ABOUT LEE KONG CHIAN SCHOOL OF MEDICINE

The Lee Kong Chian School of Medicine (LKCMedicine), a partnership between Nanyang Technological University, Singapore (NTU) and Imperial College London (Imperial), is training a generation of doctors who will put patients at the centre of their exemplary medical care. The School’s primary clinical partner is the National Healthcare Group, a leader in public healthcare recognised for the quality of its medical expertise, facilities and teaching. Named after local philanthropist Tan Sri Dato Lee Kong Chian, the School, which was officially opened by Singapore’s Deputy Prime Minister Teo Chee Hean on 28 August 2017, is a model for innovative medical education and a centre for transformative research.

Graduates of the five-year undergraduate medical degree programme that started in 2013 will have a strong understanding of the scientific basis of medicine, along with interdisciplinary subjects including engineering, technology, business and the humanities. Its first doctors will graduate in 2018 with a Bachelor of Medicine and Bachelor of Surgery (MBBS), awarded jointly by NTU Singapore and Imperial.

Cover:
LKCMedicine aims to develop a vibrant and creative research environment, with an interactive community comprising senior and junior researchers as well as undergraduate and postgraduate students. Our laboratories are seamless collaborative spaces involving different interests and expertise that strive to perform cutting-edge and innovative research. Students are an important part of our research community and we actively seed the interests of research in our medical students. All Year-4 MBBS students embark on a six-week Scholarly Project with our faculty, where they get to interact with other researchers and students and be exposed to the “nuts and bolts” of research at the same time.
A MEDICAL SCHOOL BY TWO OF THE WORLD’S FINEST UNIVERSITIES

From Watson and Crick’s discovery of the structure of DNA, right up to the present day, where CRISPR-Cas9 technology is revolutionising the potential to eradicate genetically determined disease, scientific research has been the key to many advances in medicine over the past 60 years. Over the same timeframe, many of the major developments in medical care have been new technology resulting from engineering research, such as endoscopes, stents and scanners.

The Lee Kong Chian School of Medicine (LKCMedicine), a partnership between Nanyang Technological University (NTU), Singapore and Imperial College London (Imperial), stands squarely in this tradition. We pursue transformative research into globally important health issues that have particular relevance to Singapore’s ageing society, such as diabetes and cardiovascular diseases, neurodegenerative diseases and multidrug resistant infections. This work is underpinned by our support for laboratory, clinical, population and global health research and is conducted by our outstanding faculty in superb facilities.

We have created a thriving research community, where globally-renowned senior faculty collaborate with and mentor colleagues at an earlier stage of their careers. Through our emphasis on recruitment of talented PhD students, postdocs and early career faculty, we are harnessing the passion and skills of a cohort of younger researchers who will take our research mission into the future.

In partnership with engineering and science colleagues at NTU, clinicians at National Healthcare Group and elsewhere in Singapore, as well as through international collaborations with Imperial and other outstanding research centres around the world, LKCMedicine will continue to pursue innovative and translational research to advance medical knowledge for the benefit of Singapore and for the good of humanity.

Professor James Best
Dean, LKCMedicine
OUR VISION
Redefining Medicine, Transforming Healthcare

OUR MISSION
Equipping doctors who advance the science and practice of medicine for the good of humanity. The doctors you and I would like to have caring for us.

WORLD-CLASS EDUCATION
An innovative, cutting-edge, forward-thinking and highly relevant world-class curriculum

KEY FOCUS AREAS OF OUR MISSION

SYNERGISTIC PARTNERSHIPS
Leveraging partnerships with our education, research and healthcare partners for innovative solutions

TRANSFORMATIVE RESEARCH
Impactful multidisciplinary collaborative research to improve healthcare and hence, lives

OUR VALUES

HUMILITY
We serve with humility and appreciate our individual and collective roles towards advancing medicine and transforming healthcare.

INTEGRITY
We adhere firmly to our principles of ethical conduct and will never compromise the trust others have placed in us.

COMPASSION
We serve with compassion and dedicate our actions to benefit our patients, society and positively impact lives today and tomorrow.

CONTINUOUS LEARNING
We commit ourselves to continuous learning, innovation and improvement for the advancement of healthcare in Singapore and beyond.

PROFESSIONALISM
We perform to the highest standards and seek excellence in the science and practice of medicine

LEE KONG CHIAN SCHOOL OF MEDICINE
LKCMedicine RESEARCH FOCUS

LKCMedicine is a young, thriving medical school dedicated to transforming healthcare and advancing the science and practice of medicine. We champion the best in research and education, built on a foundation of synergistic partnerships and organisational excellence.

Fundamental to LKCMedicine’s research strategy is an emphasis on Ageing and Population Health, underpinned by our growing expertise in the key areas: Metabolic Disorders, Neuroscience and Mental Health, Infection and Immunity, Dermatology and Skin Biology, Developmental Biology and Regenerative Medicine, as well as clinical and other interdisciplinary research – themes that directly address Singapore’s healthcare challenges of tomorrow and caring for its rapidly ageing population.

LKCMedicine’s researchers have access to state-of-the-art platforms and facilities, and work at the centre of international and national networks, delivering world-class science and medicine via collaborative initiatives and Research Centres.

By investing in people, creating the best research environment, and approaching healthcare’s most complex translational challenges through focused interdisciplinary research between clinical and engineering sciences, we do transformative science, provide innovative education, and ultimately, change lives for the better.

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**INFRASTRUCTURAL RESEARCH SUPPORT**

- Research Core Facility (Cell Culture, Flow Cytometry, Histology)
- Optical Microscopy
- Clinical Research Centre
- Biological Resource Facility & Gut Microbiota Platform
- Zebrafish Disease Modelling & Screening Platform
LKCMedicine 2020: TRANSFORMATIVE RESEARCH

LKCMedicine’s mission is to do impactful, multidisciplinary collaborative research to improve healthcare and hence, lives.

The School will embark on initiatives over the next few years that will allow research to flourish. Our strategic thrusts are focused on making rapid progress towards creating an optimal environment, nurturing and inspiring scientists for scientifically rigorous yet innovative work, and achieving research excellence through interdisciplinary effort.

3 KEY INITIATIVES

1. Investing in People
   - Creating a critical mass in priority research areas and promoting a “multilingual” culture amongst researchers who can express their ideas effectively across disciplines and train a new generation of clinician researchers
   - Developing a new generation of biomedical and clinician researchers

2. Creating a World-leading Medical and Health Systems Research Environment
   - Building world-class research facilities and resources
   - Facilitating the development of a new Academic Health System within HealthCity Novena

3. Fostering Interdisciplinary Research
   - Establishing significant expertise in key research areas, namely Health Systems and Population Health, Metabolic Disorders, Neuroscience and Mental Health, Infection and Immunity, and Dermatology and Skin Biology
   - Synergising with the domain expertise in engineering and technology, and other science disciplines in NTU to facilitate translation of clinical innovation into health systems and commercialisation, and drive new innovative models of healthcare delivery in Singapore
TALENT DEVELOPMENT

LKCMedicine’s vision is to transform healthcare and lives. As part of this, our Talent Development Programme aims to identify and train the next generation of biomedical and clinical research leaders, so that they can take our work forward through the next decades.

PhD PROGRAMME

The LKCMedicine PhD programme gives outstanding students the training they need to do world-class science that addresses the School’s key research themes – Metabolic Disorders, Infection and Immunity, Neuroscience and Mental Health, and Dermatology and Skin Biology. Graduates leave the programme equipped with the intellectual and technical skills to become independent research scientists, and have their clinical awareness and learning experiences uniquely reinforced through a range of local and overseas placements. To enhance our students’ employability and career mobility upon graduation, we also place strong emphasis on the development of interpersonal, presentation and management skills, coupled with training in business awareness and information technology.

POSTDOCTORAL FELLOWSHIP PROGRAMME

The Postdoctoral Fellowship Programme aims to nurture a cadre of talented biomedical and clinical research scientists at the School. Fellowships, awarded for up to three years, give gifted early-stage researchers the opportunity to explore their research interests lying within the broad themes of the LKCMedicine strategic plan.

“Trained as an engineer, my work at LKCMedicine has been an exciting and rewarding journey as I get to interact closely with clinicians and scientists to pursue my interest in translational diabetes research using novel technologies.”

HOU HAN WEI
Fellowship Recipient 2013

“The LKCMedicine Postdoctoral Fellowship has provided me excellent training in laboratory leadership, and project and resource management skills. It has allowed me to collaborate with top-notch clinicians and scientists, and experience the freedom and challenges of an independent researcher investigating endogenous host defence peptides as novel antimicrobial and anti-inflammatory drugs. The mentoring has also sharpened my skills for confident application in my scientific career.”

RATHI SARAVANAN
Fellowship Recipient 2014

“LKCMedicine has supported my work in the interactions between host and pathogenic biofilms with research platforms such as the Singapore Phenome Centre. The fellowship programme is highly demanding but rewarding as it helps me to create my own research niche and collaborate with scientists across disciplines. With the support and opportunities given, I hope to develop potential strategies to treat chronic infections.”

CHUA SONG LIN
Fellowship Recipient 2015
Research at LKCMedicine aims to deliver improved quality of life, therapeutic outcomes and levels of care for individual citizens, and a healthier, longer-living society and cost-efficient health service for Singapore.
RESEARCH FACULTY

LKCMedicine’s faculty is the engine driving our research forward. Members of our senior faculty are internationally renowned experts in their fields and serve as mentors and exemplars for our cadre of talented junior faculty. Joint and visiting appointments with other universities and hospital departments ensure a collaborative, multidisciplinary approach to deliver our strategic aims.

Yusuf Ali

Assistant Professor of Metabolic Disease

Worldwide, diabetes is increasing at a staggering rate but our knowledge of factors that damage insulin-producing cells in diabetes remains poor and there is a dire need to address this. The challenge here is that Type-2 diabetes etiology is riddled by genetic and environmental factors. Our laboratory works on teasing out such factors with focus on the East Asian insulin-producing cell.

George Augustine

Professor of Neuroscience and Mental Health

Our laboratory is interested in synaptic transmission, the process that allows nerve cells to communicate with each other, and underlies information processing and storage in the brain.

We study the basic mechanisms involved in synaptic transmission, as well as the properties of circuits formed by synaptic connections between brain neurons. The main questions we are pursuing are: (1) how are neurotransmitters secreted from neurons; and (2) how do local synaptic circuits process information within the brain.

Anna Barron

Nanyang Assistant Professor

We want to understand the mechanisms behind normal and pathological brain ageing. Using neuroimaging techniques combined with cellular, molecular, and behavioural methods, we study complex, dynamic pathological changes in animal models of ageing and disease. This approach promises insights into degenerative mechanisms, potential biomarkers and candidate therapeutic targets to promote healthy brain-ageing.

David Becker

Professor of Tissue Repair and Regeneration

The laboratory’s focus is to understand the process of normal tissue repair, why it sometimes fails and why healing is perturbed. By understanding the cell biology behind these processes, we hope to develop novel ways to improve or rescue the healing process.

James Best

Dean

With an academic and laboratory background in endocrinology, James Best has particular experience in intervention studies on the prevention of diabetes and its complications, and in diabetes management. His previous research involved physiological and molecular studies of glucose disposal and lipid biochemistry as well as clinical studies of risk factors for cardiovascular disease in diabetes. He has published over 200 original and peer-reviewed journal articles in the key areas of diabetes and metabolism.
Josip Car
Associate Professor of Health Services Outcomes Research

Associate Professor Josip Car is the Founding Director of the Centre for Population Health Sciences (CePHaS), which focuses on digital health and digital learning, health services and outcomes research, and end-of-life care research. CePHaS’s vision of “Bringing discoveries into people’s lives and health systems—for healthy families, communities and populations”, aims to respond to challenges faced by Singapore’s and other health systems, as they seek to meet the changing health needs of individuals, families and populations.

Lorainne Car
Assistant Professor of Evidence Based Medicine

Digital technology has transformed every aspect of our lives, including our healthcare. While digital healthcare innovations hold exciting promise for improvement, they cannot be implemented without solid scientific evidence. We focus on developing evidence-based recommendations on the use of digital technology in the education of healthcare professionals and patients.

Tom Carney
Assistant Professor of Developmental Biology

The skin is an essential, stable, yet regenerative barrier protecting us against environmental assaults. We are interested in how the skin is formed and maintained, as well as the defensive weapons it employs. We use zebrafish genetics to interrogate the properties and environment of the cells in the dermis and epidermis, looking at the genetic basis of barrier formation and associated human diseases. We have also developed a model of bone fracture in the zebrafish and are employing genetic and imaging tools to understand the effects of clinical drugs and infections on bone repair.

Claire Ann Canning
Senior Lecturer, Medical Education

My research focuses on technology in healthcare education. Curriculum development and ongoing evaluation are essential components of any education programme. We are using modern research methodologies, such as eye tracking, to evaluate these components of medical education. Another research area is in demonstrating validity evidence in modern assessments.

Bernhard Boehm
Professor of Metabolic Medicine

We are interested in unravelling the heterogeneity of adult-onset diabetes mellitus, including autoimmune diabetes in the adult. The lab studies the cross-talk between the innate and the adaptive immune cells and the insulin-producing β-cells of the pancreas. We perform molecular profiling at the single-cell level of immune cells and of endocrine cells.
John Chambers  
**Professor of Cardiovascular Epidemiology**
We want to identify new strategies for prediction and prevention of cardiovascular diseases and diabetes, focusing on South Asian and South-East Asian populations. We use a wide range of molecular epidemiological approaches to investigate the molecular pathways underlying disease, with a particular emphasis on DNA sequence variation and epigenetic regulation.

George Chandy  
**Professor of Molecular Physiology**
Between academic research and the completion of human phase-1 safety trials (when drugs are often licensed by biopharmaceutical companies) lies a ‘valley of death’, where promising discoveries frequently stall. Our aim is to bridge this valley of death. To achieve this goal, we are building a translational research programme focused on potassium channel-targeted therapeutics for autoimmune, fibrovascular and metabolic diseases.

Christine Cheung  
**Nanyang Assistant Professor**
Our group is interested in blood vessel ageing. We create ‘disease in a dish’ by converting patient stem cells into vascular cells of the brain and heart. We also investigate bio-signatures, such as proteins and DNA in the blood, which could predict the risk of stroke and vascular dementia.

Ch’ng Toh Hean  
**Nanyang Assistant Professor**
Our laboratory is keen to understand how learning and long-term memories are encoded in the brain. Elucidating the molecular and cellular underpinnings of memory formation is crucial for the development of effective therapies to treat cognitive and dementia-related disorders.

Sanjay Chotirmall  
**Assistant Professor of Molecular Medicine**
Our improving understanding of the basic science that underpins common chronic respiratory conditions, such as asthma and chronic obstructive pulmonary disease (COPD) leads to an accelerated need for the translation of discoveries to the clinical arena to benefit patient care. Our research focuses on areas of particular clinical significance in Singapore including COPD, bronchiectasis, asthma and pulmonary infections with particular focus on fungi and other environmental influences on lung disease.
Karen Crasta  
**Nanyang Associate Professor (National Research Foundation Fellow)**

Mitosis is the heart of the cell division process; this is when cells separate their chromosomes to yield daughter cells with identical genomes. We are (1) investigating the causes and consequences of abnormal mitotic events on genome integrity; and (2) studying cell cycle dynamics of drug response upon treatment with anti-mitotic drugs.

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Michael Ferenczi  
**Vice-Dean, Faculty Affairs; Professor of Medical Sciences; Assistant Dean, Years 1 & 2**

What controls energy transduction and performance of skeletal and cardiac muscle? The forces of contraction, shortening, power and efficiency vary between muscle types, and are affected by mutations, diseases, ageing and lifestyle. We are developing new biophysical tools to study the molecular interactions which govern the heart and our ability to move.

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Foo Jia Nee  
**Nanyang Assistant Professor (National Research Foundation Fellow)**

Each of us carries coding changes in our DNA that disrupt the function of specific genes and pathways. We study these changes as ‘experiments of nature’ which provide insights into why some individuals develop neurodegenerative diseases while others do not. This knowledge will eventually help to identify new drug targets.

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Russell Gruen  
**Professor of Surgery**

As a surgeon, I’m determined that patients with injuries, obstetric complications and other conditions needing surgery get the best possible care. As Director of NTU’s Institute for Health Technologies, I’m particularly interested in how engineering approaches and technological solutions can transform healthcare, both in wealthy countries and in poorer countries.

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Guan Xue Li  
**Nanyang Assistant Professor**

Lipids, more commonly known as fats, have been intimately linked to human health and diseases. Our group develops novel technologies for systems-scale analyses of lipids with the aims to (1) identify novel pathways and drug targets for infectious diseases, including the global health threats of tuberculosis and anti-microbial resistance; and (2) generate and harness ‘personal digital lipid codes’ to serve as potential indicators of health status and ultimately to guide personalised care and medicine.
Balázs Gulyás  
Professor of Translational Neuroscience  
Early diagnosis of developing brain pathologies, especially those which accompany neurodegenerative diseases, is the key to finding therapies that will slow, stop, or even revert harmful changes. We seek to identify and understand early pathogenic changes, using non-invasive neuroimaging techniques, and to develop clinically relevant ways of detecting them.

Philip Ingham  
Professor of Developmental Biology  
Rapid advances in genomic technologies are leading to the identification of many genes associated with human diseases. The next big challenge is to understand what these genes do. We use the tropical zebrafish as a cheap and versatile experimental model to study the function of human disease genes in vivo.

Suresh Jesuthasan  
Associate Professor of Behavioural Neuroscience  
Emotions are complex, and yet we usually experience emotions that are appropriate to the context: for example, we are frightened upon hearing strange sounds while alone in the dark, but are comforted when there are companions or some light. We study zebrafish to understand how appropriate emotions are generated.

Fabian Lim Chin Leong  
Assistant Dean, Research; Associate Professor of Exercise Physiology  
Physical exertion drives the physiology to function at an altered state of equilibrium corresponding with the demands of the activity. Our laboratory investigates the interactions among habitual physical exercise, health and ageing, and the physiological mechanisms that promote or limit work tolerance in sport and occupational tasks.

Naomi Low-Beer  
Vice-Dean, Education  
Our research focuses on developing innovative approaches to optimise how medical students are trained. In addition to studying the neuroscientific basis of diagnostic reasoning, we are looking at how to improve skills development during classroom discussions, and how to use simulation systems for better teaching and learning.
Dean Nizetic
Professor of Molecular Medicine

Down’s Syndrome (DS) causes accelerated ageing of cells, but can also protect against age-related diseases such as dementia, cancer, atherosclerosis and diabetes despite increased risks. To understand how this protection is effected, we are studying the cell and molecular biology of DS. Our data may lead to new ways of preventing or slowing ageing-related diseases in people with DS, and in the general population.

Kevin Pethe
Associate Professor of Infectious Disease

We use a multidisciplinary approach to tackle global infectious disease issues such as tuberculosis and drug-resistant super-bacteria. One of our main interests is to study how bacteria optimise their metabolic flux and energy metabolism for growth and persistence in vivo, with the goal of translating this fundamental knowledge into new prophylactic and therapeutics strategies to control disease progression.

Luo Dahai
Nanyang Assistant Professor

The constant battle between humankind and pathogens means that there is an ever-increasing demand for better disease diagnostics and therapeutics. To provide comprehensive understanding of the conflict between host and pathogens, and to guide drug and vaccine development, our lab studies the molecular basis of virus replication and the host’s counteracting defence mechanisms.

Hiroshi Makino
Nanyang Assistant Professor

The brain creates something new based on what it acquired in the past. We optically record activity from thousands of neurons in a mouse model to understand the mechanisms behind this remarkable ability.

Sreenivasa Reddy Mogali
Assistant Professor

Studying anatomy is fundamental in medicine, and we are developing innovative methods for teaching, learning and assessing anatomy. We have collaborated with NTU engineers to develop 3D-printed human models which not only simulate the appearance of human tissues and organs, but also their feel. We are investigating their merits using both experts and students.
Sven Pettersson
Professor of Metabolic Disorders
All animals harbour a complex mix of micro-organisms - the microbiome - which regulates our physiology through largely unknown mechanisms. Our systems biology research based on animal models and clinical trials aims to understand microbiome-mediated effects on health with a focus on brain and skeletal muscle.

Jerome Rotgans
Assistant Professor for Medical Education Research
We work on two research problems. Firstly, we explore how, faced with time pressure and interruptions, physicians reason when generating a diagnosis. Secondly, we study active learning, such as team- and problem-based learning, and how these instructional approaches influence student motivation and knowledge acquisition.

Yasunori Saheki
Nanyang Assistant Professor
Brain activity and neuronal survival require maintenance (homeostasis) of a precise lipid composition within neuronal membranes, but we know little about how this occurs. We use nematode worm genetics and mammalian cell biology to dissect the cellular lipid transport machinery, with the aim of understanding how its dysfunction leads to neurodegeneration.

Artur Schmidtchen
Professor of Dermatology and Skin Biology
Our research focuses on discoveries of novel innate immunity mechanisms, and development of new anti-infective and anti-inflammatory therapies based on modulation of the innate immune response.

Helen Smith
Professor of Family Medicine and Primary Care
Our research is about helping General Practitioners and Family Physicians deliver better care in the community, particularly for those patients with multiple health problems. Our development and evaluation of new ways of delivering care will help people manage their own health and reduce the number needing to attend hospitals.
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<tr>
<td>Annelies Wilder-Smith</td>
<td>Professor of Infectious Disease</td>
<td>We study emerging infectious diseases, with a particular focus on dengue, Zika and influenza, especially in terms of vaccine development and geographic spread via international travellers.</td>
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<td>Walter Wahli</td>
<td>Professor of Metabolic Disease</td>
<td>We are deepening our understanding of how the nuclear Peroxisome Proliferator-Activated Receptors (PPARs) control genes that regulate metabolism, in the hope of developing therapeutic targets for metabolic diseases, such as non-alcoholic fatty liver disease. PPARs, which are activated by fatty acids, have emerged as moderators of systemic and cellular metabolic functions, and as links between lipid signalling and inflammation, both involved in metabolic diseases.</td>
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<td>Wang Xiaomeng</td>
<td>Assistant Professor of Molecular Medicine</td>
<td>Vascular-related complications including cancer, cardiovascular diseases and diabetes account for 70% of global deaths from noncommunicable diseases. However, current approaches to treatment and prevention of these diseases are still very limited. We aim to understand the molecular and cellular mechanisms of abnormal blood vessel formation. The ultimate goal is to develop novel treatment strategies for different types of vascular complications.</td>
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<td>Navin Verma</td>
<td>Assistant Professor of Immunology and Cell Biology</td>
<td>The main focus of our research is to understand lymphocyte biology and immune response regulation. In particular, we are investigating signal transduction processes involved in T-cell migration and effector functions. Our long-term goal is to develop tunable approaches to immune modulation, implicated in autoimmune diseases and immunotherapeutics.</td>
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<td>Woo Wei Meng</td>
<td>Assistant Professor of Dermatology and Skin Biology</td>
<td>Both tissue stem cells and their surrounding microenvironment play critical roles in tissue regeneration; however, the underlying signalling mechanisms, especially those involved the microenvironment, are less clear. Using the mammalian hair follicle as a regenerative tissue model, we want to understand the mechanism of tissue regeneration, particularly how the intercellular signalling network controls the function and formation of the microenvironment.</td>
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Xia Yun  
**Nanyang Assistant Professor**

The number of people suffering from end-stage renal disease is increasing alarmingly. Due to the lack of effective treatments, we are interested in generating autologous kidney organoids (miniature organs in a dish) from human-induced pluripotent stem cells for disease modelling, drug screening, and replacement therapy.

Eric Yap Peng Huat  
**Associate Professor of Human and Microbial Genetics**

We study the patterns and effects of variation in the genomes of humans, pathogens and microbiota, and aim to exploit these differences for more accurate and rapid disease diagnosis. We focus on diagnosis of diseases and microbes prevalent in or threatening East Asian populations and environments, such as metabolic diseases, drug-resistant microbes (TB and Gram-negative bacteria) and emerging microbiomes (oral and lung). We also seek to exploit these molecular diagnostic technologies at the point-of-need in primary healthcare and in low resource settings.

Yeo Tsin Wen  
**Associate Professor of Infectious Disease**

The lab has several areas of research: they include studies of the clinical, epidemiological and pathogenic features of dengue and malaria; the clinical management, transmission dynamics and genomics of sensitive and multi-drug resistant tuberculosis and clinical studies of central nervous system infections with a focus on developing improved diagnostic strategies.

**JOINT APPOINTMENTS**

Juliana Chan  
**Nanyang Assistant Professor, School of Chemical and Biomedical Engineering & Lee Kong Chian School of Medicine, Nanyang Technological University**

The convergence of materials, medicines and technologies has presented overwhelming combinatorial possibilities relevant to human diseases. The Laboratory of Nanomedicine and Tissue Engineering focuses on the design of new materials at the nano-micro interface, in particular for diagnostic and therapeutic applications in cancer and cardiovascular diseases.

Mary Chan Bee Eng  
**Professor, School of Chemical and Biomedical Engineering & Lee Kong Chian School of Medicine, Nanyang Technological University**

Contact active antimicrobial materials kill bacteria by disrupting their membranes rather than targeting microbe metabolism, and are believed to be less likely to lead to resistant bacteria. We work on a novel class of antimicrobial materials based on positively-charged “sugar” polymers. We are also investigating the application of polymers in carbon nanotubes and organic electronics.
Rinkoo Dalan
Senior Consultant, Department of Endocrinology, Tan Tock Seng Hospital; Assistant Professor, Lee Kong Chian School of Medicine, Nanyang Technological University

We wish to identify clinical phenotypes, physiological measurements, biomarkers and genomics that can help to predict cardiovascular risk in patients with diabetes mellitus in a personalised manner. Our aim is to develop targeted methods for more intensive conventional therapies, and also to explore novel non-traditional methods to improve endothelial function.

Melvin Leow Khee Shing
Senior Consultant, Department of Endocrinology, Tan Tock Seng Hospital; Associate Professor, Lee Kong Chian School of Medicine, Nanyang Technological University

At the CNRC laboratory, we focus on unravelling nutrient, exercise, endocrine and aging factors that influence body composition, weight, insulin sensitivity, metabolic rate and brown fat in the context of the Asian phenotype. We investigate these interactions and feedback loops using techniques that interrogate whole body metabolic and nutritional physiology.
Lim Jui

Chief Executive Officer (NTU Innovation), President’s Office, Nanyang Technological University; Faculty Associate, Lee Kong Chian School of Medicine, Nanyang Technological University

Lim Jui is the CEO of NTU Innovation as well as the CEO of NTUitive Pte Ltd, Nanyang Technological University’s innovation and enterprise company. His goal is to establish NTU as the breeding ground of a new generation of young companies that make a positive impact on NTU and the world.

Ng Oon Tek

Senior Consultant, Department of Infectious Diseases, Tan Tock Seng Hospital; Assistant Professor, Lee Kong Chian School of Medicine, Nanyang Technological University

Our group has an interest in research integrating public health, laboratory medicine and clinical medicine to improve patient outcomes. In the past, we have worked on developing HIV tests for clinical care and our main current research interest is in translating whole-genome sequencing technology to combat highly-drug resistant bacteria.

Joanne Ngeow

Senior Consultant, Division of Medical Oncology, National Cancer Centre Singapore; Associate Professor, Lee Kong Chian School of Medicine, Nanyang Technological University

We are interested in understanding how our genes interact with the environment to influence our risk for disorders such as cancer. Through studying patients with familial and rare cancer syndromes, we hope to understand the underlying mechanisms so as to develop novel targets for therapeutic and preventative drug development.

Amartya Sanyal

Nanyang Assistant Professor, School of Biological Sciences & Lee Kong Chian School of Medicine, Nanyang Technological University

The main focus of the laboratory is to understand how the 3D organisation of the genome affects the transcriptional regulatory code during mammalian development, differentiation and disease.

Leopold Schmetterer

Head, Ocular Imaging, Singapore Eye Research Institute; Professor of Ophthalmology, Lee Kong Chian School of Medicine, Nanyang Technological University

The aim of our research group is to gain new insight into the pathogenesis of eye diseases and develop new treatment modalities. A specific focus is directed towards new imaging modalities in glaucoma, diabetic retinopathy, age-related macular degeneration, dry eye symptom, and drug delivery.
Andrew Tan Nguan Soon

Associate Professor, School of Biological Sciences & Lee Kong Chian School of Medicine, Nanyang Technological University

Chronic low-grade inflammation that accompanies metabolic diseases such as obesity and diabetes affects wound healing and cancer development. We are interested in how the inflamed environment worsens disease development. We use various molecular techniques, and cell and mouse models to identify important communication conduits for potential intervention.

Colin Tan Siang Hui

Senior Consultant Ophthalmologist, National Healthcare Group Eye Institute; Assistant Professor of Ophthalmology, Lee Kong Chian School of Medicine, Nanyang Technological University

Our laboratory’s research interests include vitreoretinal conditions such as polypoidal choroidal vasculopathy (PCV), age-related macular degeneration, diabetic retinopathy; myopia and its complications; cataract surgery, epidemiology, and advanced retinal imaging techniques, including optical coherence tomography, fluorescein and indocyanine green angiography, and optical coherence tomography angiography [OCTA].

Teoh Swee Hin

Professor, School of Chemical and Biomedical Engineering & Lee Kong Chian School of Medicine, Nanyang Technological University

Our group’s main research focus is on the 3D-printed bioresorbable scaffolds for bone tissue engineering. Current projects include (1) biaxel bioreactor for studying how electromagnetic fields and mechanical stresses affect bone regeneration, (2) decellularised tissues to make a cell-free scaffold that maintains its mechanical properties and protein content, and (3) skin bioengineering.

Tey Hong Liang

Senior Consultant, National Skin Centre; Assistant Professor, Lee Kong Chian School of Medicine, Nanyang Technological University

From developing non-invasive imaging techniques to providing new treatments for itchy conditions, the key focus of our research team has been to improve the outcome and quality-of-life of dermatological patients through the enhancement of diagnostic and treatment capabilities in the clinics.
VISITING PROFESSORS

Prof Christian Apfelbacher  
University of Regensburg

Prof Per-Olof Berggren  
Karolinska Institutet

Prof Peter Brukner  
La Trobe University

Prof Chung Kian Fan  
Imperial College London

Prof Paola Dazzan  
King’s College London

Prof Paul Elliott  
Imperial College London

Prof Jeremy Everett  
University of Greenwich

Prof Christer Halldin  
Karolinska Institutet

Prof Atsushi Iriki  
RIKEN Brain Science Institute

Prof Veikko Jousmaki  
Aalto University School of Science

Prof Dermot Kelleher  
University of British Columbia

Prof Barry Marshall  
University of Western Australia

Prof Paul Martin  
University of Bristol

Prof Paul Matthews  
Imperial College London
LKCMedicine recognises the human health as a multifaceted process that transcends the classical distinctions between organ systems. At LKCMedicine, the School takes a holistic “Systems Medicine” approach.
RESEARCH CENTRES

LKCMedicine boasts state-of-the-art centres and facilities that fully support a diversity of researchers working at the cutting edges of their disciplines.

Our centres are foci for international and national collaboration and knowledge-sharing, tailored to the needs of LKCMedicine’s disease themes and research initiatives of NTU. Researchers also have access to world-class facilities designed to provide the best possible technical support for streamlined experimental excellence.

SINGAPORE PHENOME CENTRE (SPC)

The Singapore Phenome Centre is a unique interdisciplinary research platform established in 2015 to enhance research capability and promote synergy between the members of the NTU Integrated Medical, Biological and Environmental Life Science (NIMBELS) cluster.

The NIMBELS cluster aims to address global challenges in biomedical and life sciences and to generate increased understanding of external environmental influences on human health. Phenomics, the study of the phenotype of an organism, and how it responds to genetic and environmental changes, is therefore a vitally important tool in its armoury.

The Singapore Phenome Centre is part of the International Phenome Centre Network. It aims to provide high quality metabolic profiling data and expert analyses to a broad range of customers from biological, medical and environmental settings in Singapore and beyond, using liquid chromatography-mass spectrometry (LC/MS) and nuclear magnetic resonance (NMR) spectroscopy. Services include:

- Quantification of targeted analyte compounds from samples in biological, clinical and environmental studies.
- Profiling of metabolites in urine, serum and plasma samples from biological, clinical and environmental sources via NMR and Ultra Performance Liquid Chromatography - Mass Spectrometry (UPLC-MS).
- Structure elucidation and validation of biomarkers.
- Imaging Mass Spectrometry on tissue sections using MALDI or DESI Imaging.
The Centre for Neuroimaging Research at NTU (CeNReN) focuses on research in basic neuroscience and the neurobiology of diseases, structural-functional biomarkers and the development of early biomarker probes, and early interventional approaches in neurological and mental health disorders. To support these three research areas, CeNReN has three distinct facilities: the Pre-clinical Imaging Centre (PIC) focuses on whole brain studies in animal disease models; the Clinical Neuroimaging Centre (CiNIC) deals with the discovery, development and monitoring of disease biomarkers in patients; and the Cognitive Neuroimaging Centre (CoNiC) is an advanced research platform for functional-structural mapping of brain mechanisms of maturation and ageing, learning and cognition.

CoNiC boasts a suite of neuroimaging modalities including state-of-the-art instrumentation for magnetic resonance imaging, magnetoencephalography, electroencephalography, eye/retina optical coherence tomography, transcranial magnetic and direct-current stimulation, near-infrared spectroscopy and hyperimaging.

In addition to facilitating multiple collaborative projects, CoNiC hosts the Singapore Neuroimaging Database (SND), an open resource of human brain imaging data sets. It is also a participant in the detailed neuroimaging study of 100,000 people currently run by UK Biobank, and supports the neuroimaging module of the Health for Life in Singapore (HELIOS) study to better predict and prevent the development of chronic conditions.

The Games for Health Innovations Centre (ALIVE) is a collaboration between LKCMedicine and its primary healthcare partner - the National Healthcare Group (NHG). It brings together healthcare providers, academic institutions and industry partners with supporting government agencies and community resources for the scientific validation, research and implementation of healthcare serious games initiatives for better healthcare outcomes.

In addition to evaluating grant calls, ALIVE aims to become the leading testing and validation centre in Asia for the emerging field of Games for Health, establishing standards and best practices for industry through innovative multidisciplinary collaborative research, knowledge transfer and multinational networking. It is also building a local talent pool of serious game developers to help establish Singapore as a hub for healthcare games.
GLOBAL HEALTH

The modern world faces health challenges of unrivalled complexity. Infections, under-nutrition and reproductive health problems, combined with the rising burden of non-communicable diseases and their associated risk factors such as smoking and obesity, are now augmented by challenges arising from globalisation itself, such as the health effects of climate change and trade policies. A robust response to this complex picture requires strengthening of health systems, enhanced research, education and networking, bolstered by efforts in health innovations and digital health.

LKCMedicine Global Health research group aims to advance research and education in the fields of communicable and noncommunicable diseases, health systems and digital health and education. We plan to create and strengthen partnerships with key academic, clinical, industrial and governmental organisations, and build a new community by enabling cross-cluster collaborations, attracting and training public health professionals and running meetings and workshops. The research group will also provide quality control and monitoring of research projects in the region.

Field research work is a vital component of global health research. We currently have links with field sites in many developing countries, and will increase this number through new engagements and mutually beneficial research projects. This will enable access to field sites for LKCMedicine students and researchers for research field work, overseas electives and Overseas Community Involvement projects. Notably, an international consortium has been established to address various research knowledge gaps in Zika infections.

CENTRE FOR PRIMARY HEALTH CARE RESEARCH AND INNOVATION

A strong primary care system reduces hospital admissions and A&E visits, and is also the only field of care that follows people throughout their life, providing continuity and familiarity. One of the biggest challenges facing primary healthcare at present is how best to manage the increasingly complex needs of an ageing population. Elderly individuals will have multi-morbidities, meaning that research must be patient-centred, rather than focused on single diseases. Furthermore, many frail older people are cared for by friends and relatives whose own health can suffer because of long term caring responsibilities, so we plan to also be attentive to promoting the wellbeing of carers as well as patients.

The Centre for Primary Health Care Research and Innovation is committed to advancing the discipline of academic family medicine in Singapore. The Centre conducts interdisciplinary research focused on the common health problems presenting to family physicians. We are particularly interested in innovative ways of delivering care and, through rigorous mixed-method evaluation, we will ensure new technologies achieve their intended objectives.

For research to achieve optimal impact for patient care in the community, we will need to be attentive to issues of translation and dissemination. As part of this, the Centre’s aim is to develop a Primary Care Research Network to enthuse and involve family physicians in rigorous research in family medicine and primary care.
THE HEALTH FOR LIFE IN SINGAPORE STUDY (HELIOS)

The Health for Life in Singapore (HELIOS) Study is a state-of-the-art prospective cohort study, established and led by LKCMedicine, and involving both NHG and Imperial College London. We plan to identify the genetic and environmental factors that underpin development of obesity, diabetes, cardiovascular disease and other complex diseases in Singapore. Our ultimate goal is to use the knowledge generated to develop new approaches for prediction, prevention, early detection and better treatment of these chronic diseases.

We are studying 10,000 Singaporeans from the three main ethnic groups (Chinese, Malay, and Indian). At the baseline visit, we collect comprehensive, high quality phenotypic information from each participant, comprising health and lifestyle questionnaires, physical measurements, and extensive physiological and imaging data. In addition, biological samples are collected and a panel of biological markers is measured in the blood. Participants will then be followed up long-term to identify changes in health status, including new onset diseases.

CENTRE FOR POPULATION HEALTH SCIENCES (CePHaS)

Modern technology has brought about many new advances in medicine, which have resulted in improved health outcomes such as increased life expectancy, reduced infant mortality rates and better access and quality of healthcare services. Despite this, many of today’s most pressing challenges in population health, such as non-communicable and chronic diseases – diabetes, cardiovascular disease, and mental health issues have gone beyond what medicine alone can solve.

The Centre for Population and Health Sciences (CePHaS) is a visionary new hub of transdisciplinary population health sciences. Launched in 2016, its mission is to address the grand challenges in population health, and to provide expertise in Singapore and internationally in eHealth/digital health and health services and outcomes research.

A key part of CePHaS’s work will be its focus on eHealth, through projects such as the development of smartphone apps to manage chronic diseases and address healthcare issues. Some of these apps could eventually be part of a doctor’s prescription to help patients better manage their symptoms and recovery using the convenience provided by smartphones.

The centre will also challenge the conventions of who provides care, and how, where and when it is provided. It will drive innovations that ensure care is accessible and affordable, leading to improved population health. Another focus of the centre is end-of-life care and support – a vital area that is often neglected, which it aims to transform.
RESEARCH FACILITIES

The LKCMedicine research laboratories are designed on an “open-lab” principle, with no walls or partitions separating one research group from another.

OPEN LAB CONCEPT

The open lab format facilitates communication between scientists with varying expertise to promote synergy in collaborative research and establishment of interdisciplinary research units. Bench space and support rooms are communal, as are the core facilities and common shared equipment such as biological safety cabinets, autoclaves, ultracentrifuges, incubators and other common sophisticated bench-top equipment like real-time PCRs and fluorescence plate readers.

RESEARCH CORE FACILITY

Our Research Core Facility covers imaging, flow cytometry, histology, a biological resource facility and other essential services to better support research at LKCMedicine. Where possible, new cutting-edge technologies or equipment are centrally acquired and shared.

ZEBRAFISH FACILITY

Zebrafish are a major model organism for biomedical research, due to relatively low costs, and ease of imaging and genetic manipulation. The Zebrafish Facility houses 2760 tanks and will provide researchers from Singapore with access to a range of wild-type, transgenic and mutant zebrafish lines. The facility also contains a quarantine room and can assist with the import and export of embryos, husbandry and IVF procedures, and has a nursery with robotic feeder for optimal growth rates. Procedure rooms are equipped with fluorescent microscopes for imaging as well as injection apparatus for generation of transgenics or knockouts.

CLINICAL RESEARCH CENTRE (CRC)

The Clinical Research Centre (CRC) enables the conduct of clinical phase 1 trials of new medicines, which include Proof of Concept studies, Pharmacokinetic/Pharmacodynamic investigations, First-in-Human Trials and Interaction studies. These types of studies are complex and intensive and require experienced staff to manage them. Thus, the CRC is configured to provide infrastructural support for clinical studies and trials, including conducive facilities and consultation rooms, observation beds, a sample processing laboratory and biorepository. It can be used by LKCMedicine research staff, key clinical partners in the National Healthcare Group, collaborating institutions as well as the industry.
GOOD RESEARCH PRACTICE @ LEE KONG CHIAN SCHOOL OF MEDICINE

As an aspiring world-class medical school, LKCMedicine is committed to research excellence, and in particular to the highest standards of ethics and integrity in all its clinical and non-clinical research endeavours. The Good Research Practice framework outlines our commitment, and is a shared responsibility of our research community.

HUMILITY

WE COMMIT TO

• Welcome feedback, be receptive to new ideas, and be open to having one's ideas challenged.
• Work as part of a team, and to value and fairly acknowledge others' contributions.
• Support science and medicine's role in benefiting humanity.

WE WILL

• Listen to other’s suggestions, and learn from them.
• Respect and be open to differences of opinion.
• Work as a team member, and recognise others’ contributions to our research goals.
• Not overstate my contribution, or the significance of my work.

INTEGRITY

WE COMMIT TO

• Adhere to moral and ethical principles.
• Honesty.
• Transparency.
• Accuracy.
• Accountability.

WE WILL

• Conduct and report my research truthfully and accurately.
• Properly record and securely preserve my primary data.
• Ensure my subjects fully understand and consent to participate, unless exempted by an Institutional Review Board.
• Not exaggerate or fabricate my research findings, or put pressure on others to do so.
• Not take shortcuts that could compromise the integrity of my research.
• Be honest about mistakes and appropriately report incidents that could compromise the good standing of the School.
• Ensure my research output accurately reflects others’ contributions, funding sources, and any potential conflicts of interest.

COMPASSION

WE COMMIT TO

• Support and minimise the suffering of colleagues in times of need.
• Minimise pain and distress experienced by research subjects.
• Empathise, as members of a medical school, with the suffering of people who have the diseases that we research.

WE WILL

• Look out for the well-being of faculty, staff and students, particularly at times of stress.
• Offer support to colleagues who are suffering.
• Look out for and minimise any pain or discomfort experienced by my human and animal study subjects.
• Actively seek to understand patients’ and carers’ experiences.

CONTINUOUS LEARNING

WE COMMIT TO

• Active learning and self-improvement.
• Provide learning opportunities for others.
• An environment and culture conducive to learning for all.

WE WILL

• Take deliberate actions to keep up to date in my field.
• Reflect on and learn from mistakes, and seek opportunities to improve.
• Initiate discussions and share new knowledge and ideas with my colleagues.
• Participate in lab meetings, seminars and other academic forums.
• Encourage our researchers to access professional development opportunities.
• Recognise and fulfil my supervision and mentoring responsibilities.
• Support students, new researchers and junior faculty to develop and maintain good research practices.

PROFESSIONALISM

WE COMMIT TO

• Role-based excellence.
• Uphold the good reputation of the school and its parent Universities.
• Abide by relevant legal requirements, institutional policies and procedures, and ethical codes and guidelines for clinical and non-clinical research.
• Respectful engagement with other members of the research community.
• Responsible use of funds.

WE WILL

• Take pride in my work, and set myself high standards.
• Be punctual and reliable.
• Represent the School and the Universities to the best of my ability.
• Familiarise myself with and adhere to all relevant laws, policies, guidelines and standard operating procedures.
• Prevent personal biases or conflicts of interests affecting my professional judgement.
• Not offend or discriminate in the workplace based on language, gender, cultural or other personal characteristics.
• Be considerate to other peoples’ time and needs.
• Duly acknowledge other researchers’ achievements.
• Not misuse research funds.

TRANSFORMATIVE RESEARCH

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TRANSFORMATIVE RESEARCH

Impactful multidisciplinary collaborative research to improve healthcare and hence, lives.