NUS | National University of Singapore

NUS Centre for Cancer Research
Yong Loo Lin School of Medicine

Early Cancer Intervention from Laboratory Discoveries to the Community

PROGRAMME BOOKLET

13 – 14 May 2024
Centre for Translational Medicine, MD6, LT35
Singapore 117599

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GENERAL INFORMATION

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WELCOME MESSAGE

With Singapore's aging population, and the rapid increase in new cancer cases across Asia, early cancer intervention has assumed vital importance in our national strategy for healthy longevity. I warmly welcome you to the 2024 Early Cancer Intervention Symposium at the NUS Centre for Cancer Research (N2CR), which is amongst the first in Singapore to explore this research area.

We are delighted not only to host outstanding international speakers from Europe and the USA, but also to provide a forum for the nascent but growing research community working on early cancer intervention in Singapore. Prof. Chorh Chuan Tan, the Singapore Government's Permanent Secretary for National Research and Development, and Chair of the Ministry of Health's Office for Healthcare Transformation, has kindly agreed to open our inaugural symposium.

This year's symposium will focus on 3 key themes: (1) Early carcinogenesis research, (2) Advances in early diagnosis and intervention technologies, and (3) Community-centric screening strategies. Thus, we will cover topics that span fundamental laboratory research on the mechanistic origins of cancer, through new technologies for diagnosis or intervention, to community-centric approaches for early intervention.

N2CR is committed to strengthening the local and regional cancer research community by nucleating and facilitating research ideas in the early cancer intervention field. This symposium is the perfect opportunity to rethink how we approach bench to bedside healthcare, and foster new collaborations between scientists, clinicians and industry experts who work towards this common goal.

I wish you all rewarding time at the N2CR Early Cancer Intervention Symposium 2024!

Ashok Venkitaraman
Director, N2CR
ECI Symposium Organising Committee

On Behalf of the Organising Committee

PROGRAMME

DAY 1 – 13 May 2024 (Monday)

0815 Onwards	**Registration**
0850 – 0900	**Opening Remarks** *& Session Chair: Ashok Venkitaraman*
0900 – 0915	***Guest-of-Honour* - Tan Chorh Chuan** *Permanent Secretary (National Research and Development)* *Permanent Secretary (Public Sector Science and Technology Policy and Plans Office), Prime Minister's Office* Opening address
0915 – 1005	***Keynote Lecture* - Joseph Sung** *Distinguished University Professor, Senior Vice President (Health & Life Sciences), Nanyang Technological University, Singapore* *Dean, Lee Kong Chian School of Medicine, Nanyang Technological University, Singapore* Oral pathogen and gastric cancer
1005 – 1035	**Morning Tea Break**
Theme 1 – Early Carcinogenesis Research **Session Chair: Jimmy So**	
1035 – 1055	**Iain Tan Bee Huat** *Senior Consultant, Director of Research, Division of Medical Oncology, National Cancer Centre Singapore Senior Clinician Scientist, Associate Professor, Duke-NUS Medical School* Early detection and prevention in colorectal cancer and multi cancer: biological and public health considerations
1055 – 1115	**Ashok Venkitaraman** *Director, NUS Centre for Cancer Research* *Director, Cancer Science Institute of Singapore* *Distinguished Professor of Medicine, Yong Loo Lin School of Medicine, NUS* Metabolic triggers for cancer evolution
1115 – 1125	Abstract Talk **Robert Matius** *Research Assistant, Department of Physiology, Yong Loo Lin School of Medicine, NUS* Extracellular vesicles within a tumourigenic senescent tumour secretome are able to confer antitumour immunity
1125 – 1145	**Tam Wai Leong** *Deputy Executive Director, Laboratory of Translational Cancer Biology, GIS,* *A*STAR Associate Professor, Department of Biochemistry, Yong Loo Lin School of Medicine, NUS* The nexus of diet and cancer
1145 – 1300	**Lunch**

Theme 2 – Advancements in Early Diagnosis and Intervention Technologies Session Chair: Karen Carmelina Crasta	
1300 – 1330	**George Hanna** *Head of Department of Surgery and Cancer, Professor, Imperial College London (UK)* Breath test to detect gastrointestinal cancers
1330 – 1350	**Shao Huilin** *Associate Professor, Department of Biomedical Engineering, Faculty of Engineering Department of Surgery, Yong Loo Lin School of Medicine, NUS* *Principal Investigator, iHealthtech* Nanosensor technologies for molecular analyses of circulating biomarkers
1350 – 1410	**Pierce Chow** *Senior Consultant Surgeon, HPB/Transplant, Division of Surgery & Surgical Oncology, National Cancer Centre Singapore and Singapore General Hospital* *Professor and Program Director, Duke-NUS Medical School* Addressing the unmet need for early diagnosis in hepatocellular carcinoma: the ELEGANCE study
1410 – 1420	Abstract Talk **Ni Qianqian** *Assistant Professor, Department of Diagnostic Radiology, Yong Loo Lin School of Medicine, NUS* Nucleic acids nanotechnologies for cancer immunotherapy
1420 – 1425	**Industry Talk** MiRXES Pte Ltd
1425 – 1455	**Afternoon Tea Break**
Theme 2 – Advancements in Early Diagnosis and Intervention Technologies Session Chair: Yvonne Tay	
1455 – 1525	**Robert Scharpf** *Associate Professor of Oncology and Biostatistics, School of Medicine, Johns Hopkins University (USA)* Detection and characterization of human cancer using cell-free DNA fragmentomes
1525 – 1545	**Lim Chwee Teck** *Director, Institute for Health Innovation & Technology (iHealthtech), NUS Society Professor, Department of Biomedical Engineering, NUS* Microfluidics for liquid biopsy – From CTCs to ctDNA
1545 – 1555	Abstract Talk **Nur Fatimah Farzanah Jalaludin** *PhD Student, Department of Physiology, Yong Loo Lin School of Medicine, NUS* Exosomal mRNA cargo are biomarkers of tumor and immune cell populations in pediatric osteosarcoma
1555 – 1615	**Mikael Hartman** *Head & Senior Consultant, Division of General Surgery (Breast Surgery), National University Hospital Associate Professor, NUS Yong Loo Lin School of Medicine and Saw Swee Hock School of Public Health* Can we prevent breast cancer?
1615	**End of Day 1 Programme**
1630 - 1715	**Meet the Speakers Session***

* Kindly email n2cr@nus.edu.sg if you are interested in meeting any of the speakers.

PROGRAMME

DAY 2 – 14 May 2024 (Tuesday)

Theme 2 – Advancements in Early Diagnosis and Intervention Technologies **Session Chair: Chen Zhi Xiong**	
0930 – 1000	**Cristian Tomasetti** *Director, Centre for Cancer Prevention and Early Detection, City of Hope (USA)* *Professor and Director, Division of Mathematics for Cancer Evolution and Early Detection, Department of Computational & Quantitative Medicine, Beckman Research Institute, City of Hope (USA)* Cancer risk prediction, early detection and minimal residual disease
1000 – 1020	**Too Heng-Phon** *Associate Professor, Department of Biochemistry, Yong Loo Lin School of Medicine, NUS* The long march from lab to bedside: Our experience from developing a miRNA technology to a clinical test
1020 – 1050	**Morning Tea Break**
Theme 3 – Community-Centric Screening Strategies **Session Chair: Lee Soo Chin**	
1050 – 1110	**Li Jingmei** *Group Leader, Laboratory of Women's Health & Genetics, Genome Institute of Singapore, A*STAR* The doctor will see you before you fall sick
1110 – 1130	**Jeffrey Halter** *Parkway Visiting Professor in Geriatrics, Yong Loo Lin School of Medicine, NUS* *Professor Emeritus, University of Michigan (USA)* The challenge of effective cancer screening in an aging population
1130 – 1140	Abstract Talk **Renu Balyan** *Scientific Liaison, Olink Proteomics Singapore* Next generation proteomic profiling of a pan-cancer cohort for the development of screening tools for cancer
1140 – 1150	**Industry Talks** NovogeneAIT Genomics Singapore Pte Ltd GenScript Biotech (Singapore) Pte Ltd
1150 – 1210	**Tan Ker Kan** *Head & Senior Consultant, Division of Colorectal Surgery, Department of Surgery, National University Hospital* Colorectal cancer screening research – Small steps to improve national outcomes
1210 – 1310	**Lunch**

Theme 3 – Community-Centric Screening Strategies Session Chair: Polly Chen	
1310 – 1400	**International Keynote - Nitzan Rosenfeld** *Director, Barts Cancer Institute, Queen Mary University of London (UK)* Expanding applications of cell-free DNA in cancer diagnostics
1400 – 1450	**Closing Keynote** - **Yeoh Khay Guan** *Senior Vice President (Health Affairs), NUS, Kishore Mahbubani Professor in Medicine and Health Policy Chief Executive, National University Health System* Earlier detection leads to better care and outcomes
1450 – 1500	**Best Abstract Award Presentation & Symposium Closing Remarks** **Polly Chen**
1500 – 1530	**Afternoon Tea Break and Networking Session** **End of Programme**
1530	**Meet the Speakers Session***

* Kindly email n2cr@nus.edu.sg if you are interested in meeting any of the speakers.

SPEAKERS
DAY 1

KEYNOTE SPEAKER

Joseph SUNG

Distinguished University Professor
Senior Vice President (Health & Life Sciences)
Dean, Lee Kong Chian School of Medicine
Nanyang Technological University, Singapore

Professor Sung received his medical degree (MBBS) from The University of Hong Kong and conferred PhD in biomedical sciences by the University of Calgary and MD by The Chinese University of Hong Kong (CUHK). He holds fellowships from the Royal Colleges of Physicians of Edinburgh, Glasgow, London, and Australia, the American College of Gastroenterology, the American Gastroenterological Association, the Hong Kong College of Physicians, the Hong Kong Academy of Medicine, Academy of Sciences of Hong Kong (ASHK), Japan Gastroenterological Endoscopy Society and Academy of Medicine, Singapore. He is an Academician of the Chinese Academy of Engineering of the People's Republic of China and Academician of the International Eurasian Academy of Sciences.

He has published over 1000 full scientific articles in leading medical and scientific journals. He was listed as "Highly Cited Researchers", released by the Clarivate Analytics, for the years 2018 to 2023. He has edited and authored over 30 books, as well as many chapters in major textbooks including the Oxford Textbook of Medicine (5th Ed.), Sleisenger & Fordtran's Gastrointestinal and Liver Disease (7th & 8th Ed) and Yamada's Textbook of Gastroenterology (4th Ed).

He served as the Vice-Chancellor and President of the Chinese University of Hong Kong (2010 – 2017) and the Chair of Worldwide Universities Network (2016 - 2017).

Professor Sung is currently Distinguished University Professor, Senior Vice President (Health & Life Sciences) and Dean, Lee Kong Chian School of Medicine at Nanyang Technological University, Singapore. He is also Emeritus Professor of Medicine at CUHK.

Talk Title: Oral Pathogen and Gastric Cancer

Talk Abstract

Cohort studies and randomized control studies (including the one conducted by Sung et al Gastroenterology 2000) have failed to demonstrate regression of gastric pathology even after successful eradication of H. pylori. It has been found that when the disease has progress to gastric atrophy and intestinal metaplasia, there is little chance of regression. Sung and Yu have found that after H. pylori has been eradicated, the stomach is colonized by a number of organisms which are normally found in the oral cavity. The significant enrichments and network centralities suggest potentially important roles of P. stomatis, D. pneumosintes, S. exigua, P. micra and S. anginosus in GC progression (Coker et al. Gut 2018). This distinct cluster of oral bacteria were associated with emergence and persistence of GA and IM. Functional pathways including amino acid metabolism and inositol phosphate metabolism were enriched while folate biosynthesis and NOD-like receptor signalling decreased in atrophy/IM-associated gastric microbiota. (Sung et al. Gut 2021). Recently, our team has unveiled the mechanism of S. anginosus promoting gastric tumorigenesis in mice. (Fu et al Cell 2024). S. anginosus accelerated GC progression in carcinogen-induced gastric tumorigenesis and YTN16 GC cell allografts. Consistently, S. anginosus disrupted gastric barrier function, promoted cell proliferation, and inhibited apoptosis. S. anginosus surface protein, TMPC, interacts with Annexin A2 (ANXA2) receptor on gastric epithelial cells mediate attachment and colonization of S. anginosus and induced MAKP activation. ANXA2 knockout abrogated the induction of MAPK by S. anginosus. Thus, this study reveals S. anginosus promotes gastric tumorigenesis via direct interactions with gastric epithelial cells. Treatment of S. anginosus may open an opportunity to prevent the development of gastric cancer in patients who have chronic H. pylori infection and intestinal metaplasia.

Iain TAN Bee Huat

Associate Professor
Senior Consultant Medical Oncologist & Division Director of Research, Division of Medical Oncology, National Cancer Centre Singapore, Singhealth

Dr. Iain Tan is a Senior Consultant Medical Oncologist, leading the colorectal cancer service in the GI Oncology Team at the Department of Medical Oncology, National Cancer Centre Singapore. He co-chairs Singhealth's multidisciplinary colorectal cancer tumor board. Nationally, he chairs the Medical Oncology Exit Exam committee for specialist accreditation & is a member of MOH's research training review panel & NMRC's grant review panel. At NCCS, he is also the clinical chair for NCCS's luminal GI cancer Comprehensive Research Program. Concurrently, he is a clinician scientist at Genome Institute of Singapore and an assistant professor at Duke-NUS. His research focuses –on metastases and drug resistance and immune-oncology in gastrointestinal cancers, with a special interest in non-invasive diagnostics & innovative early phase clinical trials. He has published widely, with many first or corresponding author publications in leading journals including Journal of Clinical Oncology, Nature Medicine, Nature Genetics, Science Translational Medicine and Lancet Oncology. For his research, he has received the ASCO Young Investigator Award (2010) and ASCO Merit Award (2011) and Singhealth Distinguished Young Researcher Award. For his clinical service & research, he received the Singapore Youth Award in 2014, the country's highest award for youths.

Talk Title: Early Detection and Prevention in Colorectal Cancer and Multi Cancer: Biological and Public Health Considerations

Talk Abstract

Early detection and screening for present complex challenges that span biological, clinical, and economic domains. I will share my experience in colorectal cancer research where findings from our work and others highlight different pathways that drive CRC development and phenotypes and suggest the different roles of cellular lineage and metaplastic transformations in different subtypes of CRC. These mechanisms could portend novel methods of cancer prevention. Additionally, advanced scientific understanding of cancer biology can inform novel early detection methodologies. Beyond technological advances, there are public health and economic considerations to determine effectiveness of screening with novel methodologies such as ctDNA and Multicancer early detection tests. The presentation will address the required data for effective population-level screening, the associated costs, potential savings, and the psychological impact on patients. The use of synthetic controls from national databases will be proposed as a method to provide robust evidence supporting screening and early detection health policy.

Ashok VENKITARAMAN

Professor
Cancer Science Institute of Singapore
NUS Centre for Cancer Research,
Yong Loo Lin School of Medicine, NUS

Ashok Venkitaraman is the Director of the Cancer Science Institute of Singapore, Research Director at the Institute of Molecular & Cell Biology at A*STAR, and holds a Distinguished Professorship of Medicine at the National University of Singapore. Ashok was previously the Ursula Zoellner Professor of Cancer Research at the University of Cambridge (1998-2020), and the former director of the MRC Cancer Unit there (2006-19).

Ashok is recognized for discovering how the hereditary breast cancer gene, BRCA2, preserves genome stability to suppress carcinogenesis, thereby illuminating the mechanism of a class of genes frequently inactivated in human cancers. Motivated by his work on tumour suppression, he has invented technologies to accelerate the discovery of drugs that modulate protein-protein interactions in these pathways, with growing clinical impact via serial spin-outs to industry, including PhoreMost.

Ashok's contributions have been recognized by awards and honours, including election to the Fellowship of the Academy of Medical Sciences, London, and membership of EMBO, Heidelberg.

Talk Title: Metabolic Triggers for Cancer Evolution

Talk Abstract

Cancer risk is determined by interactions between genetic inheritance and environmental exposures. How these factors collude to promote early steps in cancer evolution is poorly understood at the molecular level. We have used cancer susceptibility in carriers of mutations affecting the breast cancer gene, BRCA2, as a powerful model system to address this problem. Here, I will discuss recent work from our laboratory that highlights a new molecular mechanism connecting alterations in energy metabolism with inactivation of the tumour suppressive functions of BRCA2. Our work suggests a model wherein derangements in energy metabolism caused by metabolic disorders, diet or oncogenic drivers suffice to initiate early steps in cancer evolution.

ABSTRACT TALK

Matius ROBERT

Research Assistant, Department of Physiology, Yong Loo Lin School of Medicine, NUS

Extracellular Vesicles Within a Tumourigenic Senescent Tumour Secretome are able to Confer Antitumour Immunity

Matius Robert, Rekha Jakhar, Bijin Veonice Au, Gracie Wee Ling Eng, Alvin Kunyao Gao, You Heng Chuah, Karishma Sachaphibulkij, Lina Hsiu Kim Lim, Derrick Sek Tong Ong, Elaine Hsuen Lim, Yoko Itahana, Koji Itahana, Jit Kong Cheong, John Edward Connolly, Karen Carmelina Crasta

Talk Abstract

Triple-negative breast cancers (TNBC) are associated with high aggressiveness, poor prognosis, and high tumour recurrence. One avenue that could engender disease relapse is therapy-induced senescence (TIS), as they represent a population of residual disease and are highly secretory. In this study, we aimed to dissect the role of the TIS secretome, with a focus on small extracellular vesicles.

SPEAKER

TAM Wai Leong

Deputy Executive Director, Genome Institute of Singapore, A*STAR
Principal Investigator, Cancer Science Institute of Singapore, NUS

Wai Leong TAM performed his PhD research on stem cell biology at the Genome Institute of Singapore (GIS, A*STAR). He undertook his postdoctoral training with Bob Weinberg at the Whitehead Institute/MIT, where he concentrated on understanding breast cancer stem cell biology and cancer metastasis. He then joined the GIS and the Cancer Science Institute of Singapore as a faculty member. His lab focuses on uncovering emerging paradigms of cancer stem cells, specifically in the areas of cancer metabolism, cell state transitions, and tumor microenvironment. Current efforts are focused on identifying and validating preclinical targets that can lead into drug development, as well as translating fundamental discoveries into paradigms that can help change and advance clinical practice.

Talk Title: The Nexus of Diet and Cancer

Talk Abstract

Dietary nutrition is associated with cancer. Ample evidence suggest correlation, but causative mechanistic links between dietary nutrition and tumor metabolism have not been elucidated. Perturbations to dietary composition change whole-body metabolism. The systemic nutrient availability, in turn, influences metabolite levels within the tumor-microenvironment. While some dietary nutrients are thought to provide substrates that support cancer cell function as a general principle, evidence of causation has been challenging to ascertain. Furthermore, dietary nutrients necessary for the maintenance of specific cancer cell states are largely undetermined. Recognizing how dietary interventions can influence metabolic pathways for the control of disease progression or improve therapeutic responses is an area of untapped potential. This requires deep mechanistic insights into the altered metabolome. Furthermore, cancer cells have been thought to utilize nutrients in cell-autonomous manner, but more recently, cell-extrinsic factors arising from the tumor microenvironment have been observed. Understanding the extent and nature of such metabolic exchanges between tumor and microenvironment cells is new; it can inform on the use therapeutic inhibitors to target metabolic vulnerabilities.

George HANNA

Head of Department of Surgery and Cancer,
Professor, Imperial College London (UK)

George Hanna was trained in Ninewells Hospital, Dundee, Scotland in laparoscopic and oesophago-gastric surgery under the clinical and academic mentorship of Professor Sir Alfred Cuschieri. He obtained FRCS (Edinburgh) in 1993 and PhD (University of Dundee) in laparoscopic surgery in 1997. He joined Imperial College as Clinical Senior Lecturer and Upper Gastrointestinal Consultant Surgeon in 2003 and promoted to Reader in 2005 and Professor of Surgical Sciences in 2008. He became the Head of Division of Surgery in 2012 and Head of Department of Surgery and Cancer in 2018. He is a Fellow of Academy of Medical sciences.

The current interests of his laboratory revolve around volatile organic compounds analysis for biomarker discovery and understanding the molecular drivers of volatile biomarkers, supported by Cancer Research-UK research programme, Pancreatic Cancer-UK, Medical Research Council (MRC) and National Institute of Health Research (NIHR). This programme aims to develop and validate a non-invasive breath test as a platform diagnostic technology to detect gastrointestinal (oesophageal, gastric, colorectal, pancreatic and liver) cancers. His surgical research aims to develop, validate and use competency assessment tools for training and quality assurance of surgical performance in randomised controlled clinical trials.

Talk Title: Breath Test to Detect Gastrointestinal Cancers

Talk Abstract

Early gastrointestinal cancers typically have non-specific symptoms that could be overlooked, wrongly attributed to common benign conditions. It is not feasible to refer all patients with non-specific symptoms to have specialized investigations. Breath test is the proposed solution as a triage tool to refer patients with non-specific symptoms to have endoscopy or imaging. We are developing a single breath test based on volatile biomarkers to detect oesophageal, gastric, liver, pancreatic and colorectal cancers.

SPEAKER

SHAO Huilin

Dean's Chair Associate Professor
Department of Biomedical Engineering
Institute for Health Innovation and Technology

Dr. Huilin Shao is Dean's Chair Associate Professor, Department of Biomedical Engineering, and Principal Investigator, Institute for Health Innovation & Technology (iHealthtech), National University of Singapore. Dr. Shao received her BA from Cornell University, with a double major in Biological Sciences and in Physics. She completed her dual PhD (Biophysics) at Harvard University and PhD (Medical Engineering) from Harvard-MIT Health Sciences and Technology (HST). Her research focuses on developing integrated nanotechnology platforms for molecular analyses of novel biomarkers. She has pioneered multiple technologies to advance molecular diagnostics. Her work has been published in top journals such as Nature Biotechnology, Nature Nanotechnology, Nature Medicine, Nature Biomedical Engineering, Nature Communications and highlighted in major reviews and popular news media. In recognition of her achievement, Dr. Shao has received multiple awards, including James Mills Pierce Award, A*STAR Independent Fellowship, NUS Early Career Research Award, the L'Oreal For Women in Science National Fellowship, Springer-Nature MINE Young Scientist Award, and Singapore Presidential Young Scientist Award.

Talk Title: Nanosensor Technologies for Molecular Analyses of Circulating Biomarkers

Talk Abstract

The growing emphasis on personalized medicine significantly increases the need to analyze key molecular markers. In comparison to tissue biopsies, circulating biomarkers (liquid biopsies) can be conveniently and repeatedly obtained from biofluids with minimal complications. Exosomes have recently emerged as a promising circulating biomarker. Exosomes are nanometer-sized membrane vesicles actively shed off by cells and possess unique advantages: they abound in biofluids and harbor diverse molecular contents. In this talk, I will describe various nanosensor systems we have developed for quantitative analyses of diverse circulating biomarkers. These technologies integrate advances in device engineering, nanomaterial sciences and molecular biology. By enabling rapid, sensitive and cost-effective detection of circulating biomarkers, these platforms could significantly expand the reach of preclinical and clinical research, in informing therapy selection, rationally directing trials, and improving sequential monitoring to achieve better clinical outcomes.

Pierce CHOW

Senior Consultant Surgeon, HPB/Transplant, Division of Surgery & Surgical Oncology, National Cancer Centre Singapore and Singapore General Hospital
Professor and Program Director, Duke-NUS Medical School

Prof Pierce Chow is Professor and Program Director at the Duke-NUS Medical School and Senior Consultant Surgeon at the National Cancer Centre Singapore (NCCS) and the Singapore General Hospital. He is concurrently a National Medical Research Council (NMRC) funded Senior Clinician-Scientist and was the founding President of the College of Clinician Scientists, Academy of Medicine Singapore.

Prof Chow was conferred the Chapter of Surgeon's Gold Medal in the conjoint FRCSE/MMed examination in 1995, and after completing his surgical residency and PhD, he trained in liver transplantation with Professor Russell Strong in Australia. On top of his busy clinical practice in hepato-pancreato-biliary (HPB) surgery, Prof Chow has been very active in clinical and translational research in liver cancer.

Prof Chow co-founded the Asia-Pacific Hepatocellular Carcinoma (AHCC) Trials Group and has been the protocol chair of more than ten prospective multi-center clinical studies in liver cancer over the last 20 years. Pierce has led the multi-disciplinary NMRC TCR National Flagship Program in Liver Cancer since 2016 and the program has been successfully renewed in 2022 with the NMRC OF-LCG grant. In 2020, he was awarded an A*STAR IAF-ICP grant in collaboration with industry, to conduct a nation-wide 2000-patient cohort study to develop diagnostics for early detection of hepatocellular carcinoma (HCC) in high-risk patients. Subsequently in 2021, he initiated a multi-national, investigator-initiated Phase II randomised clinical trial (STRATUM) fully supported by industry to compare the safety and efficacy of a novel combinatorial treatment for intermediate HCC patients. Pierce is also faculty at the Genome Institute of Singapore and the SingHealth Duke-NUS Global Health Institute, and Research Director at the Institute of Cell and Molecular Biology Singapore. Prof Chow was conferred the NMRC National Outstanding Clinician Scientist Award in 2012 for improving clinical outcomes with his research on Liver Cancer. In 2024, he was inducted into the Master Academic Clinicians Hall by the SingHealth-Duke-NUS Academic Medical Centre.

Talk Title: Addressing the Unmet Need for Early Diagnosis in Hepatocellular Carcinoma: the ELEGANCE Study

Talk Abstract

While hepatocellular carcinoma (HCC) is the 6th most common cancer in the world, it is the 4th most common cause of cancer death. A main reason for the high case mortality of 0.92 is our current inability, in the majority of patients, to detect HCC at its early stage where there is opportunity for cure. Surveillance for patients at high-risk of hepatocellular carcinoma (HCC) currently comprises of 6-monthly US examination and serum AFP test. This combination of 2 different modalities is cumbersome at the level of primary care and many patients do not avail themselves of surveillance. The combination tests however also misses 1/3 of early cancers. In addition, we are also currently unable to stratify patients into very high risk groups (who may need surveillance < 6 months apart) and less high risk groups (who may not need 6 monthly surveillance).

The ELEGANCE study is a 2000-patient prospective cohort study of patients at high-risk of developing HCC (liver cirrhosis from any cause, chronic viral hepatitis, NASH), who on top of 6-monthly US and AFP surveillance also contributed longitudinal biosamples for micro RNA, metabolomic and mircobiomic studies. 1000 of the patients also received a non-contrast enhanced MRI scan at the onset of the study to provide data for AI analysis. The aim of the study was to develop a more accurate point-of-care diagnostic for the early diagnosis of HCC and to uncover changes in the microbiome and metabolome that predicts the development of HCC that can offer opportunities to prevent the development of the cancer. An AI approach is also adopted to utilise data from the MRI to stratify patients into different risk groups. This ASTAR IAF-ICP funded study collaborates with 3 industrial entities namely MIRxes, Perspectum and Amili.

Early results from the cohort study will be discussed.

ABSTRACT TALK

NI Qianqian

Assistant Professor,
Department of Diagnostic Radiology, Yong Loo Lin School of Medicine, NUS

Nucleic Acids Nanotechnologies for Cancer Immunotherapy

Talk Abstract

Among various nucleic acids therapeutics, messenger RNA (mRNA) is no doubt one of the most promising therapeutic modalities in multiple diseases beyond infectious diseases, as billions of administrations of COVID-19 mRNA vaccines have convinced its safety and efficacy. One major challenge of cancer vaccination is how to increase the immunogenicity of delivered mRNA vaccine. In this talk, we will mainly discuss how we develop and leverage on novel lipid nanoparticle (LNP) technologies to facilitate lymph node delivery and provide potent immune activation. We synthesized a serious of amphiphilic poly 2-(Dimethylamino)ethyl methacrylate (DMAEMA) polymers and evaluated their performance in enhancing mRNA delivery and vaccination potency. The top-performing formula induced multi-fold increase of mRNA production yield in targeted cells and robust immune response via intracellular activation of STING sigaling pathway, and remarkably inhibit tumor growth with prolonged immune memory effect. Overall, this approach holds promise for advancing clinically translatable mRNA cancer vaccine.

Robert SCHARPF

Associate Professor
Johns Hopkins Bloomberg School of Public Health

Dr. Robert Scharpf is a biostatistician with expertise in the analysis of high-throughput genomic data. He is the leader of the Biostatistics Core for the Gastrointestinal Spore at the Sidney Kimmel Cancer Center at Johns Hopkins University and has over a decade of experience developing statistical models and software in cancer genomics. His main areas of expertise are the development of statistical methods for processing high-throughput genomic data, approaches to detect and model technical sources of variation such as batch effects, multi-study models for genome-wide association studies, and the development of machine learning approaches for prediction. Methodological interests include hierarchical Bayesian models and their implementation to address inferential problems in cancer genomics. Applications of these methods include the early detection of cancer from fragmentation patterns of cell-free DNA in blood and the identification of specific alterations in DNA that can be used to guide treatment of cancer patients.

Talk Title: Detection and Characterization of Human Cancer Using Cell-Free DNA Fragmentomes

Talk Abstract

Non-invasive approaches for cell-free DNA (cfDNA) assessment provide an opportunity for cancer detection and intervention. We have previously developed an approach called DNA evaluation of fragments for early interception (DELFI) that utilizes genome-wide fragmentation profiles to provide a high-performing and cost-effective approach to cancer detection. Here we describe the development of predictive models based on machine learning to identify aberrant patterns of fragmentation in individuals with cancer and examine the genomic and chromatin features associated with these changes.

LIM Chwee Teck

Director, Institute for Health Innovation & Technology (iHealthtech)
Professor, Department of Biomedical Engineering, NUS

Professor Lim is the NUS Society Chair Professor of Biomedical Engineering and Director of the Institute for Health Innovation and Technology at the National University of Singapore. His research interests are in the development of microfluidic technologies for cancer diagnosis and personalized therapy. He has co-authored over 470 journal publications and given more than 450 plenary/keynote/invited lectures. He is also a serial entrepreneur having started six companies to commercialize technologies developed in his lab. Prof Lim is an Elected Fellow of IUPESM, US National Academy of Inventors, AIMBE, IAMBE, the ASEAN Academy of Engineering and Technology, the Academy of Engineering, Singapore, the Singapore National Academy of Science and the Institution of Engineers, Singapore. He and his team have garnered over 100 research awards and honours including Nature Lifetime Achievement Award for Mentoring in Science, Asia's Most Influential Scientist, Highly Cited Researcher, IES Prestigious Engineering Achievement Award, ASEAN Outstanding Engineering Achievement Award, Asian Scientists 100, Credit Suisse Technopreneur of the Year Award, Wall Street Journal Asian Innovation Award (Gold) and the President's Technology Award among others.

Talk Title: Microfluidics for Liquid Biopsy – From CTCs to ctDNA

Talk Abstract

Microfluidics for liquid biopsy is transforming how cancer diagnostics can be performed through the utilization of microscale fluid dynamics. This approach allows for the isolation and analysis of circulating tumor cells (CTCs) and circulating tumor DNA (ctDNA) from minute liquid biopsy samples, such as peripheral blood. Such microfluidic platforms enable precise manipulation of small volumes of blood, facilitating the efficient capture and separation of rare cancer cells and genetic materials. By providing a minimally invasive method for detecting and monitoring cancer, microfluidics holds great promise in advancing personalized medicine and enhancing our understanding of tumor dynamics. Here, we will highlight several microfluidic technologies that we have developed to detect and isolate CTCs and ctDNAs from cancer patient blood. We believe such technologies will pave the way for improved cancer diagnosis, prognosis, and even personalized therapy.

ABSTRACT TALK

Nur Fatimah Farzanah JALALUDIN

PhD Student, Department of Physiology, Yong Loo Lin School of Medicine, NUS

Exosomal mRNA Cargo are Biomarkers of Tumor and Immune Cell Populations in Pediatric Osteosarcoma

Jonathan Lian K Ong*, Nur Fatimah Farzanah Jalaludin*, Meng Kang Wong, Sheng Hui Tan, Clara Angelina, Sarvesh A. Sukhatme, Trifanny Yeo, Chwee Teck Lim, York Tien Lee, Shui Yen Soh, Tony K. H. Lim, Timothy Kwang Yong Tay, Kenneth Tou En Chang, Zhi Xiong Chen, Amos HP Loh
*Both authors contributed equally

Talk Abstract

Osteosarcoma, the most prevalent malignant bone tumour in youth, often recurs despite aggressive treatment. Our study evaluates the use of peripheral blood exosomes to monitor treatment response and recurrence. Exosomes from osteosarcoma patients showed altered mRNA signatures, suggesting potential biomarkers for disease monitoring. This offers insights into osteosarcoma's pathophysiology and could aid in treatment management.

SPEAKER

Mikael HARTMAN

Associate Professor and Senior Consultant
Department of Surgery, Yong Loo Lin School of Medicine, NUS
NUS Saw Swee Hock School of Public Health (SSHSPH)

A/Prof Mikael Hartman is a Breast and Trauma Surgeon at the Department of Surgery, National University Hospital (NUH), and an Associate Professor at the Department of Surgery, National University of Singapore (NUS) Yong Loo Lin School of Medicine and NUS Saw Swee Hock School of Public Health. He received his medical training and completed his doctoral studies in the field of epidemiology at Karolinska Institutet, Sweden. He is leading the development of the Singapore Breast Cancer Cohort, the Singapore-Malaysia Breast Cancer Working Group, the Breast Cancer Prevention Programme at NUS Saw Swee Hock School of Public Health, the Breast Cancer Screening and Prevention Programme at NUS Yong Loo Lin School of Medicine and BREAst screening Tailored for Her (BREATHE) Programme. His specialty focuses on breast cancer etiology, prognostication, genetic contribution to breast cancer, clinical epidemiology and trauma. Currently, he serves as the Head of Breast Service, Department of Surgery, NUH. On top of this, A/Prof Hartman is also the Founder for an AI start-up company called FathomX.

Talk Title: Can We Prevent Breast Cancer?

Talk Abstract

Breast cancer screening has remained unchanged in the last forty years, despite the advances in technology. Current screening efforts focuses on age-based mammography screening. However, there is a need to shift towards a more tailored breast cancer screening method to include genetic risk and incorporate the use of Artificial Intelligence (AI) in detecting breast cancer. Findings from the risk-stratified pilot programme may potentially aid healthcare professionals to accurately predict development of breast cancer in patients, thus allowing for early diagnosis and treatment. Mammograms are inherently time consuming and difficult to read. AI assistant can potentially reduce workload and increase diagnostic accuracy.

SPEAKERS DAY 2

Cristian TOMASETTI

Professor and Director,
Division of Mathematics for Cancer Evolution and Early Detection, Department of Computational and Quantitative Medicine, Beckman Research Institute, City of Hope
Translational Genomic Research Institute, City of Hope

Dr. Tomasetti's work is recognized internationally for his paradigm-shift contributions to the current understanding of cancer etiology and tumor evolution. By combining mathematical modeling, statistical analysis, and machine learning, with experimental, epidemiological, and DNA sequencing data, he has provided the first quantitative evidence for the large role in cancer causation played by the normal, i.e. endogenous, accumulation of somatic mutations in the cells of the human body. As an applied mathematician, he also currently leads the effort to develop novel blood tests and classification algorithms for the early detection of cancer as well as for monitoring cancer patients.

Before joining City of Hope and TGen, he was an Associate Professor of Oncology and Biostatistics at Johns Hopkins University with appointments in the Division of Biostatistics and Bioinformatics, in both the Department of Oncology (Sidney Kimmel Comprehensive Cancer Center) and the Department of Biostatistics (Bloomberg School of Public Health). Dr. Tomasetti holds a Ph.D. in Applied Mathematics from the University of Maryland, College Park (Dec. 2010). After his Ph.D., he was a Ruth L. Kirschstein National Research Service Award Postdoctoral Fellow in the Department of Biostatistics of the Harvard School of Public Health and in the Department of Biostatistics and Computational Biology of the Dana-Farber Cancer Institute (Jan. 2011 – Jun. 2013), after which he became a faculty member at Hopkins (Assistant Professor, Jul. 2013 – Dec. 2017).

Talk Title: Cancer Risk Prediction, Early Detection and Minimal Residual Disease

Talk Abstract

I will present recent developments in novel methodologies and assays for cancer early detection as well as for the detection of minimal residual disease and monitoring. I will conclude with a novel approach to cancer risk prediction.

SPEAKER

TOO Heng-Phon

Associate Professor, Department of Biochemistry, NUS

Too received his undergraduate training in Biochemistry, Imperial College of Science & Technology, UK and continued his PhD training in a joint research project in Imperial College, Institute of Ophthalmology and West Minister Hospital, London. Thereafter, he was in the Medical Research Council, Cambridge (UK), where he was a Procter & Gamble Fellow and moved to the Department of Anesthesiology and Department of Biological Chemistry & Molecular Pharmacology, Harvard Medical School. He is a faculty in the Department of Biochemistry and Director of Research (N2CR), Yong Loo Lin School of Medicine, National University Singapore. He was a Scientific Advisor to the Biotransformation Innovation Platform and an adjunct scientist in the Bioprocess Technological Institute, A*STAR. He was a Fellow of the Singapore Massachusetts Institute of Technology Alliance in the Molecular Engineering of Biological & Chemical Systems program and co-chaired the Chemical & Pharmaceutical Engineering program. His laboratory was funded by Roche Diagnostics (USA & Asia Pacific) and National Institute of Health (USA) to develop diagnostic assays for infectious diseases, and intellectual properties of specific diagnostic and biotechnology platforms with various agencies and with MIT, USA. He is also a co-founder and Chairman of mirxes Pte Ltd and AGEM Bio and is a recipient of the President Technology Award.

Talk Title: The Long March from Lab to Bedside: Our Experience From Developing a miRNA Technology to a Clinical Test

Talk Abstract

It is not a surprise that interventions are more effective when cancers are detected at early stages resulting in dramatic improvements in survival and quality of lives. Unfortunately, ~50% of cancers are still detected at advanced stages. Exciting innovations and developments in early cancers detection is actively evolving and the use of liquid biopsies
is particularly interesting given its potential to shed information on disease prognosis, progression and responses to therapies, in less invasive or non-invasive manners.
Developing such innovations require the translation of fundamental sciences and technologies to useful products for diagnosis or surveillance, a journey flawed with challenges in regulatory and commercial demands. Over the many years, we have embarked on such a path and this brief discussion is on the many challenges required to translate from laboratory to the patient use, lessons beyond technology development.

LI Jingmei

Group Leader
Genome Institute of Singapore, A*STAR

Dr Li Jingmei is a woman in Science doing Science for women. The science she leads has been described as strategic, personal, and empathetic. She looks for patterns and answers in the chaos that manifests as genetic and non-genetic data. Her ultimate vision is to change the perception of breast cancer screening, making it an insta-mammogram-mable lifestyle habit.

Talk Title: The Doctor Will See You Before You Fall Sick

Talk Abstract

Leveraging polygenic risk scores and non-genetic factors allows us to personalize risk assessments, ensuring more targeted and effective preventive measures. We are entering a new era of proactive healthcare by integrating advanced genetic insights with lifestyle and environmental considerations. The BREAst Cancer Screening Tailored for HEr (BREATHE) study is the first risk-based breast cancer screening study in Singapore. BREATHE aims to empower individuals with the knowledge to navigate their unique health journeys, fostering early detection and personalized interventions. Together, we can transform breast cancer screening from a one-size-fits-all to a precision-guided strategy, amplifying our ability to save lives and promote long-lasting well-being.

Jeffrey B. HALTER

Professor Emeritus, University of Michigan
Parkway Visiting Professor, NUS

Dr. Halter is Professor Emeritus at the University of Michigan (UM), where he served as Chief of the Division of Geriatric Medicine for 27 years. He is also Parkway Visiting Professor in Geriatrics, Yong Loo Lin School of Medicine, National University of Singapore. He was founding Director of the UM Geriatrics Center and the Geriatric Research, Education, and Clinical Center at the VA Ann Arbor Healthcare System. Dr. Halter's research interests include neuroendocrine regulation of metabolism in aging and in diabetes mellitus, and regulation of autonomic nervous system function. He is an author of over 300 research papers and book chapters, and Senior Editor of Hazzard's Geriatric Medicine and Gerontology, the 8th edition of which was published by McGraw-Hill in 2022. Dr. Halter is a past President of the American Geriatrics Society (AGS). He has been elected to membership in the American Society for Clinical Investigation and as a Fellow of the American Association for the Advancement of Science.He has received the Donald P. Kent Award from the Gerontological Society of America and the AGS Nascher/Manning Award.

Talk Title: The Challenge of Effective Cancer Screening in an Aging Population

Talk Abstract

Age is the single most important risk factor for developing cancer. In the United States, over 60% of all newly diagnosed malignant tumors and 70% of all cancer deaths occur in persons 65 years or older. Singapore is one of the fastest greying populations in the world. By 2030, about one in five Singapore residents will be 65 years or older. Screening to detect cancers early is a key strategy to reduce cancer related mortality, especially for breast, cervical, and colorectal cancers. However, older adults are both underscreened and thus underdiagnosed with cancer, as well as overscreened and placed at increased risk of overtreatment. Although routine cancer screening has little likelihood to result in a net benefit for very old or disabled individuals with limited life expectancy, screening is still common in such people and even in nursing home patients with severe disability who would likely not benefit from treatment. Thus, the challenge for a successful community based cancer screening program is to provide incentives for those who will benefit from early detection, but avoid overscreening those with limited remaining years of life.

SPEAKER

ABSTRACT TALK

Renu BALYAN

Scientific Liaison, Olink Proteomics Singapore

Next Generation Proteomic Profiling of a Pan-Cancer Cohort for the Development of Screening Tools for Cancer

Renu Balyan, Marijana Rucevic, María Bueno Álvez, Ryan Lamers, Ola Caster, Hilda Andersson, Fredrik Edfors, Linn Fagerberg, and Mathias Uhlen

Talk Abstract

A comprehensive characterization of blood proteome profiles in cancer patients could provide a better understanding of disease biology, enabling earlier diagnosis, risk stratification and better monitoring of different cancer subtypes. Here, we describe the use of next generation protein profiling using Olink Explore to define the proteome signature in blood across patients representing 12 major cancer types. A panel of 83 proteins was found to identify the correct cancer types with AUCs ranging between 0.93 and 1 indicating that a cost-effective pan-cancer population screening can be foreseen in which a panel of proteins are used to identify multiple cancer types in a single assay.

TAN Ker Kan

Head and Senior Consultant, Division of Colorectal Surgery,
National University Hospital

A/Prof Tan Ker Kan is currently the Head and Senior Consultant of the Division of Colorectal Surgery in the National University Hospital.

Pertaining to today's talk, he completed his PhD in the Saw Swee Hock School of Public Health and has been working in the field of Health Services Research and Population Health for the past few years.

He was also the Chairperson of the National Colorectal Cancer Screening Programme for the past 3 years.

He has been awarded several NMRC PHRGs for his work in health services research and is currently a HPHSR CSA (Senior Investigator) recipient, although these encompass projects unrelated to colorectal screening

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Talk Title: Colorectal Cancer Screening Research – Small Steps to Improve National Outcomes

Talk Abstract

The Singapore Colorectal Cancer Screening Programme has been running for over a decade. Whilst there is improvement in the screening rates amongst the population over the years, there remain issues that are unresolved and under-emphasized.

Some of these issues that would be highlighted in this talk included barriers towards screening in our unique multi-ethnic society, the FIT kits that were used, and barriers towards colonoscopy amongst FIT positive individuals.

Nitzan ROSENFELD

Director, Barts Cancer Institute,
Queen Mary University of London

Prof. Nitzan Rosenfeld is a leader and pioneer of the field of cancer liquid biopsies. He trained in Physics and Systems Biology before leading a Computational Biology team in a biotech company. In 2009 he set up a research group at the Cancer Research UK Cambridge Institute of the University of Cambridge, to develop methods and proof-of-concept applications of liquid biopsies for cancer precision medicine. Their work was recognised by multiple academic awards and election as a fellow of the British Academy of Medical Sciences. In 2014 Prof. Rosenfeld co-founded Inivata (now a part of NeoGenomics), a cancer genomics company unlocking liquid biopsies to transform the care of cancer patients. Prof. Rosenfeld's trainees and lab alumni have taken on research and leadership roles throughout the liquid biopsy community. In 2024 Prof. Rosenfeld took on the role of Director of the Barts Cancer Institute at Queen Mary University of London.

Talk Title: Expanding Applications of Cell-Free DNA in Cancer Diagnostics

Talk Abstract

Blood plasma and other body fluids contain cell-free DNA, and in individuals with cancer this includes fragments of circulating tumour DNA (ctDNA) that originate from tumour cells. Analysis of cell-free DNA by appropriate genomic tools can provide information about the cancer status and its changes over time and in response to treatment. This has enabled the development of diagnostic applications based on cell-free DNA analysis for non-invasive molecular profiling and for detection of minimal residual disease, that are rapidly becoming part of the clinical standard of care. Large efforts are underway to develop, assess and establish the utility of cell-free DNA for earlier detection of cancer. Research in our group pursues new developments in sequencing technologies, and capitalises on discoveries about the molecular characteristics, epigenetic and fragmentation patterns of cell-free DNA. We apply cutting-edge methods to cohorts of samples, carefully collected in collaboration with clinical investigators, to improve existing tools and develop new diagnostic strategies. Key projects include pre-symptomatic detection of cancer in populations at high-risk; improvement and implementation of tools for detection of residual disease; and intense monitoring of cancer response and recurrence using simplified finger-prick self-sampling.

YEOH Khay Guan

Professor
Yong Loo Lin School of Medicine, NUS
Division of Gastroenterology and Hepatology,
National University Hospital

Dr Yeoh Khay Guan is concurrently Chief Executive, National University Health System and Professor of Medicine at the National University of Singapore. He practices as a Senior Consultant at the Division of Gastroenterology and Hepatology, National University Hospital (NUH). Dr Yeoh's research interest is in enhancing the early detection of gastric and colorectal cancers. He is the Lead Principal Investigator of the Singapore Gastric Cancer Consortium, a national flagship research group, which aims to improve the outcomes for gastric cancer by early detection, improving treatment and advancing the understanding of gastric carcinogenesis. He has published over 200 peer-reviewed papers in international journals and has an H-index of 61 with over 12249 citations. He also chairs the National Colorectal Cancer Screening Committee of the Health Promotion Board, Ministry of Health, which recommends guidelines for the national colorectal screening programme in Singapore. He was awarded the National Medical Excellence Award as Outstanding Clinician Scientist by the Ministry of Health, Singapore in 2013, and the Public Administration Medal (Gold) in 2022 for his contributions to medical education and healthcare.

Talk Title: Earlier Detection leads to Better Care & Outcomes

Talk Abstract

Cancer is the leading cause (28.2%) of death in Singapore. Common cancers include breast, colorectal, lung, and prostate. There are national screening programmes for breast, cervical and colorectal cancers, albeit with suboptimal uptake and population compliance. There is therefore a strong opportunity for more widespread uptake of screening and early detection to reduce cancer mortality.

Recent work from the Singapore Gastric Cancer Consortium (SGCC) has contributed to: Co-developing the world's first blood-based test (GASTROClear) for detection of gastric cancer (GC); application of single-cell and spatial profiling to dissect the origins and clonal dynamics of gastric carcinogenesis; new insights on early detection and prevention resulting in changes to clinical practice; and improving treatment for peritoneal metastases through translational research.

Looking ahead, we anticipate refreshed synergy in the national research community to create a cancer research continuum from fundamental discovery to clinical translation; between academia and health systems to bring practice-changing innovations into deployment and practice; to emphasise early detection and early intervention as key strategies to improve outcomes; and taking impetus from the recent national Healthier SG program to revitalize population screening with new solutions aimed at improving community uptake.

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