendance from students from all three medical schools.



Duke-NUS aims to nurture students into outstanding, compassionate and capable clinicians, by connecting them to the international medical community, not just in Singapore.

AWARDS AND ACCOLADES



Dr Wu Hong King (back right), an alumnus from the Class of 2017, was recognised in the Singapore Health Quality Service Award 2021 for his efforts in the national COVID-19 response in the migrant worker dormitories.

Singapore Health Quality Service Award 2021 COVID-19 Edition Superhero Merit Award

Class of 2017 alumnus Dr Wu Hong King received the Singapore Health Quality Service Award 2021 COVID-19 Edition Superhero Merit Award for his contributions to Singapore's pandemic control efforts. He first ran a medical post at one of the migrant worker dormitories with a team of volunteers from Changi General Hospital under the guidance of senior colleagues. Subsequently, he acted as the liaison officer representing SingHealth at the Joint Taskforce (Assurance)—the committee coordinating pandemic control efforts across all migrant worker dormitories in Singapore. The Singapore Health Quality Service Awards COVID-19 Edition honoured outstanding healthcare professionals who contributed significantly to the nation's fight against COVID-19.

Duke-NUS alumnus awarded National Outstanding Clinician Scientist Resident Award

Class of 2013 alumnus Dr Paul Tan Hon Sen, currently a SingHealth clinician-scientist resident from the Anaesthesiology & Preoperative Sciences Academic Clinical Programme (ANAES

ACP), clinched the National Outstanding Clinician-Scientist Resident Award for AY2020. First introduced in 2016, this award recognises clinician-scientist residents for their outstanding performances in, and contributions to, clinical training and research. With only two awards given annually, SingHealth residents have won eight out of ten awards and four of them are Duke-NUS alumni.

Silver Quill Award

A paper published by Duke-NUS faculty members and a student received The 2021 Silver Quill Award for the most downloaded research article in 2020, as recognised by the Association for the Study of Medical Education.

Titled "*Medical Students' Preference for Returning to the Clinical Setting During the COVID-19 Pandemic*", the paper was jointly authored by Professor Scott Compton, Associate Dean for Medical Education, Associate Professor Shiva Sarraf-Yazdi, Associate Dean for Educational Strategies and Programme Development, Dr Felicia Rustandy (Class of 2021) and Associate Professor Lalit Kumar Radha Krishna, Associate Dean for Ethics and Professionalism.

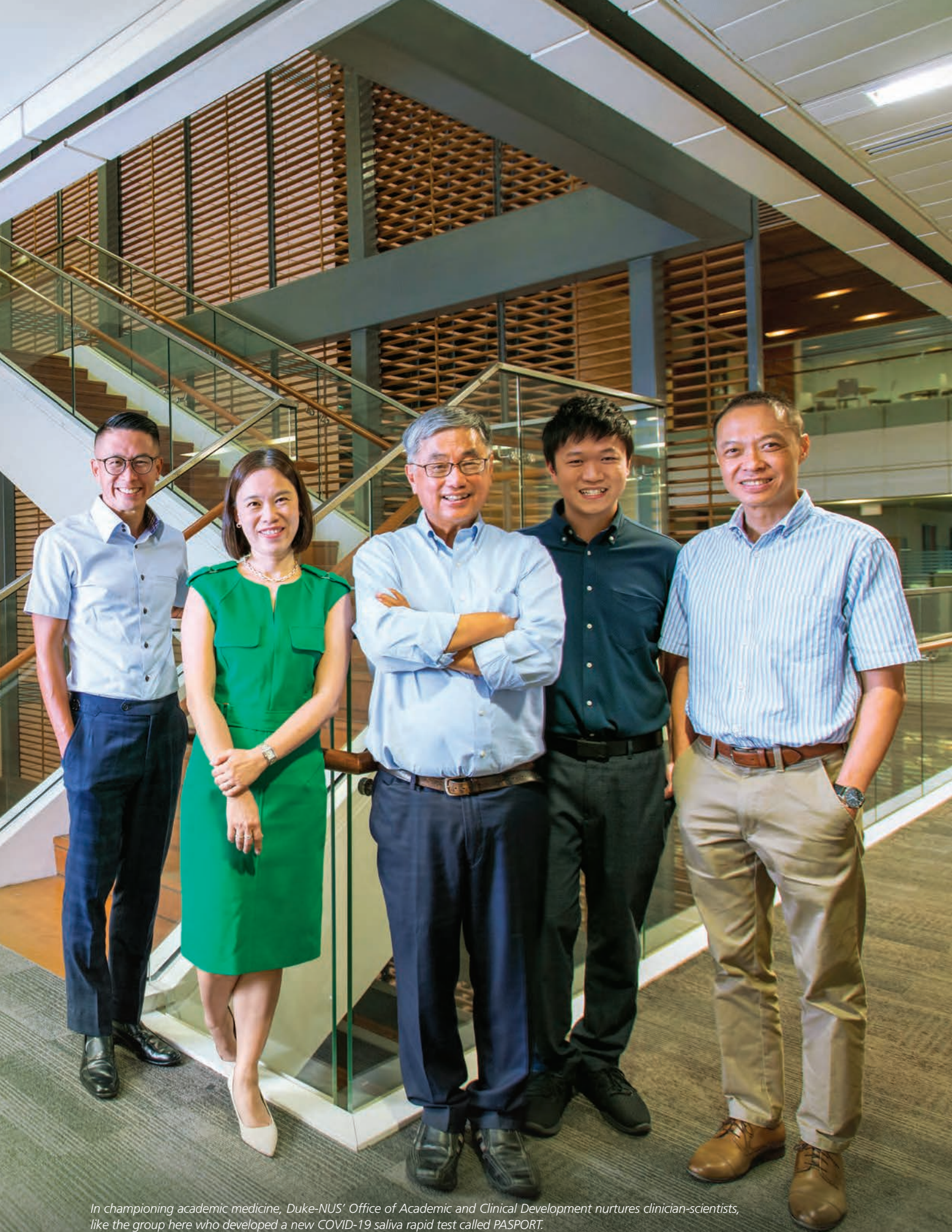


Class of 2013 alumnus Dr Paul Tan Hon Sen clinched the National Outstanding Clinician-Scientist Resident Award for AY2020.

OFFICE OF ACADEMIC AND
CLINICAL DEVELOPMENT

ADVANCING ACADEMIC MEDICINE





In championing academic medicine, Duke-NUS' Office of Academic and Clinical Development nurtures clinician-scientists, like the group here who developed a new COVID-19 saliva rapid test called PASPORT.



message from
**CLINICAL
ASSOCIATE
PROFESSOR
CHOW
WAN CHENG**

**VICE-DEAN FOR
ACADEMIC AND CLINICAL
DEVELOPMENT***

The pandemic has underscored the impact of academic medical partnerships, which have enabled the development of COVID-19 testing tools, vaccines and therapeutics at a record speed, equipping the world with better defences against the virus.

Academic medicine is what Duke-NUS strongly believes in and continuously strives for. Together with our academic medical partner, SingHealth, the School harnesses the joint capabilities and resources in research, education, clinical expertise and infrastructure to enable clinicians to engage in bench-to-bedside research, nurturing the next generation of clinicians.

As the key driver for academic medicine in the SingHealth Duke-NUS community, the Office of Academic & Clinical Development has spared no efforts to engage, grow and recognise clinicians from the 15 Academic Clinical Programmes.

In 2021, we launched the Duke-NUS Hall of Master Academic Clinicians where eight senior clinical faculty were recognised and inducted for their outstanding achievements in combining clinical mastery, exemplary standards of professionalism, leadership and academic contribution.

In collaboration with Duke Health, we organised a series of webinars to engage clinicians from the SingHealth Duke-NUS Academic Medical Centre. Revisions of existing programmes and new initiatives were also introduced to support clinicians in building a successful academic career in research and education.

As we celebrate our successes and achievements, I would also like to express my immense gratitude to Professor Wong Tien Yin, who stepped down from the role, for his exemplary leadership and unstinting dedication during his time at the School. I would also like to take the opportunity to extend my best wishes to him in his new role as the Founding Head of Tsinghua Medicine—a new academy of healthcare and medical sciences at Tsinghua University in Beijing.

As we head into 2022, we will focus on strengthening our strategic programmes and initiatives to facilitate research and innovation while increasing engagement with young and talented clinicians as we strive to grow to new heights in furthering Academic Medicine.

*Vice-Dean for Office of Academic and Clinical Development (OACD) (Designate) from 1 November 2021 to 31 December 2021, and Vice-Dean for OACD since 1 January 2022.

HONOURING THE CONTRIBUTIONS OF OUR CLINICAL FACULTY

Duke-NUS launches new Hall of Master Academic Clinicians

On 15 January 2021, Duke-NUS launched its Hall of Master Academic Clinicians to recognise senior clinicians from the SingHealth Duke-NUS Academic Medical Centre who have distinguished themselves by combining clinical mastery, exemplary standards of professionalism, leadership and outstanding academic achievement.

Eight distinguished academic clinicians were inducted into this Hall at the Ngee Ann Kongsi Auditorium at Academia. They are Clinical Professor Ang Chong Lye, Professor Chay Oh Moh, Clinical Professors Fock Kwong Ming, Tan Ban Hock and Venkataraman Anantharaman, Associate Professor Ong Biau Chi, Clinical Professors Tan Kok Chai and Wong Wai Keong,

Not only have they built a stellar track record in clinical practice, they have also gone the extra mile in pursuing

academic research, nurturing the next generation of clinicians while juggling teaching, research, clinical and even administrative duties.

As the role models for many who aspire to careers in academic medicine, they shared their aspiration and passion for being clinician-scientists and clinician-educators with the guests at the auditorium including Duke-NUS Governing Board Chairman Mr Goh Yew Lin, Dean Professor Thomas Coffman and SingHealth Group CEO Clinical Professor Ivy Ng, as well as those joining in virtually. In telling their first-hand experiences, the newly elected Master Academic Clinicians also offered practical advice to younger residents and consultants who are just about to start on their own academic journey, such as cultivating essential skills in good planning and time management.

The ceremony also provided the opportunity to congratulate 29 promoted and newly appointed senior clinical faculty.



PUSHING ACADEMIC MEDICINE TO GREATER HEIGHTS

As the catalyst and enabler for implementation of academic medicine in the SingHealth Duke-NUS Academic Medical Centre (AMC) the Academic Medicine Department (AMD) is committed to building an integrated academic medicine ecosystem by facilitating the establishment of strategies, engaging and stewarding partnerships, as well as providing resources and enabling performance optimisation.

In 2021, AMD continued to advance its mission to promote academic medicine through various initiatives and activities.

Joint SingHealth-Duke-NUS and Duke Health webinar series held during AM Leaders Forum 2021

In collaboration with Duke Health, AMD held a series of webinars themed “Adaptation and Innovation across the Pacific in Response to the COVID-19 Pandemic” on 18 December 2020 and 2 February 2021. The series of three webinars served as a platform for clinicians from both the SingHealth Duke-NUS AMC and Duke Health to share their experiences in managing the pandemic. It covered inspirational responses in the areas of (1) clinical operations; (2) research—from bench to bedside/community; and (3) technology-driven innovation for education and population health.

The series culminated in an apex webinar held at the annual Academic Medicine Leaders Forum 2021.

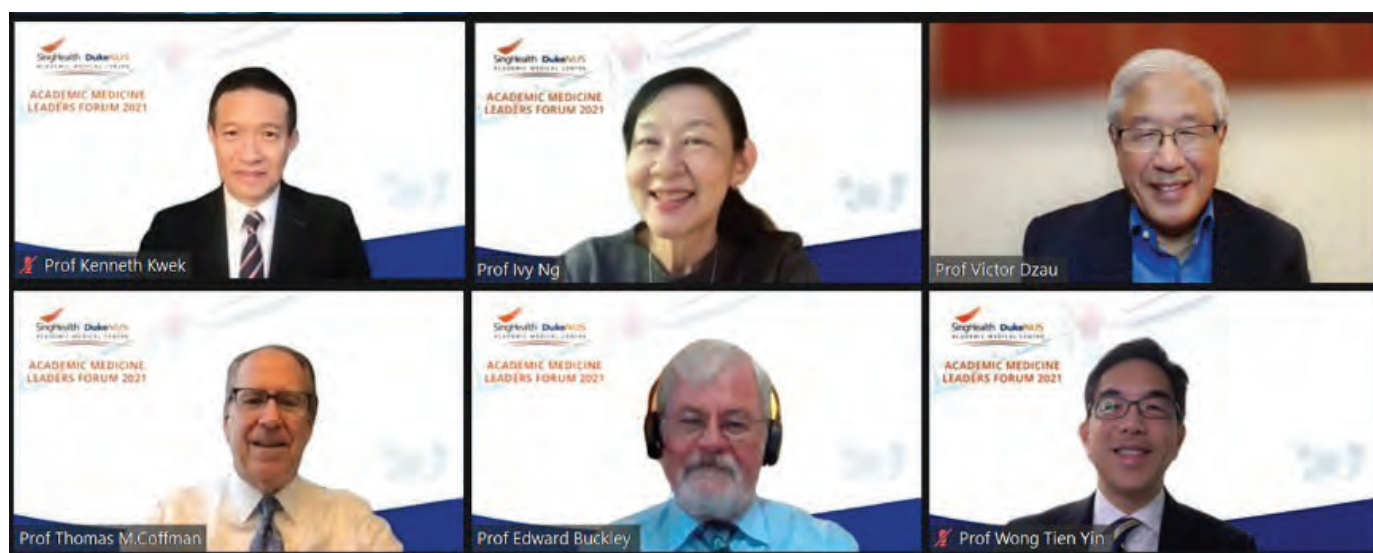
Academic Medicine Leaders Forum 2021: Inspirations from leaders to leaders

Leaders from the SingHealth Duke-NUS AMC gathered for the virtual AM Leaders Forum on 23 April 2021 to discuss and explore the roles of AMC in future healthcare systems. In his keynote presentation, Professor Victor Dzau, President of the United States National Academy of Medicine, shared his insights on how AMCs can prepare for the next epidemic. More than 300 participants from the AMC including senior management attended the forum and were encouraged by the inspirational sharing from senior leaders.

Engaging A*STAR National Science Scholars to support talent engagement and development

The SingHealth Duke-NUS AMC held a virtual dialogue with more than 30 A*STAR National Science Scholars on 22 July 2021. In his opening address, Dean Professor Thomas Coffman introduced the vibrant, supportive environment that SingHealth Duke-NUS AMC offers to develop clinician-scientists.

Senior clinician-scientists including Professor Wong Tien Yin, Clinical Associate Professor Chow Wan Cheng and Professor Aung Tin, as well as present and past A*STAR scholars now working at the Singapore General Hospital and Singapore National Eye Centre shared useful insights



Professor Victor Dzau and leaders from SingHealth Duke-NUS Academic Medical Centre gathered for the virtual Academic Medicine Leaders Forum 2021.

and perspectives with prospective scholars who were considering embarking on their academic medicine journeys. The scholars were also introduced to the Academic Chairs of the Academic Clinical Programmes (ACPs), and were encouraged to reach out for more information.

Sharpening focus to align with evolving national research and innovation

To better support and grow clinician-scientists, clinician-educators and clinician-innovators amid the changing healthcare and biomedical research landscape, the Academic Medicine Department reviewed the ACP funding support schemes.

To communicate these revisions as well as to create awareness of ACP funding initiatives, AMD conducted a series of four virtual roadshows in September 2021. Clinical Associate Professor Chow Wan Cheng together with the Chairpersons and selected panelists from the respective four domains in Education, Clinical and Systems Innovation, Research and Global Health interacted with participating clinicians, nurses,

allied health professionals and ACP administrative staff. Recordings were shared with ACP faculties who could not be present during the sessions.

After the review, ACP academic initiatives were broadened with a sharpened focus on funding support schemes:

- In supporting clinician-scientists, the previous Nurturing Clinician-Scientist Scheme (NCSS) was refined to a more comprehensive Nurturing Clinician-Researcher Scheme (NCRS). This refinement better aligned the NCRS with the National Medical Research Council's revisions in policies and guidelines on talent development, in addition to enriching the AMC with a wider range of clinician-researchers for broader faculty engagement and research culture building.

- For clinician-educators, a themed approach was rolled out, focusing on building capabilities in areas which are aligned with the SingHealth Duke-NUS Education Masterplan and encouraging projects that are strategically aligned with AMC goals. Key themes for FY2022 are technology-enhanced learning, faculty development, and interprofessional education & collaborative practice.
- To encourage clinical and systems innovation, the internal and external funding landscapes were reviewed and additional funding was set aside through a new Innovation Seed Grant to kickstart and support early-stage innovation projects that have the potential for AMC-wide adoption and scaling in the health system.

Tenure Scheme for ACP faculty paves way for enhanced development and support

Rolled out in April 2021, the Tenure Scheme for ACP Faculty recognises and retains academic clinicians in the

health system who contribute to Duke-NUS research and education programmes, and to enable Duke-NUS to compete effectively in attracting local and regional talents.

Along with the scheme, a Mentoring and Review Framework has also been formalised to oversee the development of tenure track faculty. This was done with the support of senior faculties from the Signature Research Programmes and ACPs. A Faculty Mentor Resource Group comprising senior scientists and clinician-scientists from across the AMC was centrally formed with AMD, providing mentoring expertise to ACP Chairs in the ACP Central Tenure Track Mentoring and Review Committees.

To help implement this new framework, AMD has since successfully facilitated four meetings for the pre-existing tenure track faculties in the Oncology and Ophthalmology and Visual Sciences ACPs.



Forming the Faculty Mentor Resource Group are (L-R from top): Professors Antonio Bertoletti, David Virshup, Gopal Iyer, Jodhbir Mehta, Marcus Ong, Paul Michael Yen, Salvatore Albani, Tazeen H Jafar, Teh Bin Tean, Tina Wong, Zhang Suchun

RECOGNISING AND SUPPORTING OUR CLINICAL FACULTY

The Academic Development Department (ADD) plays a pivotal role in faculty appointment, as well as the recognition and development of clinical faculty. Regular engagement and training sessions are also provided to support the academic and personal development of clinicians from the SingHealth Duke-NUS Academic Medical Centre (AMC).

Supporting clinician-scientists in academic career advancement

ADD continues to help clinician-scientists expand their skill-sets and build meaningful academic careers through capacity building.

In collaboration with the managing editor of the *Proceedings of Singapore Healthcare*, ADD held a workshop on manuscript writing, on 6 July 2021. This three-hour workshop provided young clinicians with practical tips on preparing research manuscripts, and—following positive feedback from participants—similar workshops will be planned. Two seminars were held to further enrich the skill-sets of clinician scientists. The “Getting Your Research Work Published” seminar, on 25 May 2021, saw editors from the three local journals, Associate Professor Seet Chee Seong, Clinical Professor Ang Tiing Leong and Associate Professor Lai Siang Hui, speak on various topics related to publication which attracted 89 attendees.

On 27 July 2021, the “All You Need to Know About Reviews” seminar was held, attracting 111 attendees. It featured talks by Professor Loh Xian Jun from A*STAR, Professor Aung Tin, Chief Executive Officer of the Singapore National Eye Centre, and Assistant Professor Tham Yih Chung, a senior clinical research fellow at the Singapore Eye Research Institute.

Nurturing budding clinician innovators

Associate Professor Derrick Chan, director of the Clinician-Innovator Development Programme (CINDP), one of the programmes facilitated by ADD, continued to mentor clinician-innovators and advised on queries pertaining to a wide range of topics including intellectual property, industry collaboration and research careers. Under his tutelage, there were four applications for the National Council of Social Service (NCSS) under the Clinician-Innovator category during the ACP Grant Call FY2021 Cycle 2.

Three emerging clinician-innovators were awarded the Nurturing Clinician-Innovator Award (NCIA) under the ACP Programme Grant—Nurturing Clinician-Researcher Scheme. This is an initiative to nurture young clinicians into successful clinician-researchers by supporting them with resources, including funding and protected time. Besides the NCIA, outstanding clinicians were also recognised under the Nurturing Clinician-Scientist Award and Clinician-Investigator Development Award.

CINDP also partnered with the SingHealth Medical Technology Office, Singapore Biodesign and the National University Health System to launch the “Re-imagining Innovation: A Biodesign Workshop”. The inaugural workshop focused on emergency medicine and was well received by attendees. Topics covered in the workshop included biodesign and project development processes, case studies and success stories, grants and resources available, as well as the career path of a Clinician-innovator in the SingHealth Duke-NUS AMC. Q&A clinics with innovation offices were also arranged for faculty to discuss their ideas and projects. The next workshop will focus on the anaesthesiology and perioperative sciences ACP.

ENABLING AND EMPOWERING BUDDING CLINICIAN-SCIENTISTS



CCSD mentees receive acclaimed Transition Awards and Clinician Scientist Awards

Eight mentees from the Centre for Clinician-Scientist Development (CCSD) received the Ministry of Health's National Medical Research Council (NMRC) Transition Award and first-time Clinician Scientist Award.

To celebrate their landmark achievements, CCSD brought together leaders from Duke-NUS and the SingHealth Duke-NUS AMC and organised a special Zoom event. During the event, each winner shared their research journey, with a common theme being their gratitude to the CCSD team and

Clinician-scientists play an essential role in both generating scientific discoveries and in guiding the transformation of those discoveries into impactful therapies and advances in patient care. At the Centre for Clinician-Scientist Development (CCSD), we identify, enable, and empower budding Clinician-scientist seeking to build productive and impactful research careers that will continue to transform and advance medicine.

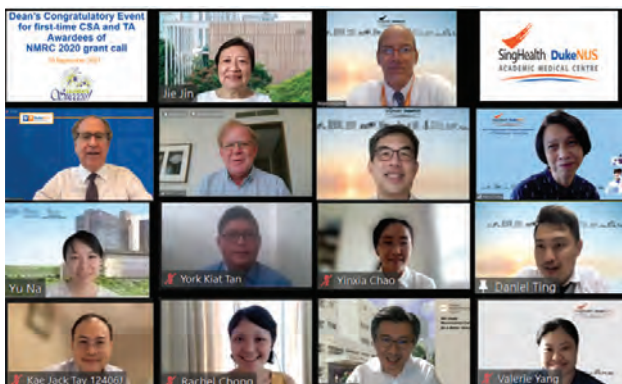
In the past year, we have embraced and supported the evolving definition of a Clinician-scientist to include Clinician-investigators and Clinician-innovators, and have added new heads to encourage, mentor and lead these new avenues towards careers in research. We have refocused our efforts on the identification and support of those with the highest probability of success, while designing programming to level-set research knowledge across the AMC."

Professor Roger Vaughan

Director, Centre for Clinician-Scientist Development

their mentors. The event was opened by Professor Wang Jie Jin, Deputy Director of CCSD, who served as the event's host.

CCSD is well supported by senior scientists at Duke-NUS who provide junior clinician-scientists within CCSD grantsmanship programmes with valuable guidance. The centre was formerly led by Founding Director Professor Koh Woon Puay, and now under the leadership of Professors Roger Vaughan and Wang Jie Jin, who served as Interim Director.



AWARDS AND ACCOLADES

Distinguished professorship for outstanding academics in medical oncology

In September 2021, Professor Lim Soon Thye was reappointed as the Tanoto Foundation Professor in Medical Oncology for a third term.

This professorship was established to support medical oncology and research initiatives that explore the genetic basis of cancers that are prevalent in Asia. As a leading expert in the field of medical oncology, Professor Lim's research focus is on lymphomas that are common in Asia and hitherto have dismal outcomes. The appointment will help to further support him and his team in their efforts to translate discoveries into next generation trails and applications, improving the diagnosis, prognosis and treatment of patients afflicted with lymphoma.

As the lead Principal Investigator, Prof Lim secured a S\$10 million NMRC Open Fund-Large Collaborative Grant from The Singapore LYMPHoma translatiONal studY (SYMPHONY) programme in 2019. The programme seeks to focus on next-generation biomarkers which can be exploited for better diagnosis and prognostication, as well as improved clinical response to immunotherapy.



Professor Lim Soon Thye was reappointed as the Tanoto Foundation Professor in Medical Oncology for a third term.

Outstanding clinician-scientists and researchers win national research awards

Sixty-seven winners were recognised at the NMRC awards ceremony on 6 Dec, 2021. Under the Nov 2020 grant call, seven clinician scientists and researchers from the SingHealth Duke-NUS AMC won Clinician-Scientist Awards. In addition, 12 budding clinician-scientists received the Transition Award, Clinician Innovator Development Awards and NMRC Research Training Fellowships.

These awards reaffirm the commitment of the SingHealth Duke-NUS AMC to transform medicine and improve the quality of patient care.



OFFICE OF CORPORATE SERVICES

REINVENTING CORPORATE ADMINISTRATION

Katherine Nay and Ramalakshmi Gayathri Vinjamuri are among the students at Duke-NUS receiving financial aid.





message from
**MS KAREN
CHANG**

SENIOR VICE-DEAN FOR
CORPORATE SERVICES

As the pandemic's second year, 2021 provided some reprieve from the tremendous uncertainty of its first. It brought about changes to our economy, social fabric, as well as the way we work and live. Yet it also provided opportunities for reinvention, especially for us in the biomedical research, education and academic medicine sector.

Duke-NUS has responded decisively and with agility to address the challenges posed by the pandemic, with the entire Office of Corporate Services striving to continue providing best-in-class administration support.

Among our accomplishments are the adoption of an e-WorkFlow system and its integration with DocuSign, the Cloud Human Resource System, Concur and the Robotic Process Automation, all of which supported seamless flexi-workplace arrangements. We made certain to capitalise on all opportunities to further elevate and strengthen the Duke-NUS brand through extensive external outreach, garnering prominent recognition in targeted areas.

So, when Duke-NUS ranked among Singapore's Best 200 Employers, we celebrated earnestly; the award, being the recognition of our great employee experiences, deep affiliation, strong culture of respect for diversity, continued

enablement for innovation and opportunities for growth and development that Duke-NUS offers.

As we move into the next phase of living with the virus, we will continue to seek and seize opportunities to embrace the new normal which will be far more technology-driven, presenting more big challenges. Led by NUS, we have begun plans for our administrative workforce to be data competent and artificial intelligence-ready. The challenges of digital disruption call for rethinking and reinventing to succeed and be ahead of the curve. High on our agenda is the enhancement of cybersecurity and prevention of data breaches. Seeking cost optimisation without compromising growth, identifying essential and non-essential cost buckets while maintaining quality service remains paramount.

I wish to express my heartfelt appreciation and gratitude to our donors for their continued belief in our mission of Transforming Medicine, Improving Lives. Their steadfast support and generosity have facilitated our many achievements and accomplishments. Their gifts have made a difference to our students, faculty and helped us advance our mission.

Together with our donors, benefactors and champions, we will continue to make greater things happen.

ENHANCING BRAND VISIBILITY THROUGH COMMUNICATIONS AND PUBLICATION EFFORTS

As Duke-NUS increasingly makes a name for itself in biomedical research, medical education and academic medicine, the Communications and Strategic Relations team stepped up its efforts to highlight the School's name on the map. The team has been adopting an integrated approach to showcase the School's strong capabilities and stellar achievements through various channels. These efforts were recognised with international and regional awards last year, further cementing the School's position as a world-class medical school.

Twin win for 15 Years of Impact at Apex Awards

Published for Duke-NUS' 15th anniversary, the *15 Years of Impact* commemorative book was produced to showcase the School's research and education accomplishments and milestones. For its excellence in editorial content and design, the book received two awards of excellence at the Apex Awards, an international award for publication excellence: "One-of-a-Kind Publications – Custom Published" and "One-of-a-Kind Publications – Government".

These awards were a recognition of the quality content that the School has been producing and its efforts to internationalise the Duke-NUS brand.



A finalist at the PR Awards 2021 for COVID-19 media campaign

Since the start of the SARS-CoV-2 pandemic, Duke-NUS experts have worked tirelessly to help further understanding of the virus through ground-breaking research and innovations, positively impacting the fight against COVID-19. To effectively communicate and promote their discoveries to a global audience, the Communications and Strategic Relations team adopted a multi-pronged media strategy, actively reaching out to local and international media contacts.

Leveraging the School's strong capabilities in cutting-edge research and academic medicine, as well as the proven track record in SARS-related research, the team established a niche area in COVID-related commentaries and worked with reputable local and international media outlets to feature thought leadership pieces from Duke-NUS experts.

For the outstanding efforts in promoting COVID-related thought leadership and research discoveries, the Communications and Strategic Relations team was a PR Awards 2021 finalist in the category of "Best PR Campaign: Healthcare & Pharmaceuticals". The annual award recognises and celebrates the best and most inspired and successful public relations and communications campaigns in the region.



Supporting our scientists through capacity-building activities

As part of its continuous effort to support the communication needs of the School's faculty and researchers, the Communications and Strategic Relations team organised workshops under the Duke-NUS Master Effective

Communication series. These included joint workshops with the communications team from Duke University on storytelling through visuals, collaborative webinars with Nature Research on talking about research effectively with non-scientists, as well as training sessions to hone interview and public speaking skills among the School's researchers.

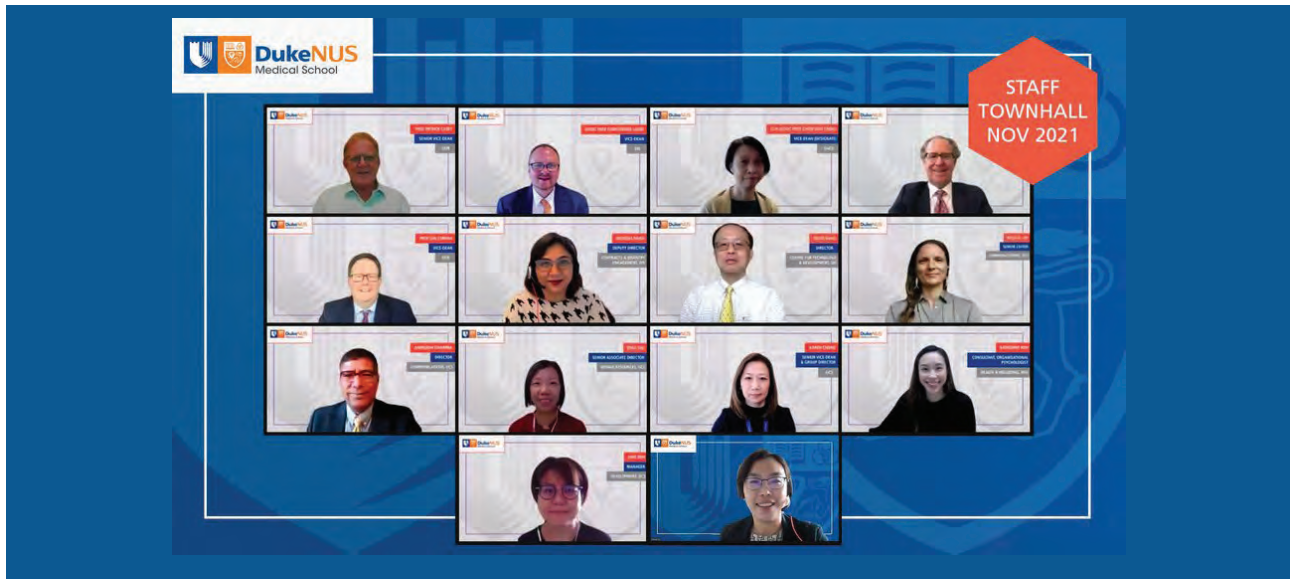


Duke-NUS researchers at a media training workshop

Building trust and enhancing organisational excellence

The Office of Corporate Services strives to enhance employee experiences, aiming to attract and retain talented professionals. As part of its ongoing efforts to create a more open environment, the Office launched an immersive training programme in partnership with external consulting firm, FranklinCovey, last year.

The programme kicked off with a 360 Trust Quotient Assessment, followed by a two-day workshop to equip staff with a common framework and language of trust to develop leaders at all levels. The programme will help establish a high-trust culture, laying the foundation for building a collaborative work environment and increasing organisational performance.



The Staff Peer Support System was introduced at the Staff Townhall held in November 2021.

Peer-to-peer support system advocates better mental health

To ensure a supportive and caring community for employees amidst the mental health challenges posed by the pandemic, Duke-NUS expanded the mental health programmes offered to staff, with support from its parent university, the National University of Singapore. One recent initiative is the Staff Peer Support System (PSS), which provides a compassionate and understanding safety net of trained peers for employees to share their concerns in confidence. This initiative aims to bring the School one step closer to creating an environment that is open and supportive of all aspects of mental health.

Pilot project promises better workplace flexibility

Giving employees flexibility in their work arrangement is one example of the School's commitment to creating a nurturing and high-trust environment for its diverse workforce that has to balance family and care needs with work. Before the pandemic, Duke-NUS employees could opt for flexible working hours without compromising the statutory work hour requirement. With the transition to the new normal, Duke-NUS will continue to provide employees with the flexible working hours and workplace options.

IT advancements that enhance workflow automation

Last year, Robotic Process Automation was introduced to help automate time-consuming, repetitive tasks centred around student card access requests and HR payroll processing. This is part of the School's ongoing effort to digitalise its internal processes, which saw the launch of the Document e-Approval System in 2020 to support online document approval in response to the COVID-19 crisis. Since then, the system has processed more than 65,000 requests across more than 20 types of work approvals. The workflow automation platform was also enhanced, having been integrated with DocuSign to enable the signing of agreements and contracts with e-signatures.

Building resilience

Between June and October 2021, the teams from Risk Management and IT co-led an exercise to assess the School's response to a cybersecurity attack scenario. Business units and departments across the School formulated and submitted their business continuity plans to the Risk Management Steering Committee. The School's business continuity management universe was also updated to reflect the general continuity strategies that were adopted. The School has also embarked on a cybersecurity tabletop exercise with key stakeholders to validate these plans.

Supporting future clinicians through student financial aid

Duke-NUS is committed to helping outstanding students receive a world-class education. In addition to our Student Financial Aid Fund, the School offers more than ten scholarships and bursaries which have been set up with the generous support of our donors.

About 60 per cent of students at Duke-NUS receive some form of financial aid. The School gives out scholarships and bursaries from schemes such as:

Bursaries

- Duke-NUS Bursary
- Dhun Nargolwala Bursary
- Charles Ng Bursary
- Meek & Lowly Bursary

Scholarships

- Duke-NUS Dean's Scholarship
- Goh Foundation Scholarship
- Lee Foundation Scholarship
- Shaw Foundation Scholarship
- Ngee Ann Kongsi Distinguished Scholars Programme

Recognising how the world's economy and people's livelihoods have been hit hard by the pandemic, the School also offered additional financial support to students through its COVID-19 Relief Scheme, introduced in 2020.



In recognition of the support of donors to Duke-NUS in its pursuit of excellence in education, research and innovation, the Development department launched the "Give to Greater Things" campaign in 2021.

I was delighted to receive the Meek & Lowly Bursary, which has enabled me to embark on the journey to pursue medicine without having excessive worries about my finances. The award is also an affirmation from the School towards all the keen learners, despite our varied backgrounds.

I am from a non-science background. Thus the journey has not been entirely smooth sailing. The first challenge was the Medical College Admission Test (MCAT) as I had not touched science for a long time. Most importantly, the Doctor of Medicine programme itself requires us to grasp a vast amount of information within a short period of time. Even though in the beginning, the flipped classroom model can be daunting, I eventually got the hang of it. My teammates were certainly instrumental to my academic performance and overall morale. The experience was an opportunity of a lifetime as the courses are thought-provoking and impactful to my future career. One that stands out to me is the dissection of a cadaver. The lessons we gained from the silent mentors granted me a true appreciation of the intricacies of the human anatomy and the fragility of life.

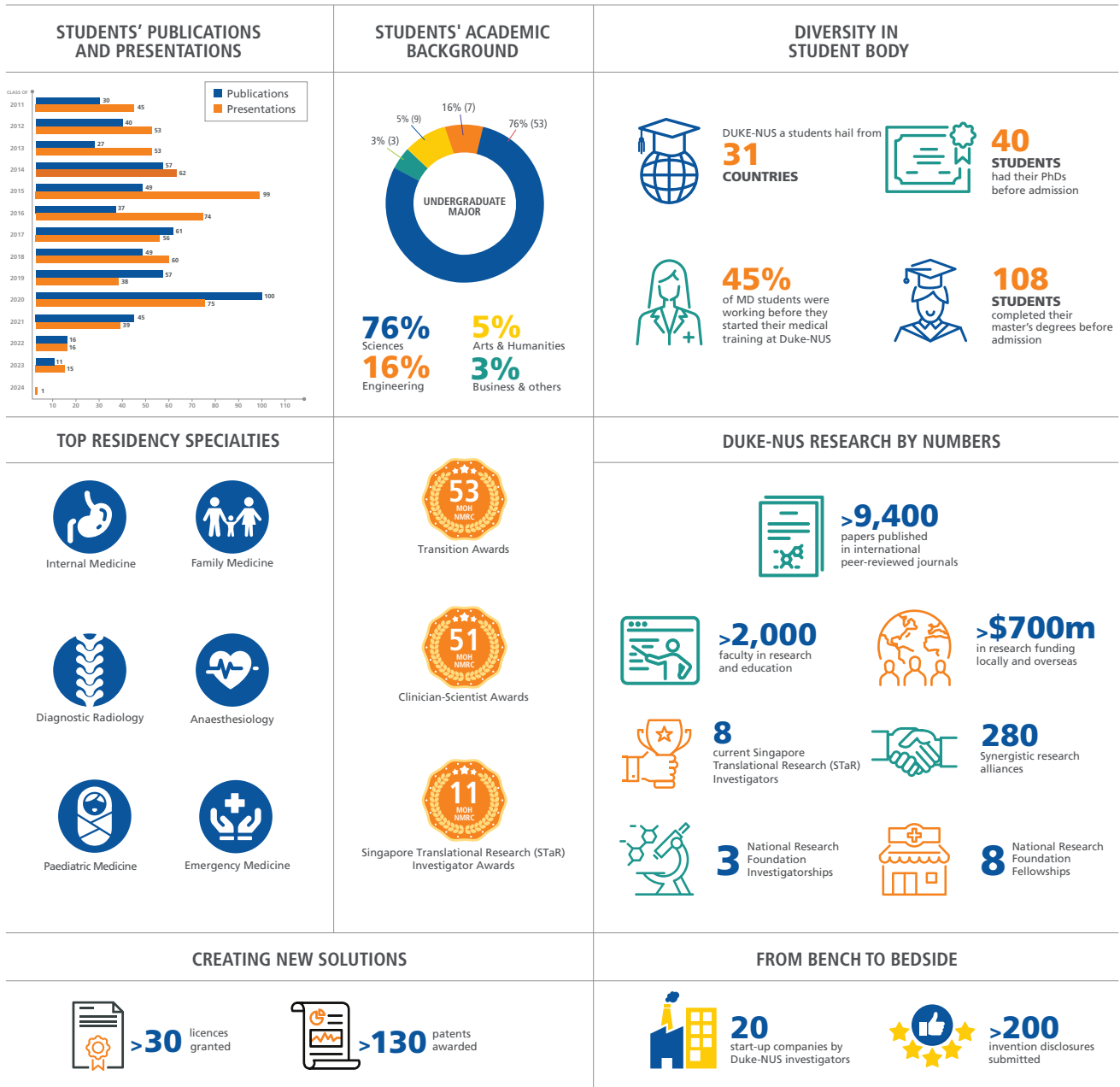
Faith Wong Pih Yng (Class of 2025)

Meek & Lowly Bursary Recipient



DUKE-NUS FACTS AND FIGURES AT A GLANCE

information as of 31 January 2022




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