香港中文大學醫學院
Faculty of Medicine
The Chinese University of Hong Kong

HEALTH
Li Ka Shing Institute of Health Sciences
李嘉誠健康科學研究所



PROGRESS REPORT 2024

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Executive Summary
報告摘要

Professor Dennis Lo

"We sincerely thank the Li Ka Shing Foundation for its visionary support since the Institute's founding, empowering our researchers to drive cutting-edge scientific innovation and transformative global health impact. I hope the Institute continues to inspire ground-breaking discoveries and advancements."

In 2024, the Li Ka Shing Institute of Health Sciences (LiHS) achieved remarkable milestones, driven by the efforts of our Principal Investigators and research teams. Their groundbreaking work continued to advance the frontiers of translational medicine, embodying the Institute's unwavering commitment to transforming scientific discoveries into impactful clinical applications that benefit society.

This year, I had the honour of receiving several international recognitions. The Golden Medal from Palacký University in Olomouc acknowledged my long-standing collaborations with scientists throughout the Czech Republic. Additionally, I received Honorary Membership from the Czech Society of Perinatal Medicine for my contributions to the advancement of perinatal healthcare and education. I was also awarded the Jiménez Díaz Lecture Award by Fundación Conchita Rábago for my work on non-invasive prenatal testing, becoming the first Chinese scholar to receive this prestigious honour. Furthermore, I was deeply humbled to be awarded the Scientific Achievement Award at the 13th Most Achieved Chinese Awards, which celebrates individuals whose contributions transcend national and disciplinary boundaries.

Among our colleagues, Professor Jun Yu made history by being named a National Distinguished Doctor by the National Health Commission of China. This is the first time an academic from Hong Kong has received this prestigious distinction. Her groundbreaking work on gastrointestinal cancers and microbiome-liver interactions continues to reshape the field of digestive disease research and early diagnostics.

Professor Siew Ng received both the Bank of China Science and Technology Innovation Prize and the Gold Medal cum Prize of the International Federation of Inventors' Association (IFIA) for her contribution to the field of microbiome science. Her award-winning research has translated microbial biomarkers into non-invasive diagnostic tools for inflammatory and neurodevelopmental disorders. Additionally, her post-COVID therapy, SIM01, is now demonstrating tangible benefits for patients recovering from long COVID, exemplifying the Institute's commitment to translating research into direct patient care.

Professor Jeremy Teoh was recognised with two significant awards in 2024. The Gold Medal Prize for Best Original Research by Young Fellows, presented by the Hong Kong Academy of Medicine, celebrated his leadership of a multicentre Phase 3 trial comparing surgical techniques for bladder cancer. He was also named a WCUS Rising Star by the World Chinese Urological Society (WCUS) for his contributions to urological innovation.

Professor Hei Ming Lai received the Croucher Tak Wah Mak Innovation Award 2024 for his achievements in biomedical engineering and spatial biology, an honour reserved for Hong Kong's most coveted emerging scientific leaders. His team's development of a 3D spatial multi-omics platform is paving the way for more precise tissue diagnostics and global accessibility in translational medicine.

In the global arena, Professor Vincent Mok was honoured with the 2024 Advance Global Australian Award in Education, Science and Research. This recognition highlights his pioneering work in understanding and preventing dementia and cerebral small vessel disease, which are areas of increasing relevance for ageing populations worldwide.

Also honoured on the international stage, Professor Cheuk Chun Szeto received the Dr. Dimitrios G. Oreopoulos Award from the Canadian Society of Nephrology. As a prominent figure in nephrology, Professor Szeto's work on peritoneal dialysis has improved the quality and accessibility of home-based therapies for patients with chronic kidney disease.

A key institutional achievement this year was the selection of CUHK's diabetes research programme for the 12th round of the prestigious Areas of Excellence (AoE) Scheme. Led by Professors Ronald Ma and Juliana Chan, the project, "Using Data to Transform Diabetes Care and Patient Lives", secured over HK$80 million in funding. This initiative, grounded in three decades of research, brings together a diverse network of partners across clinical, academic, and public health disciplines. Its objective is to address urgent global challenges in diabetes by developing integrated, data-driven approaches for disease prevention, treatment, and education, ultimately aiming to reduce disease burden and improve lives on a population level.

Our research teams also made significant scientific advances, publishing impactful findings in leading international journals.

In a new study published in *Proceedings of the National Academy of Sciences* in October 2024, my team, along with Professors Allen Chan, Jacky Lam, and Peiyong Jiang, introduced FRAGHA (FRAGmentomics-based Histone modification Analysis), a novel blood-based diagnostic approach that decodes histone modifications via cell-free DNA fragmentation patterns. This non-invasive technology can be applied in prenatal testing, oncology, and transplant monitoring, enhancing early detection and personalised care through epigenetic insights without the need for complex procedures.

Professor Jun Yu led a pivotal study that identified *Streptococcus anginosus* as a driver of gastric inflammation and carcinogenesis. By uncovering its tumour-promoting mechanisms, including activation of MAPK signalling via host–bacterial interactions, the research opens new therapeutic avenues for gastric cancer prevention. The findings, published in *Cell* in February 2024, further deepen the growing understanding of microbiota-driven malignancies.

Professor Ling Qin and his team conducted an innovative study that elucidated how the degradation products of biodegradable magnesium implants, including hydrogen gas, magnesium ions, and alkaline byproducts, synergistically enhance bone regeneration. The study revealed these effects are mediated through modulation of nerve signalling, providing new directions for fracture healing and orthopaedic implant design. These findings were published in *Bioactive Materials* in December 2024.

Professors Hei Ming Lai, Yun Kwok Wing, and Bei Huang introduced INSIHGT, a scalable and affordable 3D spatial biology platform. The method enables uniform molecular visualisation deep within tissues using accessible chemical probes, allowing multi-modal profiling of proteins and nucleic acids. This platform, published in *Nature Communications* in December 2024, broadens accessibility to high-resolution tissue imaging and facilitates advanced histopathological and molecular studies across a range of diseases.

Professor Billy Ng and his team explored the development of OGTACs — bifunctional small molecules that enable precise, protein-specific O-GlcNAcylation in living cells. This exciting development offers control over a key post-translational modification implicated in neurodegenerative diseases and cancer, creating new opportunities for mechanism-driven therapeutic development. The findings were published in the *Journal of the American Chemical Society* in April 2024.

We also proudly opened the CUHK Faculty of Medicine Li Ka Shing Experimental Core Animal Facility in 2024, made possible by the steadfast support of the Li Ka Shing Foundation. The facility will significantly enhance our research capacity for *in vivo* studies and preclinical diagnostics, strengthening translational pipelines across LiHS and the broader biomedical ecosystem at the University. We are immensely grateful for the unwavering support from the Li Ka Shing Foundation, our partners and collaborators. Fuelled by our exceptional research community and shared vision, LiHS is poised to continue leading the advancements in global health through pioneering science.

As I take on the role of Vice-Chancellor and President at CUHK, I am honoured to pass the directorship of the Institute to Professor Ronald Ma. An eminent leader in endocrine and metabolic research, Professor Ma is well-positioned to guide LiHS into a new era of growth and scientific excellence. I wish LiHS continued success, marked by extraordinary achievements and boundless opportunities in the future.

2024年對李嘉誠健康科學研究所而言是成就斐然的一年，我們的首席研究員和研究團隊持續在轉化醫學領域開拓新猷。他們的開創性工作體現了研究所堅定的使命——將科學發現轉化為具深遠影響的臨床應用，造福社會。

本人今年有幸獲得多項國際殊榮。我獲捷克奧洛穆茨帕拉茨基大學（Palacký University in Olomouc）頒授金獎，以表揚我與該國科研人員多年來的深入合作。同時，我亦獲捷克圍產醫學學會榮譽會籍，以表彰我在圍產醫療與教育領域的貢獻。我亦憑藉在無創產前檢測方面的開創性研究，獲西班牙 Conchita Rábago 基金會頒發「希門尼斯迪亞斯講座獎」（Jiménez Díaz Lecture Award），成為首位獲此殊榮的華人學者。此外，我很榮幸獲得「第十三屆華人榜——科學成就獎」，該獎項旨在表彰對中華民族、國際社會及所屬國家有重大貢獻的華人。

在我們的首席研究員中，于君教授今年創下歷史，成為首位獲中國國家衛生健康委員會頒授「國家傑出醫師」榮譽的香港學者。她在腸胃癌與腸道微生物與肝臟之間交互作用的研究持續引領領域發展，為消化疾病研究與早期診斷開闢新局。

黃秀娟教授則憑藉其於腸道微生物研究領域的卓越貢獻，榮獲「中銀香港科技創新獎」和「國際發明聯盟協會（IFIA）獎暨金獎」。她的研究成功將微生物生物標記轉化為應用於腸炎及神經發展障礙的非入侵性診斷工具。此外，其研發的新冠後綜合症療法 SIM01 已在臨床上為患者帶來實質效益，充分體現研究所致力於將科研成果轉化為造福患者的承諾。

張源津教授在 2024 年獲得兩項重要獎項，包括其領導的多中心第三期臨床試驗，針對膀胱癌不同手術方式之比較研究，榮獲香港醫學專科學院「最佳年青院士原創研究獎金獎」；此外，他亦獲世界華人泌尿外科學會頒發「世界華人泌尿外科學會新星獎」，表彰其於泌尿創新醫學領域的貢獻。

在生物醫學工程和空間生物學領域方面，黎曦明教授榮獲「裘槎麥德華前瞻科研大獎 2024」，此獎為本地科研界極具聲望的青年學者榮譽。他的研究團隊所研發之三維空間多組學平台，正在改變全球臨床組織診斷及轉化醫學之面貌，並促進相關技術普及化。

在國際科研舞台上，莫仲棠教授憑藉其於認知障礙症及腦小血管病方面的研究成就，榮獲「2024 年全球澳洲進步獎——教育、科學及研究類別」。此獎旨在表彰對全球產生深遠影響的澳洲學者，充分肯定其於老齡化相關神經退化疾病研究的貢獻。

同樣在國際舞台上獲獎的還有司徒卓俊教授。他榮獲加拿大腎臟病學會頒發的「Dimitrios G. Oreopoulos 醫生獎」，以表彰其在腹膜透析及家庭腎臟治療上的傑出貢獻，進一步提升了腎病患者的生活品質與治療選擇。

今年研究所最重要的成就之一，是香港中文大學糖尿病研究項目入選大學教育資助委員會第 12 輪「卓越學科領域計劃」。該項目由馬青雲教授和陳重娥教授領導，運用數據轉化糖尿病護理以改善患者生活，獲得超過八千萬港元的資助。該計劃以過去三十年的研究為基礎，並凝聚了臨床、學術和公共衛生領域的廣泛合作夥伴，旨在透過數據驅動的整合方法來預防、治療及教育糖尿病，從而提升全球應對糖尿病的能力並改善患者生活。

我們的研究團隊亦取得重大科學進展，在領先的國際期刊上發表了具影響力的研究成果。

在 2024 年 10 月發表於《美國國家科學院院刊》的一項具里程碑意義的研究中，我與陳君賜教授、林偉棋教授和江培勇教授的團隊共同推出了 FRAGHA（基於片段組學的組蛋白修飾分析，FRAGmentomics-based Histone modification Analysis），這項創新血液診斷技術透過分析游離 DNA 的片段化特徵，來解讀組蛋白修飾狀態。這項無創技術可應用於癌症篩查及器官移植監測，為臨床提供高準確度之表觀遺傳學資訊，在無需複雜程序的情況下增強早期檢測和個性化護理。

于君教授領導的關鍵研究，發現咽峽炎鏈球菌（*Streptococcus anginosus*）為胃癌的重要誘因。該菌透過結合宿主細胞蛋白及激活 MAPK 訊號通路，引發持續性炎症與細胞病變。此發現揭示微生物驅動腫瘤生成的新機制，為胃癌預防與治療提供嶄新方向，並於 2024 年 2 月在《細胞》期刊上發表。

秦嶺教授及其團隊進行了一項創新研究，闡明生物可降解鎂金屬植入物的降解產物（氫氣、鎂離子及鹼性副產物）如何協同促進骨骼再生。該研究指出，相關作用透過調節神經訊號路徑實現，為骨折治療與骨科植入物設計提供新方向。這些發現於 2024 年 12 月在《生物活性材料》期刊上發表。

黎曦明教授、榮潤國教授和黃蓓教授共同推出了 INSIHGT，這是一種可擴展且成本效益高的三維空間生物學平台 。這項技術能夠讓分子探針均勻滲透厚組織，並進行多模式檢測，大幅擴展了高解像度組織影像及疾病研究的應用範疇 。這個平台於 2024 年 12 月在《自然通訊》上發表。

吳濰龍教授及其團隊致力於開發 OGTACs 雙功能小分子技術 。這項技術能夠在活細胞中精準調控特定蛋白質的 O-GlcNAc 修飾 。此突破性方法對解析神經退化性疾病和癌症的致病機制具有深遠影響，同時也為藥物開發開闢了新的路徑。這些發現於 2024 年 4 月在《美國化學會雜誌》上發表。

2024 年亦見證「中文大學醫學院李嘉誠動物實驗核心設施」正式啟用，此設施獲李嘉誠基金會鼎力支持，將大大提升我們於活體研究與臨床前診斷的能力，強化研究所與中文大學在生物醫學方面的研究實力。

我們衷心感謝李嘉誠基金會、所有合作夥伴與支持者的堅持與信任。有賴卓越的研究社群與共同目標，李嘉誠健康科學研究所將繼續引領全球健康領域的發展。

隨著我即將出任香港中文大學校長，我欣然將研究所所長一職交棒予馬青雲教授。作為內分泌與代謝研究的領軍人物，我深信他將帶領研究所邁向嶄新里程。我衷心祝願研究所未來持續茁壯、成果豐碩。



Executive Summary
報告摘要

Professor Ronald Ma

"As I take up the role of Director of the Institute, I am committed to uphold our legacy of excellence, nurturing the next generation of scientific leaders, and advancing cutting-edge medical research to develop innovative solutions for global healthcare challenges."

Since its establishment in 2007, the Li Ka Shing Institute of Health Sciences (LiHS) has been a cornerstone of innovation in biomedical sciences, steadfastly translating scientific discoveries into transformative clinical solutions. The Institute's remarkable achievements reflect the collective commitment and efforts of our Principal Investigators to advance translational medicine and deliver meaningful benefits to patients through health sciences research.

Under Professor Dennis Lo's visionary leadership as Founding Director, LiHS has established a solid foundation for fruitful medical research that continues to propel future excellence. His leadership has fostered a collaborative, innovative environment, positioning LiHS as a global hub for groundbreaking research. Since joining LiHS as a Principal Investigator specialising in diabetes research, and serving on the Executive Committee from 2022 to 2024, I have been deeply grateful for Professor Lo's mentorship and support. His guidance has shaped my work and inspired our collective pursuit of excellence.

As Professor Lo transitions to his role as Vice-Chancellor and President of The Chinese University of Hong Kong, I am profoundly honoured to assume the directorship of LiHS. With humility and determination, I am committed to steering the Institute towards new frontiers of scientific and societal impact. The outstanding achievements of our Principal Investigators and their teams in 2024, as noted by Professor Lo, lay a strong foundation for our future. Notable milestones include Professor Jun Yu's recognition as a National Distinguished Doctor for her pioneering work on gastrointestinal cancers, Professor Siew Ng's awards for advancing microbiome-based diagnostics, and Professor Vincent Mok's global recognition for dementia research. The selection of our diabetes research programme, co-led with Professor Juliana Chan, for the Areas of Excellence Scheme exemplifies LiHS's leadership in tackling global health challenges through data-driven innovation.

In 2025, LiHS is devoted to upholding its legacy of distinction, breaking new ground in scientific discovery to enhance healthcare for communities in Hong Kong and beyond. The newly opened Li Ka Shing Experimental Core Animal Facility and the reopening of the Biosafety Level 3 Laboratory will enhance our capacity for preclinical research, strengthening our translational pipeline. We will prioritise emerging fields such as precision medicine, leveraging technologies like artificial intelligence and multi-omics to develop personalised diagnostics and therapies for chronic diseases, neurodevelopmental disorders, and more. The Institute remains steadfast in its commitment to advancing cutting-edge research that addresses evolving global health needs. Simultaneously, we are dedicated to nurturing the next generation of health sciences leaders. Through international partnerships and regional leadership, we will bridge laboratory research with clinical practice, delivering solutions that benefit communities in Hong Kong and globally.

We extend heartfelt gratitude to the Li Ka Shing Foundation for their enduring support, which has enabled state-of-the-art facilities and pioneering research programmes. Their visionary philanthropy continues to fuel our mission. As we embark on this new chapter, LiHS is resolute in honouring Professor Lo's legacy while seizing opportunities to shape the future of healthcare. With the dedication of our researchers, staff, and partners, we will advance cutting-edge science, foster global collaborations, and work tirelessly to improve lives through health sciences innovation.

李嘉誠健康科學研究所自 2007 年成立以來，一直是生物醫學創新領域的中流砥柱，致力將科學發現轉化為臨床應用，透過健康科學研究為患者帶來實質益處。研究所的卓越成就充分展現出我們的首席研究員對推動轉化醫學的承諾與努力。

在創所所長盧煜明教授富有遠見的領導下，研究所奠定了堅實的科研根基，持續推動卓越研究。他創建了鼓勵協作與創新精神的環境，使研究所成為全球領先的科研樞紐。我加入研究所擔任專注於糖尿病研究的首席研究員，並於 2022 至 2024 年間擔任執行委員會成員，一直以來深切感受到盧教授的啟發與支持。他的指導不但啟發了我的研究工作，更激勵我們共同追求卓越。

隨著盧教授榮任香港中文大學校長，我深感榮幸接任研究所所長一職。我將以謙遜的態度和堅定的信念，帶領研究所開拓科研，在社會上產生更深遠的影響。

正如盧教授所指出，2024 年各位首席研究員及其團隊所取得的傑出成果，為我們的未來奠定堅實基礎。當中于君教授憑其在腸胃癌研究中的開創性成果，獲選為「國家傑出醫生」；黃秀娟教授因推動微生物組診斷學發展而獲得多項獎項；以及莫仲棠教授在認知障礙研究方面獲得國際肯定。此外，我與陳重娥教授共同領導的糖尿病研究項目，獲選為「卓越學科領域計劃」，充分體現研究所透過數據驅動的創新，以應對全球健康挑戰的領導地位。

展望 2025 年，研究所將繼續秉承其卓越傳統，在科研探索上開闢新天地，提升香港及其他地區的醫療水平。新啟用的李嘉誠實驗動物核心設施與重新開放的三級生物安全實驗室，將進一步提升我們的前期臨床研究能力，強化整體轉化研究平台。我們將優先發展精準醫學等新興領域，運用人工智能與多組學技術，研發針對慢性疾病、神經發展障礙等的個人化診斷與治療方案。研究所將一如既往地專注於解決不斷演變的全球健康挑戰，並致力培育下一代健康科學領袖。透過國際合作與地區領導，我們將結合實驗室研究與臨床實踐，推動創新且具影響力的醫療解決方案，造福社會。

我們衷心感謝李嘉誠基金會長久以來的慷慨支持，使我們得以建構世界頂級設施，推展具前瞻性的研究計劃。基金會具有遠見的慈善精神持續推動我們實踐使命。邁向新篇章之際，研究所將銘記盧教授的卓越貢獻，把握機遇開創醫療健康研究的未來。憑藉研究人員、職員與各界夥伴的共同努力，我們將推動尖端科學、促進國際合作，並努力不懈透過健康科學創新改善人類生活。

Steering Committee
督導委員會



Governance and Administration
管治與行政

The Steering Committee of the Li Ka Shing Institute of Health Sciences (LiHS) was formed in 2007. The 18th meeting of the Steering Committee was held on 16 December 2024 and was attended by the committee members who gave invaluable recommendations on the future development and direction of the Institute.

李嘉誠健康科學研究所督導委員會於 2007 年正式成立。本年度的督導委員會會議於 2024 年 12 月 16 日舉行，會上各成員就研究所的未來發展發表了寶貴的意見。

Philip Chiu
趙偉仁



- Dean of Medicine, CUHK
  香港中文大學醫學院院長
- Shun Hing Education and Charity Fund Professor of Robotic Surgery, CUHK
  香港中文大學信興教育及慈善基金機械人外科教授
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  香港中文大學呂志和創新醫學研究所所長
- Director, Multi-Scale Medical Robotics Center, CUHK
  香港中文大學醫療機械人創新技術中心主任
- Director, Chow Yuk Ho Technology Centre for Innovative Medicine, CUHK
  香港中文大學周毓浩創新醫學技術中心主任
- Professor, State Key Laboratory of Digestive Disease, CUHK
  香港中文大學消化疾病研究國家重點實驗室教授

Dennis Lo
盧煜明



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- Li Ka Shing Professor of Medicine, CUHK
  香港中文大學李嘉誠醫學講座教授
- Director, Li Ka Shing Institute of Health Sciences, CUHK
  香港中文大學李嘉誠健康科學研究所所長
- Chairman, Department of Chemical Pathology, Faculty of Medicine, CUHK
  香港中文大學化學病理學系系主任
- Professor of Chemical Pathology, CUHK
  香港中文大學化學病理學講座教授
- Director, State Key Laboratory of Translational Oncology, CUHK
  香港中文大學轉化腫瘤學國家重點實驗室主任



Wai-yee Chan
陳偉儀

- Pro-Vice-Chancellor/Vice-President (Strategic Developments), CUHK
  香港中文大學副校長（策略發展）
- Director, Institute for Tissue Engineering and Regenerative Medicine (iTERM), CUHK
  香港中文大學組織工程與再生醫學研究所所長
- Li Ka Shing Professor of Biomedical Sciences, School of Biomedical Sciences, CUHK
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Tony Mok
莫樹錦

- Associate Dean (Translation and Entrepreneurship), Faculty of Medicine, CUHK
  香港中文大學醫學院副院長（科研轉化及創業）
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  香港中文大學李樹芬醫學基金腫瘤學教授





Ling Qin 秦嶺

- Assistant Dean (Mainland Affairs), Faculty of Medicine, CUHK
  香港中文大學醫學院助理院長（內地事務）
- Director, Musculoskeletal Research Laboratory, CUHK
  香港中文大學骨關節肌肉研究實驗室主任
- Director, CUHK Hong Kong-Shenzhen Innovation and Technology Research Institute (Futian)
  香港中文大學深圳創新研究院（福田）院長
- Director, Innovative Orthopaedic Biomaterials and Drug Translational Research Laboratory of Li Ka Shing Institute of Health Sciences, CUHK
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- Choh-Ming Li Professor of Department of Orthopaedics and Traumatology, Faculty of Medicine, CUHK
  香港中文大學卓敏矯形外科及創傷學學系教授



Cecilia Leung 梁欣欣

- Assistant Secretary, Li Ka Shing Institute of Health Sciences, CUHK
  香港中文大學李嘉誠健康科學研究所助理秘書長

Secretary 秘書

Executive Committee
執行委員會



The Executive Committee of the Li Ka Shing Institute of Health Sciences was established by the Steering Committee of the Institute. It is an executive and administrative body discharging its responsibilities of activities and affairs of the Institute. The Executive Committee acts and makes executive and administrative decisions on behalf of the Steering Committee and to report the decisions to the Steering Committee on regular basis.

The Executive Committee held its annual meeting on 7 May 2024 and was attended by the committee members who gave invaluable recommendations with respect to the execution and administration of activities and affairs of the Institute.

李嘉誠健康科學研究所執行委員會由研究所督導委員會成立。執行委員會負責為研究所行政和決策作出方向性的指引，以履行研究所的活動和事務職責。執行委員會同時亦代表指導委員會向研究所作出管理和行政的決定，並定期向指導委員會匯報工作進度和決策記錄。

執行委員會於 2024 年 5 月 7 日舉行年度會議，各委員會成員就著研究所的未來執行和管理方向發表了寶貴的建議。

Dennis Lo
盧煜明



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- Director, Li Ka Shing Institute of Health Sciences, CUHK
  香港中文大學李嘉誠健康科學研究所所長
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Siew Ng
黃秀娟

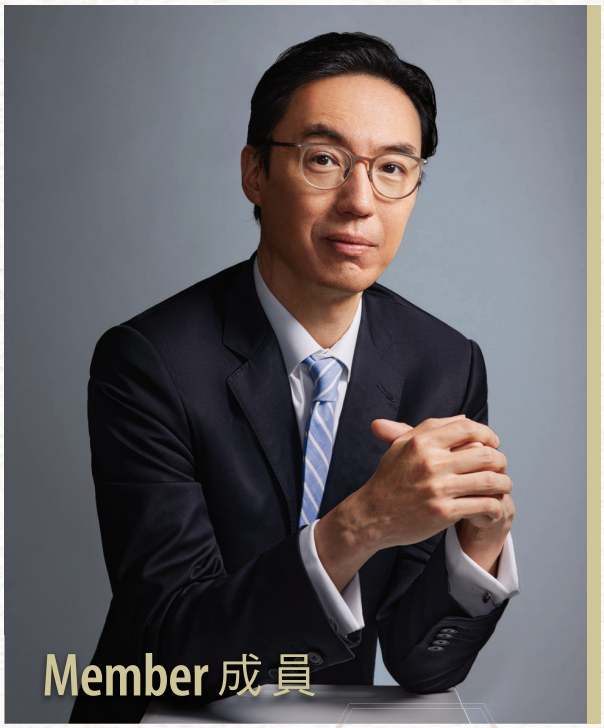
- Associate Dean (Research), Faculty of Medicine, CUHK
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- Croucher Professor of Medical Sciences, CUHK
  香港中文大學裘槎醫學科學教授
- Professor, Department of Medicine and Therapeutics, Faculty of Medicine, CUHK
  香港中文大學內科及藥物治療學系教授
- New Cornerstone Investigator
  新基石研究員
- Director, Microbiota I-Center (MagIC)
  香港微生物菌群創新中心總監
- Associate Director, Centre for Gut Microbiota Research
  腸道微生物群研究中心副主任
- Professor, State Key Laboratory of Digestive Disease, CUHK
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  香港中文大學內科及藥物治療學系教授
- Director, Institute of Digestive Disease, CUHK
  香港中文大學消化疾病研究所主任
- Director, Research Laboratory of Institute of Digestive Disease, CUHK
  香港中文大學消化疾病研究實驗室主任
- Director, State Key Laboratory of Digestive Disease, CUHK
  香港中文大學消化疾病研究國家重點實驗室主任

Ronald Ma 馬青雲



- Associate Dean (External Affairs), Faculty of Medicine, CUHK
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- S.H. Ho Professor of Diabetes, CUHK
  香港中文大學何善衡糖尿科教授
- Professor, Department of Medicine and Therapeutics, Faculty of Medicine, CUHK
  香港中文大學內科及藥物治療學系教授
- Head (Academic Affairs), Division of Endocrinology and Diabetes, CUHK
  香港中文大學內分泌及糖尿病科主任
- Professor (by Courtesy), School of Biomedical Sciences, CUHK
  香港中文大學生物醫學學院教授（禮任）
- Co-director, CUHK-SJTU Joint Research Centre in Diabetes Genomics and Precision Medicine, CUHK
  香港中文大學 — 上海交通大學糖尿病基因組與精準醫療聯合研究中心主任
- Steering Committee, Hong Kong Institute of Diabetes and Obesity, CUHK
  香港中文大學香港糖尿病及肥胖症研究所督導委員

Cecilia Leung 梁欣欣

- Assistant Secretary, Li Ka Shing Institute of Health Sciences, CUHK
  香港中文大學李嘉誠健康科學研究所助理秘書長

Secretary 秘書

LiHS Office
研究所辦公室

As of December 2024, a total of 22 staff members in the LiHS Office were in post, including administrative, scientific, research and technical staff. During the reporting period, the LiHS office oversaw the general administration of the Institute, the Li Ka Shing Medical Sciences Building, and various core facilities, including the Biomedical Computing Centre, the Molecular Biology Core Facilities, and the Cell Biology Core Facilities.

截至 2024 年 12 月底，研究所辦公室共已聘任 22 名僱員，包括行政、科學、研究及技術人員，負責研究所的日常運作，並支援重點科研設施的運作，包括生物醫學計算機中心、分子生物學重點科研設施、和細胞生物學重點科研設施。



Director and Administration Team
研究所所長與行政團隊

In this photo, in the middle of the front row is Professor Dennis Lo, Cecilia Leung (fifth from the left), and other administration team members.
相片中前排中間為盧煜明教授、梁欣欣女士（左五）及其他行政團隊成員。



The Li Ka Shing Medical Sciences Building 李嘉誠醫學大樓

The Li Ka Shing Institute of Health Sciences was housed inside the 11-storey Li Ka Shing Medical Sciences Building. As of December 2024, there were approximately 722 research personnel working in the Building. Principal Investigators and their research groups were allocated research space inside the Building following assessment by the Faculty's Research Space Allocation Committee, based on their track records in research. In addition, several multi-disciplinary research laboratories were allocated on a departmental and/or strategic basis.

With the full support from the University and the Faculty, the Institute will recruit additional top-notched research scientists in order to enhance our competitiveness in research.

李嘉誠健康科學研究所建於樓高 11 層的李嘉誠醫學大樓內。截至 2024 年 12 月，約有 722 名科研人員於大樓內工作。醫學院研究空間分配委員會根據各項目負責人及其隊伍的研究成果分配各隊伍在研究所內可使用的研究空間。另外，委員會亦根據所屬部門及策略性原則分配各個多範疇的實驗室。

在大學和醫學院的全力支持下，研究所將招聘更多出類拔萃的科學家以提升我們的科研實力。

Research Facilities 研究設施

The Institute pledges to provide an excellent research environment for all the cutting-edge biomedical research projects and technological advancements in the University and the Faculty of Medicine. The diverse facilities have enabled researchers to accelerate their research into fruition.

本研究所致力為我們最先進的研究項目及技術提供良好的科研環境。所內的多元化設施致力輔助本校及醫學院的研究人員，令他們能夠更專注於實驗，進一步開拓及實現他們的科研夢想。

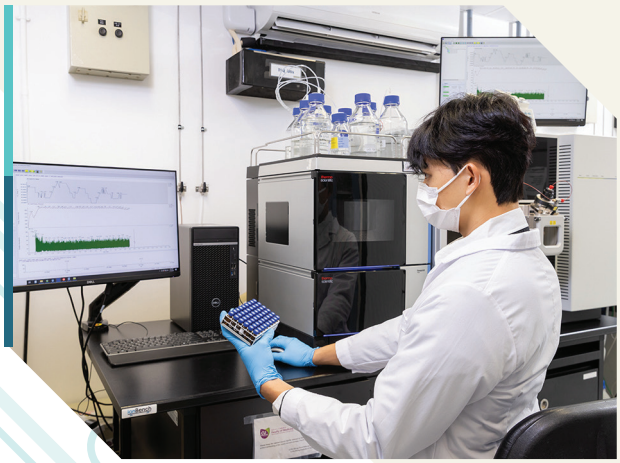
Li Ka Shing Translational Omics Platform 李嘉誠轉化組學平台

The **Li Ka Shing Translational Omics Platform (LKS TOP)** is a state-of-the-art, multi-omics platform tailor-made for cutting-edge genomics, proteomics, and metabolomics studies. It consists of some of the best-in-class research facilities for accelerated biomarkers screening and discovery. These platforms are also routinely utilised in the fields of precision medicine, microbiota and nutrition sciences, drug development against emerging infectious diseases, cardiometabolic diseases, cancer studies, childhood diseases, and traditional Chinese medicine.

李嘉誠轉化組學平台旨在為基因組學、蛋白質組學和代謝組學研究提供最先進的科技及儀器。這平台擁有一系列世界頂尖的科研設施，可提升精準醫學、微生物學及營養科學的研究水平、加速傳染病藥物開發、以及支援心血管代謝、癌症、兒童疾病和傳統中醫藥等領域中的生物標記篩選和發現。

The Platform has two mass spectrometry systems: the Thermo Scientific TSQ Altis Triple Quadrupole and the Thermo Scientific Orbitrap Eclipse Tribrid. The TSQ Altis utilises its triple quadrupole to deliver precise quantitative analysis and qualitative identification of various compounds. Its robust performance in multiple reaction monitoring can greatly enhance our researchers' capability to detect low abundance targets in complex samples, rendering it an extremely reliable tool for daily routine analyte quantification analysis.

這平台包含兩套質譜系統：Thermo Scientific TSQ Altis 三重四極桿質譜儀，以及 Thermo Scientific Orbitrap Eclipse Tribrid 四極桿－線性離子阱－電場軌道阱三合一質譜儀。TSQ Altis 採用三重四極桿技術，能精準定量分析及鑑定各種化合物。此系統能在多重實驗反應中檢測低濃度目標分子，此成為研究人員日常不可或缺的分析工具。



Thermo Scientific TSQ Altis
Triple Quadrupole Liquid Chromatography – Mass Spectrometer
Thermo Scientific TSQ Altis 三重四極桿液相色譜 - 質譜聯用儀

The Orbitrap Eclipse is a three-in-one mass analyser with an exceptional sensitivity and resolution for the detection of low-abundance analytes and their untargeted simultaneous measurement. Its robust performance is facilitative for both qualitative and quantitative proteomics/metabolomics analyses. With the optional FAIMS Pro interface, the protein and peptide identification limits can be further reduced.

Orbitrap Eclipse 結合三種不同的質量分析器，擁有無與倫比的靈敏度和分子分辨率。它可以檢測低濃度目標，並同時為眾多樣本作出非靶向分析。此質譜儀賦予蛋白質和代謝研究人員不可或缺的定性及定量能力。 透過 FAIMS Pro 接口，它更可以進一步提升蛋白質和肽的偵測極限。



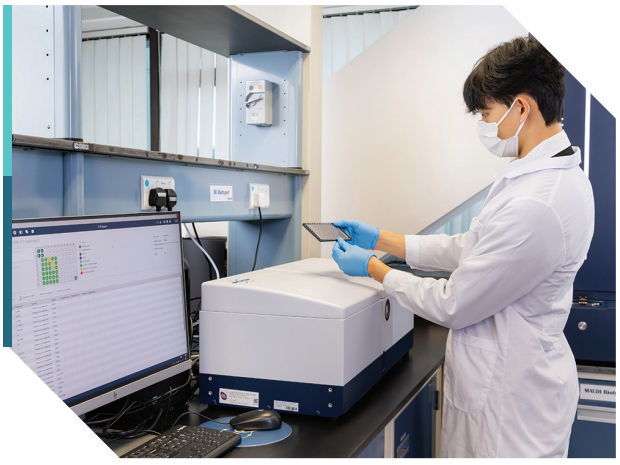
Thermo Scientific Orbitrap Eclipse
Tribrid Liquid Chromatography – Mass Spectrometer
Thermo Scientific Orbitrap Eclipse 四極桿 - 線性離子阱 - 電場軌道阱三合一液相色譜 - 質譜聯用儀

Both mass spectrometers can be coupled to an ultra-high performance liquid chromatography system (UHPLC), that offers an enhanced ability to separate the target proteins or small molecules amongst complex mixtures.

The Platform has two biotypers, namely the Bruker MALDI Biotyper Sirius System and IR Biotyper. These systems offer robust, high-throughput and cost-effective taxonomical identification of micro-organisms. The MALDI Biotyper Sirius determines a micro-organism's species by analysing their unique proteomic fingerprints, followed by matching them with the instrument's extensive reference libraries. Subsequently, the IR Biotyper can differentiate different micro-organisms to their sub-species levels by analysing their unique infrared absorption spectra, making it a powerful tool for investigating disease outbreaks.

此平台還具有兩部微生物鑑定系統，分別是 Bruker 基質輔助激光解吸電離質譜儀和 Bruker 傅立葉變換紅外光譜儀。這兩部儀器具有絕佳性能，常被用於微生物鑑定和分類。基質輔助激光解吸電離質譜儀透過參考數據庫分析微生物獨特的蛋白質指紋，來識別未知微生物。隨後，傅立葉變換紅外光譜儀通過分析微生物的紅外吸收光譜確認其物種，是一項調查疾病爆發的主要工具。

通過與超高效能液相色譜系統互相結合，兩台質譜儀均皆可以為用家從複雜樣本中分離及分析目標蛋白質或小分子。



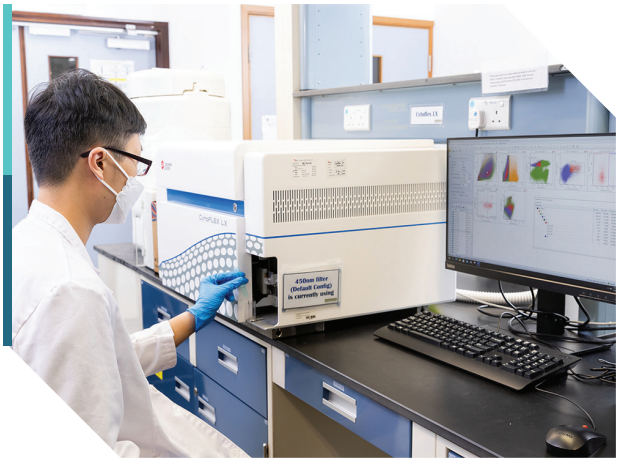
Bruker IR Biotyper
Bruker 傅立葉變換紅外光譜儀



Bruker MALDI Biotyper Sirius
Bruker 基質輔助激光解吸電離質譜儀

Furthermore, the Platform is equipped with a Beckman Coulter CytoFLEX LX flow cytometer. This system measures cellular characteristics as cells pass through a laser beam in a fluidic stream. Being the most advanced model of the series, the cytometer can detect up to 21 fluorescence parameters, which gives a high degree flexibility for researchers to customise their panels and allows simultaneous analyses of multiple biomarkers within a single cell. In addition to cellular detection, this cytometer can also detect nanoparticles with size of 80nm (such as extracellular vesicles).

此外，這平台亦配備 Beckman Coulter CytoFLEX LX 流式細胞儀。該系統利用激光分析及測量細胞特徵。作為系列中最先進的型號，它能分析細胞內的多個生物標記（最多同時讀取多達 21 個螢光參數），使研究人員設計實驗時能享受更大的靈活性。除了細胞之外，它亦支持測量直接徑小至 80 納米的粒子（例如細胞外囊泡）。



Beckman Coulter CytoFlex LX Flow Cytometer
Beckman Coulter CytoFlex LX 流式細胞儀

Additionally, this Platform is equipped with an Emulate Human Organ Emulation System, a powerful *in vitro* simulation system that can imitate the natural physiological environment and mimic mechanical stretching on an organ-chip. Multiple types of organ-chips can be treated or co-cultured to emulate a range of disease micro-environments/conditions for the studies of gut barrier disruption, liver and kidney toxicity prediction, and drug-drug interactions predictions. The system provides a higher specificity and sensitivity when compared to traditional studies with animal models.

另外，本平台亦配備一套 Emulate 人體模擬系統。它是一個在仿真官芯片上模擬細胞自然生理環境及物理拉伸訊號的體外系統。研究人員可運用多種器官芯片模擬以及研究不同人體器官疾病（例如腸道屏障損壞）。它亦能對藥物肝臟及腎臟毒性作出預測及判定藥物之間的相互作用。相對於傳統動物實驗，它能夠為用家提供更特異與靈敏的實驗資訊。

李嘉誠轉化組學平台於 2021 年起正式開放，我們自此定期舉辦一系列設備及技術分享研討會及訓練工作坊。研究人員可透過網上系統預約使用各種設備，本研究所的技術人員亦會為研究人員提供日常儀器基本操作之培訓。

The Li Ka Shing Translational Omics Platform (LKS TOP) was officially opened to researchers of the Faculty of Medicine in 2021. A series of technical seminars and training workshops on the major instruments has been regularly held ever since. Researchers can make online reservations for all of the instruments via the Li Ka Shing Institute of Health Sciences Registration and Booking System. In-house training on the basic operation of the equipment is routinely provided by the Institute.



Emulate Human Organ Emulation System
Emulate 仿真器官芯片和人體仿真系統

Biomedical Computer Centre
生物醫學計算中心

The Biomedical Computing Centre (BCC) is one of the important facilities within the Institute and is an essential facility for supporting the next generation sequencing analysis (NGS), bio-informatics, data analysis, artificial intelligent (AI) based data analysis, bio-medical research and translational genomics are the focus of the Institute.

The Centre enhanced its data centre infrastructure (core network and structured cabling) alongside overall upgrades to computing servers, storage systems capacity, high-speed file systems and data management starting in 2021. All systems improvement and upgrades were made based on the existing data centre infrastructural architecture, together with 12 IT equipment racks in the Research Data Centre (RDC) in Hong Kong Children's Hospital (HKCH).

In 2024, the Centre continued upgrading and improving the equipment to provide better service, and support to the researchers in performing their research jobs.

本中心自 2021 年起，改善數據中心基礎設施（核心網絡和結構化佈線）、強化整體計算服務、系統存儲容量、升級防水高速文件和數據管理系統等。所有系統改良、升級或整合均建基於現有數據中心設施以及香港兒童醫院內研究數據中心的 12 個 IT 設備櫃。

生物醫學計算中心是研究所內其中一項重要設施，目前主要支援次世代排序（NGS）、生物信息、人工智能，及轉譯基因學的大數據分析。

在本年內，此中心將繼續強化有關的伺服器設備，並向研究人員提供更佳的服務及支持。

The major areas for this upgrade include:
是次系統升級的主要包括：

- On top of the high-performance computing servers for bio-informatics and AI acquired, an updated cluster computing service was established and started servicing the researchers.

  在中心的高性能計算服務器上，建立更現代化的叢集計算服務，並開始為研究人員提供完整的服務。

- The clustered computer nodes are now providing a total of 5,584 CPU cores, 94TB of system memory and a total of 376 TFLOPS processing power. The GPU systems have been integrated into a new GPU AI cluster computing architecture that can provide over 6 PetaFLOPS AI operations and 10 PetaOPS INT8 performance.

  中心計算架構內的服務器叢集現能提供整體 5,584 個 CPU 核心服務、94TB 內存和整體 376 TFLOPS 的計算能力。這 GPU 系統已被集成到一個新的 GPU 人工智能叢集計算架構中，可以提供超過 6 PetaFLOPS AI 運作和 10 PetaOPS INT8 的運算能力。

- Virtualisation and other related cloud computing technologies were introduced. Services and resources can be released to researchers in a much more flexible, highly efficient and secure manner.

  此中心引入了虛擬化和其他相關的雲計算技術，讓新的服務和資源，可以以一個更精準、高效和安全的方式，提供給研究人員。

- High performance file systems were updated and upgraded to provide an extra 30% Tier-1 and 40% Tier-2 usable storage space for researchers.

  高性能檔案系統已進行更新和升級，為研究人員提供了額外百分之三十的一級（Tier-1）和百分之四十的二級（Tier-2）可用儲存空間。

- The network infrastructure of BCC has been recently improved, by adhering to industry best practices, to facilitate connectivity of the emerging high-speed "multi-node, multi-GPU" computing devices supporting up to 400Gbps and even 800Gbps in the near future.

  生物醫學計算中心的網絡基礎設施近期已按照行業最佳實踐方法進行了升級優化佈局，以準備迎接支持 400 Gbps 傳輸連接需求的「多節點、多圖形處理器」等計算設備，並在不久的將來進一步提升至 800 Gbps 等高速設備。

- A new surveillance system was deployed with a new set of cameras in the BCC environment to enhance image quality.

  中心最近部署了一套監控系統，透過配備新的閉路電視攝影機，實現了更清晰的畫質表現來提供更好的監控。

- BCC will continually explore the possibility of saving more power in the metric of Power Usage Effectiveness (PUE) with different strategies, such as direct cooling, to support the growing demands of the centre.

  中心將持續探索各種策略來提升用電效率(PUE)，例如直接冷卻等技術方案，以節省更多電力並滿足數據中心日益增長的需求。



32 + 12
Local Remote



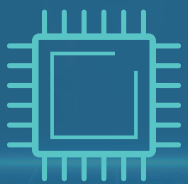
6 + 10
PetaFLOPS AI PetaFLOPS INT8



>36
Petabytes Storage



94TB
RAM



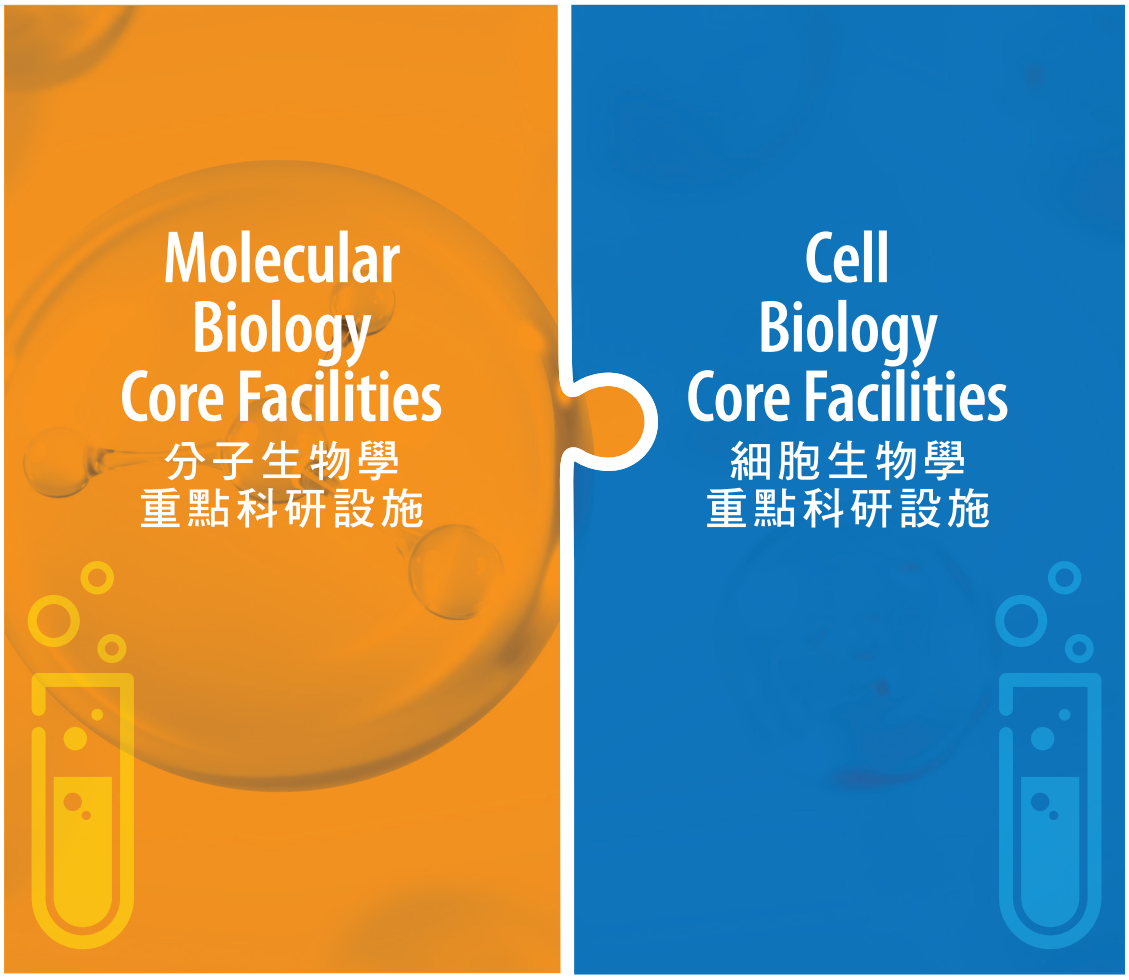
5,584
CPU Cores &
157,696
CUDA Cores



100GE & 200GE
Backhome Network
25GE to 100GE
to Serevers and Storage Systems

Core Facilities
重點科研設施

The Core Facilities at the Institute include the following:
研究所內的重點科研設施包括：



Molecular Biology Core Facilities 分子生物學重點科研設施

The **Molecular Biology Core Facilities** provide a comprehensive molecular research platform for our researchers to perform a variety of fundamental and crucial routine experimental procedures, including, but not limited to, Sample Quality Control, Transfection, and Molecular Analysis, etc.

分子生物學重點科研設施致力為研究人員提供一個全面的樣本品質控制、基因轉染、以及分子分析科研平台。

Sample Quality Control
樣本品質管制

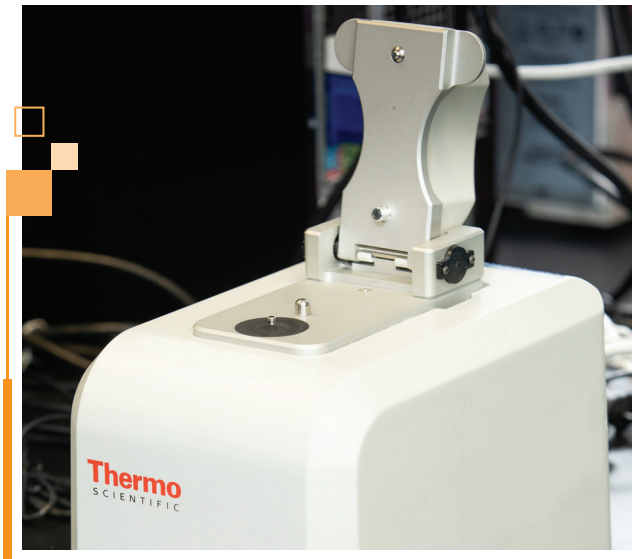
The Agilent 2100 Bioanalyzer is a microfluidic-based platform for simultaneous automated electrophoretic separation and detection of DNA/RNA/protein samples, that is capable of providing quality data regarding sample quantities and qualities in a timely manner using only tiny amounts of samples. It is often used in a wide range of applications, including but not limited to gene expression analyses, RNA integrity evaluation, sizing of DNA fragments, and protein characterisation. Thus, the system is highly favoured by researchers. It serves as a powerful analytical tool for quality control workflows across various life science research applications, from next-generation sequencing to biopharmaceutical development etc.

通過利用微流控技術，Agilent 2100 生物分析儀能自動電泳分離和檢測生物分子，作出樣本品質和濃度的快速評估。這套系統只需少量的樣本，便能作出精確生物分子的定量和純度分析。它日常被廣泛應用於基因表達分析、RNA 完整性評估、DNA 片段大小測量和蛋白質表徵研究等多種領域。因此，它是一個廣受歡迎的分子分析工具，主要被應用在各種生命科學樣本的品質控制（包括新一代基因測序及生物製藥開發）。



Nucleic Acid Quantification and Quality Assessment
核酸定量分析和質量評估

- Agilent 2100 Bioanalyzer
  Agilent 2100 生物分析儀



- Thermo Fisher Scientific Nanodrop ND-1000 & ND-2000 Spectrophotometers
  Nanodrop 分光光度計

The Nanodrop Spectrophotometer is a compact instrument designed for the rapid and accurate quantification of nucleic acids, proteins, and other biomolecules. It utilises a patented sample retention system that comes with a minimal sample volume requirement (as low as 0.5 µL). The spectrophotometer covers a wide range of UV-Vis wavelengths, thus allowing the measurement of sample purity and concentration without even the need for measurement cuvettes. It features intuitive software for data analysis and includes pre-configured methods for the most common assays.

Nanodrop 分光光度計能夠快速且準確地測量核酸、蛋白質和其他生物分子的濃度。它獲得專利的樣品測量系統，每次只需要少至 0.5 微升的樣本。此分光光度計涵蓋了廣泛的紫外-可見光波長，因此用家可在無需使用分光液槽的情況下量度樣本的純度和濃度。它簡單易用的軟件已經包含常見的分析方法，方便用家分析數據。

The Qubit 2.0 Fluorometer is a versatile instrument that can quantify DNA, RNA, and protein samples using fluorescence dye-based assays. Specific dyes that can minimise impurities have been utilised by the instrument to make accurate sample measurements. The device features an intuitive interface, automatic standard curve plotting, a built-in dilution calculator and data storage in the .csv format that can facilitate the quantification with as little as 1 µL of samples within 5 seconds.

Qubit 2.0 螢光定量儀是一款利用螢光原理定量 DNA、RNA 和蛋白質的多功能儀器。它使用特定染料減低樣本雜質對於量度的影響。該設備具有簡單易明的界面、能自動地繪畫標準曲線、並內置稀釋計算器以及支持 .csv 的儲存格式，方便用家在少於 5 秒內準確測量少至 1 微升的樣本。



- Invitrogen Qubit 2.0 Fluorometer
  Qubit 2.0 螢光定量儀

Transfection
基因轉染



Electroporation 電脈衝穿孔
- Amaxa Nucleofector II
  電穿孔轉殖儀

The Amaxa Nucleofector II is a transfection device that utilises electrical pulses to effectively transfect nucleic acids and small molecules into a wide range of cell types, including primary cells and difficult-to-transfect cell lines. Equipped with pre-optimised transfection buffers as well as tailor-made programs for more than 100 cell types, the Nucleofector II is also armed with a closed system design to minimise contamination to facilitate highly efficient transfections with a high cellular viability rate. Its scalable sample capacities are also favoured by scientists for transfections that are crucial for advanced cell biology research, gene expression studies, cell engineering and much more.

Amaxa Nucleofector II 轉染裝置能有效地利用電脈衝將核酸（如 DNA 和 RNA）輸送至原代細胞和其他難以轉染的細胞。它配備針對 100 多種細胞預先優化的轉染程式，亦同時配有樣品容量擴展和防止細胞污染的封閉設計。本儀器被廣泛應用於細胞生物學研究、基因表達研究、細胞工程等領域。

Molecular Analysis
分子分析

The Bio-Rad QX200 Droplet Digital PCR (ddPCR) system offers precise, absolute nucleic acid quantification without the need for any standard curves. By partitioning the samples into thousands of nanoliter-sized oil droplets, this technology enables the reliable detection of rare genomic mutations, copy number variations, and precise quantification of nucleic acids with high sensitivity and reproducibility. Applications include cancer research for detecting low-frequency mutations, viral load quantification in infectious diseases, and accurate gene expression analyses et cetera.

透過使用 Bio-Rad QX200 Droplet Digital PCR（ddPCR）系統，用家無需設定核酸濃度參考標準曲線，便能精確地絕對定量核酸。通過將樣本分割成數以千個納升體積的小油滴，本儀器能可靠地檢測罕見基因突變、拷貝數變異，並作精確且可重現性的高靈敏度核酸定量。常見應用包括檢測癌症研究基因低頻突變，感染性疾病研究中的病原定量，以及準確的基因表達分析。



Gene Expression Profiling, Analysis and Genotyping
基因表達譜及基因型態分析
- Bio-Rad QX200 Droplet Digital PCR System
  微滴式數位聚合酶鏈式反應系統



• Illumina iScan Microarray System 芯片掃描系統

The iScan System provides accurate data with a high resolution for genome-wide association studies (GWAS), gene expression profiling, and methylation analyses. Its automation and scalability make it the suitable device for a diverse range of research applications, including the understanding of complex genetic diseases, novel biomarker discovery, and pharmacogenomics research et cetera.

iScan 系統能為全基因組聯合分析 (GWAS)、基因表達分析和甲基化分析提供帶有高解析度且準確的數據。其自動化和可擴展性適用於不同的研究範疇，它常被用於複雜遺傳疾病研究、生物標記物發現和藥物基因組學等等。

The QuantStudio 12K Flex Real-Time PCR System supports high-throughput quantitative PCR applications, accommodating a 96-well or a 384-well plate per run with an interchangeable heat block format for research flexibility. It features advanced optical components that enable precise and sensitive detection across multiple fluorescence channels, supporting gene expression, genotyping, and copy number variation analyses with various fluorescent dyes (e.g. TaqMan and SYBR Green). The system also offers automated data analysis and comprehensive software for experiment setup, data interpretation, and report generation.

QuantStudio 12K Flex 實時 PCR 系統支持高通量螢光核酸定量，它具有可互換的發熱模組，每次實驗最多同時支持 96 或 384 個樣本。它的先進光學組件可以精確收集多個螢光通道上的訊號。它現時被廣泛使用在以 TaqMan 和 SYBR Green 等以螢光試劑為基礎的基因和拷貝數變異分析。該系統的軟件還提供自動化數據分類，方便用家設計實驗、分析數據和實驗結果。



• Life Technologies QuantStudio 12K Flex Real-Time PCR 定量實時聚合酶鏈鎖反應儀

The ChemiDoc MP Imaging System combines advanced gel/blot imaging capabilities with versatile detection methods i.e. fluorescence, chemiluminescence, and colorimetric detections. It supports a variety of fluorescent reporters in a multiplexed manner, providing the users with a wide breadth of versatility. Its auto focusing, exposure fine tuning and simplified sample previewing, and the support of stain-free protein workflows are all beloved merits of this instrument. The stain-free approach saves time by eliminating lengthy staining and destaining steps. It provides more accurate and efficient protein quantitation and preserves proteins for further analysis like mass spectrometry or Western blotting. In addition, the automatic recognition feature of the Smart Trays ensures hassle-free automatic selection of the correct protocols based on the imaging tray in use. This system is mainly used in protein/nucleic acid gel documentation, western blotting, and protein-ligand interaction analysis et cetera.

ChemiDoc MP 影像系統具有先進的成像能力．它透過使用螢光、化學發光以及比色法等多種方法顯影及分析樣本，為研究人員提供實驗靈活性。它具有自動對焦、曝光和預覽等功能去簡化用家設定。它的系統支援無染色技術，能免除耗時的染色和脫色步驟，為用家提供快捷、準確的蛋白質分析及定量。這項技術有助於提高實驗重覆性，能保留蛋白質樣本到下一步質譜或蛋白免疫印迹分析。此外，它內置防呆智能托盤自動識別



Multi-purpose Imaging System 多功能成像系統

- Bio-Rad ChemiDoc MP Imaging System
  多色螢光及化學發光成像系統

功能，可確保用家選擇正確的顯影方法。本儀器能智能地為用家選擇實驗程序，無須手動調整。現時此系統被廣泛應用於蛋白質 / 核酸分析、免疫印跡法和蛋白質受體 - 配體相互作用等實驗。



Bead-based Suspension Analysis 磁珠懸浮偵測

- Bio-Rad Bioplex-200 Bead-based Suspension Array System
  磁珠懸浮液相芯片系統

The Bio-Plex 200 System is a multiplex immunoassay platform that supports the detection and quantification of up to 100 analytes in a single sample run. It is a magnetic bead-based flow cytometric platform that measures and characterises biomolecules. The integrated liquid handling system enables automated sample acquisition. Each bead is scanned by lasers for bound analytes identification and quantification. It is now widely used in the field of immunology and oncology for drug discovery, enabling our researchers to delineate complex biological systems.

Bio-Plex 200 系統是一台多重免疫分析儀。通過磁珠分離法與流式細胞技術，本儀器可在單一樣本中同時分析及測量多達 100 種分析物。它的液體處理系統可以自動完成樣本採集、識別和定量分析物。本系統現被廣泛應用於免疫學、腫瘤學和藥物研發，令研究人員進一步了解複雜生物系統。

Cell Biology Core Facilities 細胞生物學重點科研設施

The Cell Biology Core Facilities provide a series of comprehensive cellular research platforms for cell-biology related work, such as Cell Selection and Cell Culturing.

細胞生物學重點科研設施為研究人員提供全面的研究設備，
例如細胞篩選及細胞培育。

Cell Selection
細胞篩選

The Leica LMD 7000 is a laser microdissection system designed for precise tissue dissection, enabling the isolation of specific cells or regions through high-resolution imaging with its highly customisable cutting parameters. Its user-friendly software facilitates the high purity sample collection with minimal risks of contamination. The system supports the purification of samples from complex tissue environments that are frequently encountered in genomic, transcriptomic, and proteomic studies in the field of cancer research, neuroscience, and developmental biology.

Leica LMD 7000 是一款雷射顯微切割系統。透過用家指定的成像解析度和切割參數，它能夠精確分離組織切片上特定的細胞或區域。它簡單易用的軟件能方便用家準確地採集高純度樣本又減少樣本污染。此系統目前被用於癌症、神經科學和發育生物學中有關基因及蛋白質的研究。



Micro-dissectio 顯微切割
- Leica LMD7000 Laser Micro-dissector
  激光捕獲顯微切割器

The BD FACSAria Fusion Flow Cytometry Cell Sorter provides a precise and efficient separation of complex cell populations. It enables the simultaneous detection and sorting of cells, up to 18 parameters, ensuring an in-depth phenotypic analysis with gentle and targeted sorting that minimises impact on cell viability. The certified biosafety cabinet features a biocontainment design that ensures users' safe handling of hazardous samples. This system is compatible with various sample types of collection devices, including single-cell deposition, benefiting researchers in field of immunology, stem cell biology, and cancer research in their downstream applications.

BD FACSAria Fusion 流式細胞分選儀能精確且高效能地從樣本分離目標細胞。它能夠同時偵測多達 18 個細胞參數，方便用家進行深入的樣本表型分析。透過溫和、針對性的分選，本儀器能大幅度減少實驗對細胞活力的影響。此外，它的生物安全功能和生物隔離設計具有認證，能確保使用者處理危險樣本時的安全。它備有一系列樣本收集設備，及支持不同的實驗需求（包括單細胞沉積等等）。此系統目前被用免疫學、幹細胞生物學和癌症研究，它大大簡化了研究人員的下游分析。



Cellular Analysis & Collection 細胞分析與收集
- BD FACSAria Fusion Flow Cytometry Cell Sorter
  流式細胞分選儀



Cell Culture Facilities 細胞培養室
- Class II Type A2 Biosafety Cabinet
  第二等級 Type A2 生物安全櫃

Cell Culturing
細胞培養

Our Cell Culture Facilities are equipped with seven certified Class II Type A2 Biosafety Cabinets. Both animal- and human-origin cell lines can be cultured in them. Benefitted from a recent expansion of our facilities, our researchers now can enjoy a higher degree of cell culture capability.

我們的細胞培養設施共配備七個獲得認證的二級 A2 型生物安全櫃。無論動物細胞以及人類細胞皆可以在生物安全櫃中培養。有鑒於近期的擴建，我們研究所　的細胞培養效率得以大大提升。

Li Ka Shing Experimental Animal Core Facility 李嘉誠實驗動物中心

To keep up the increasing demand of animal holding facility, **Li Ka Shing Experimental Animal Core Facility** has been opened in 2024 at the Institute to provide centralised animal housing and care services for the research community at The Chinese University of Hong Kong. The newly implemented library system in the Main Holding Room has greatly expanded the capacity for housing mice.

All cages are individually ventilated to minimise the risk of cross-animal transmission of infectious agents, and equipped with an equally important automated watering system to eliminate the repetitiveness of water bottle filling and back and forth transport by our animal users. When the facility reaches its highest operation level, it can cater for more than 7,500 laboratory mice.

為了持續進行尖端醫學研究，**李嘉誠實驗動物中心**於 2024 年正式開放，旨在為大學的研究人員提供集中的實驗動物寄養和護理服務。在這中心主寄養室的圖書館鼠籠系統內，小鼠的飼養數量顯著地增加，以滿足研究人員對動物實驗日漸增加的需求。

此外，中心內的所有鼠籠都采用獨立通風系統，可以大大降低動物之間傳播感染源的風險及保護研究人員。我們的鼠籠自動供水系統可節省耗時的水瓶填充和不必要的動物運輸。當本中心全面投入運作後，可同時容納超過 7,500 隻實驗用的小鼠。



Animal Procedure Room 動物手術室



Laboratory Animal Main Holding Room
實驗動物主寄養室

One of the critical components of the Facility is the Animal Procedure Room, designed for performing medical procedures in a ventilation-controlled and sterile environment. Supported with dissection microscopes, anaesthesia systems, and stereotaxic surgery devices, researchers can conduct surgeries and device implantations into the experiment animals.

This Room is frequently utilised in behavioural and neuroscience research, as it is designed in a way that can ensure precise interventions, minimise animal discomfort, all of which essential for valid and reproducible experimental results.

動物手術室是我們其中一個關鍵設施，旨在給予研究人員在受控和無菌的環境下進行動物實驗。手術室內配備解剖顯微鏡、麻醉系統和立體定位手術設備，為研究人員提供餵食藥物工具及手術設備。本手術室經常被用於行為和神經科學研究，因為它的設計可以確保實驗的精準並最大限度地減少動物的不適。這一切對於優質動物實驗都是不可劃決的。



ISOcage N System
ISOcage N 系統

Trained personnel from the Laboratory Animal Services Centre (LASEC) are responsible for the animal facility husbandry and routine operation. Regular animal welfare check is conducted by veterinarians to identify any signs of animal illness or distress, ensuring timely intervention when necessary. To minimise contamination within the Animal Facility, all incoming materials must be sterilised and all trained users are required to don an additional layer of personal protective equipment as instructed before entering the Facility.

了解到動物實驗在生物醫學研究中至為重要，我們採取多項措施提供最優質的實驗動物。

大學實驗動物中心 (LASEC) 的受訓人員負責該中心的動物飼養和日常運作。獸醫亦會定期抽樣檢查動物，如發現任何疾病或痛苦的跡象，他們會及時介入。

所有物品進入該設施前必須徹底消毒，每位研究人員亦必須正確穿上保護裝備。

The Facility also includes an Animal Biosafety Level 2 (ABSL2) Laboratory suite safeguarding both the experiment animals and researchers that involve the use of zoonotic ABSL2 pathogens from any potential biohazards and lab-acquired infections.

Experiment animals are maintained in negative pressure ISOcage N systems. They must be experimented in the biosafety cabinets, aligning with the University's own biocontainment guidelines and personnel protection mandates.

A reversed day-night cycle holding room is also set up in the Facility, for any research requiring an opposite diurnal cycle for the study of rodent physiology and behaviour at night.

中心亦包括一個二級動物生物安全 (ABSL2) 實驗室，令研究人員能夠安全處理及防止動物病源體的洩漏。

房內配備負壓 ISOcage N 系統和生物安全櫃，以保護研究人員。

此外，中心還設立了晝夜顛倒房間支持小鼠夜間行為的研究。



Reversed Day-night Cycle Holding Room
日夜顛倒寄養室

Biosafety Level III (BSL3) Laboratory
三級生物安全實驗室

The **Biosafety Level III (BSL3) Laboratory** at the Li Ka Shing Institute of Health Sciences is located on 11/F of Li Ka Shing Medical Sciences Building. The 300m^2 BSL3 core facility is a highly specialised microbiology research laboratory that supports researchers' needs on infectious agents.

The Laboratory consists of laboratory suites to support *in vitro* experiments on risk group 2 or 3 agents and organisms, and animal laboratory suites for conducting *in vivo* Animal Biosafety Level III (ABSL3) experiments. There is also a BSL2 Control and Preparation area to support the operation of the BSL3.

The Laboratory consists of cutting-edge research facilities that allow researchers to conduct microbiological, virological, and epidemiological studies. This would accelerate microbiology research to advance current clinical treatments and public health protection.

三級生物安全實驗室位於李嘉誠醫學科學大樓 11 樓，佔地約 300 平方米。此核心設施是一個進行微生物學研究的專門實驗室，為研究人員進行具感染性病原體的相關研究而設。

本設施包括多間實驗室，用以進行第二級或第三級風險等級病原體和微生物的體外實驗（BSL3），以及進行體內生物安全等級三（ABSL3）動物實驗的動物實驗室。此外，設施內亦設有一個第二級生物安全（BSL2）的控制與準備區，用以支援整個 BSL3 實驗室的運作。

實驗室配備先進的研究設施，使研究人員能夠安全地進行微生物學、病毒學及流行病學等的研究工作，從而加速微生物學領域的科研發展，以推動臨床治療進步及保護公共衛生。



Virus Culture Laboratory



P2 Control Area

The BSL3 facilities incorporate special engineering and negative pressure containment features that allow researchers to work safely with animals and pathogens that require BSL3 practices.

The BSL3 facilities are integrated with a comprehensive Building Management System (BMS), that provides real-time monitoring and automated control of key environmental conditions, including the negative pressure, temperature, humidity, and lighting, etc. This system maintains optimal environmental conditions in the laboratory to provide a safe research environment.

To uphold the highest BSL3 Laboratory safety standards, the laboratory infrastructure, equipment, and standard operating procedures (SOP) are certified annually by

qualified external consultants. This regular assessment ensures that all operations in the laboratory comply with biosafety requirements established by recognized international institutions. In addition, routine performance checks and certification are conducted on all critical equipment within the BSL3 Laboratory to ensure its proper functionality.

The facilities provide basic research infrastructure such as incubators, freezers, bench-top centrifuges, microscopes, and microplate readers to support microbiological research activities. Some advanced research equipment includes:

三級生物安全實驗室配備專業的工程設計及負壓隔離系統，使研究人員能夠在高度安全的環境下，按照 BSL3 的操作規範處理動物與病原體。

設施內均配備完善的樓宇管理系統（BMS），可實時監察並自動控制多項關鍵的環境條件，包括負壓、溫度、濕度及照明等。此系統可維持實驗室環境在最佳狀態，以提供安全的研究環境。

為維持最高的實驗室安全標準，實驗室的基礎設施、儀器設備及標準作業流程（SOP）每年均由專業的外部顧問進行認證，確保實驗室內的所有儀器和操作均符合國際機構所訂定下的生物安全指引。而且，實驗室內所有關鍵設備皆由專業人員定期進行效能檢查及認證，以確保其功能正常。

本設施提供多項基礎研究所需的設備，包括培養箱、低溫冰箱、桌上型離心機、顯微鏡及微孔盤讀取器，全面支援各類微生物學的研究工作。此外，亦配備了一些先進的研究儀器，包括：



Class II Type A2 Biosafety Cabinet
第二等級 A2 型生物安全櫃

The BSL3 Laboratory is equipped with five certified Class II Type A2 Biosafety Cabinets, which are essential for maintaining a safe working environment when handling pathogenic microorganisms and infected animals. These cabinets provide a physical barrier between the researcher and the biohazardous materials. All experimental procedures involving infectious agents are strictly conducted within these biosafety cabinets. When used in conjunction with established BSL3 safety guidelines, these cabinets offer a high level of containment, significantly reducing the risk of pathogen exposure and ensuring the safety of laboratory personnel.

本實驗室配備五台通過認證的 Class II A2 型生物安全櫃，為處理病原微生物及感染動物時提供安全的工作環境。此類生物安全櫃可形成有效的物理屏障，隔開研究人員與生物危害物。所有涉及感染性病原體的實驗操作，皆嚴格於生物安全櫃內進行。配合既定的 BSL3 安全操作指引使用時，這些生物安全櫃可提供高度的生物隔離防護，有效降低病原體暴露的風險，確保實驗人員的安全。

The ISOcage Animal Biocontainment System is an advanced animal housing solution for high-level pathogen containment. Each cage functions as an individual, airtight pathogen isolator. The cages are equipped with HEPA filters and maintained under high negative pressure. This design ensures that all air entering or exiting the cage is filtered, providing an effective barrier against the escape of infectious agents. This high level of containment significantly enhances biosafety, offering maximum protection to both the research personnel and the surrounding environment. It also enables researchers to conduct BSL3 level animal experiments with confidence and control.

ISOcage 動物生物隔離系統是一種先進的動物飼養解決方案，專為高等級病原體的隔離與研究而設計。每個籠盒皆為獨立且密封的病原體隔離單位，配備高效微粒空氣（HEPA）過濾器，並維持高負壓狀態。此設計可確保所有進出籠盒的氣體皆經過過濾，有效阻止病原體的洩漏。此高規格的隔離設計大幅提升了生物安全等級，為研究人員及周邊環境提供完善的防護。該系統亦讓研究人員能在高度可控的條件下，有信心地進行 BSL3 等級的動物實驗。



ISOcage Animal Biocontainment System
ISOcage 動物生物隔離系統



Beckman Coulter Optima XE-90 Ultracentrifuge
Beckman Coulter Optima XE-90 超高速離心機

The Beckman Coulter Optima XE-90 Ultracentrifuge is a vital tool in microbiology research within the BSL3 Laboratory. It enables high-speed separation and purification of biological materials. In a BSL3 setting, it is useful for concentrating infectious agents, isolating viral particles, and preparing biomolecules for downstream molecular analysis. This ultracentrifuge is configured for enhanced biosafety and installed with HEPA filters. It supports research on pathogens and novel therapeutic developments.

Beckman Coulter Optima XE-90 超高速離心機是三級生物安全實驗室中進行微生物研究不可或缺的重要設備，具備高效分離與純化生物物質的能力。在 BSL3 環境中，此儀器可用於濃縮病原體、分離病毒粒子，並製作生物分子樣本，以供後續的分子學分析。本離心機採用強化的生物安全配置，並配備高效微粒空氣（HEPA）過濾器。該設備能夠支援病原體研究以開發新的治療策略。

The BSL3 facility is equipped with three large-capacity autoclaves, ensuring thorough decontamination and maintaining a high level of biosafety within the laboratory. By exposing infectious agents to high-pressure saturated steam, these autoclaves effectively inactivate a wide range of pathogens. This enables reliable sterilisation of biohazardous waste and contaminated materials. It is essential for preventing accidental pathogen release and safeguarding both research personnel and the surrounding environment.

三級生物安全實驗室配備三台大容量高壓蒸氣滅菌器，確保實驗室內能達到徹底的消毒處理與高水準的生物安全管理。透過高壓飽和蒸氣的滅菌程序，這些消毒爐能有效滅活各類病原體，可靠地消毒生物危害廢棄物及受污染的材料。此過程能夠防止病原體意外洩漏，保障研究人員及實驗環境的安全。



Autoclaves 高壓蒸氣滅菌器



Beckman Coulter CytoFLEX S Flow Cytometer
Beckman Coulter CytoFLEX S 流式細胞儀

The Beckman Coulter CytoFLEX S Flow Cytometer is a high-performance analytical instrument installed in the BSL3 Laboratory. It offers fluorescence-based detection of cells and pathogens for identification, analysis, and quantification applications. It supports a broad range of applications, including cell biology, immunology, and microbiology. The system is equipped with four lasers and nine fluorescence detection channels, enabling sensitive and precise analysis of cellular and pathogen phenotype with high resolution.

Beckman Coulter CytoFLEX S 流式細胞儀是一部高性能的分析儀器，安裝於此實驗設施中。該儀器透過螢光訊號進行細胞與病原體的偵測，應用於鑑定、分析及定量等研究工作。它能支援細胞生物學、免疫學及微生物學等多元化的研究應用。系統配備有四支雷射與九個螢光偵測通道，可進行高解析度的靈敏分析，精確辨識細胞與病原體的表型特徵。

Research Activities and Outputs 科研動態

Research Areas and Teams 研究領域隊伍

Research teams within the Institute are grouped under two main areas, namely "Diseases and Pathobiology" and "New Technologies".

研究所內的研究隊伍可大致分為兩大研究範疇，是為「疾病及病理生物」和「創新技術」。

Diseases and Pathobiology 疾病及病理生物

Research Area 研究領域	Principal Investigator 首席研究員
Digestive Diseases, Gastroenterology and Hepatology 消化、腸胃及肝臟疾病研究	Jun Yu 于君
	Louis Lau 柳浩城
	Jimmy Lai 黎梓滔
Infectious Diseases, Public Health and Microbiota 傳染病、公共衛生及腸道微生物學	Siew Ng 黃秀娟
	Renee Chan 陳韻怡
	Peter Cheung 張栢恒
	Hein Min Tun 黃世萬
	Chris Mok 莫家斌
	Ken Chan 陳嘉鵬
	Lin Zhang 張琳
	Mingyuan Li 李明圓
	Likai Tan 譚力凱
	Jake Chung 鍾明基
Cancers 癌症研究	Jessie Liang 梁巧儀
	Andreas Möller
	Chester Lai 賴宇軒
	Jeremy Teoh 張源津
Cardiovascular Medicine 心血管疾病研究	Xiaoqiang Yao 姚曉強
	Alex Lee 李沛威
Diabetes and Obesity 糖尿病與肥胖症研究	Juliana Chan 陳重娥
	Ronald Ma 馬青雲

Research Area 研究領域	Principal Investigator 首席研究員
Neuroscience and Neurotechnology 神經科學及神經技術	Owen Ko 高浩
	Hei Ming Lai 黎曦明
	Vincent Mok 莫仲棠
	Thomas Leung 梁慧康
	Bonaventure Ip 葉耀明
	Yun Kwok Wing 榮潤國
	Bei Huang 黃蓓
	Petrina Lau 劉友璞
Reproduction and Development 生殖與發育研究	Ronald Wang 黃志超
	Max Wang 王堯
Nephrology 腎臟疾病研究	Cheuk Chun Szeto 司徒卓俊
	Jack Ng 吳傑聰

New Technologies 創新技術

Research Area 研究領域	Principal Investigator 首席研究員
Molecular Diagnostics 分子診斷學	Dennis Lo 盧煜明
	Nelson Tang 鄧亮生
	Allen Chan 陳君賜
	Jacky Lam 林偉棋
Stem Cells and Tissue Regeneration 幹細胞及組織再生研究	Kathy Lui 呂愛蘭
	Wayne Lee 李郁偉
	Ning Zhang 張寧
Biomaterial, Chemical Biology and Drug Translational Research 生物材料、化學生物學與藥物轉譯研究	Ling Qin 秦嶺
	Billy Ng 吳濰龍
	Louis Cheung 張穎愷
Genomics and Bioinformatics 基因組學與生物訊息學	Peiyong Jiang 江培勇
	Ken Sung 宋永健
	Xin Wang 王鑫
	Terry Yip 葉卓風
Non-coding RNAs and Cellular Signalling 非編碼核糖核苷酸研究及細胞訊號轉導	Huating Wang 王華婷
	William Wu 胡嘉麒
	Huarong Chen 陳華溶
	Xiaona Chen 陳小娜
Robotics & Artificial Intelligence 人工智慧	Zheng Li 李崢
	Kai Fung Chan 陳啟楓



Publications and Other Research Outputs
學術著作及其他研究成果

A summary of the publications and other research outputs of individual teams for the reporting period can be found in Appendix: Reports on Research Activities.

In 2024, a total of 310 publications from these teams were published.

Among the publications, 116, 49 and 57 were published in journals with impact factors greater than 4, 10 and 15, respectively. Highlighted below are several major ones:

各小組的研究成果及著作詳列於附錄：科研活動報告部分。過去一年，研究所屬下各研究小組共發表 310 篇學術論文，當中有 116、49 及 57 篇分別刊登於影響分子高於 4、10 及 15 的學術刊物。

PNAS RESEARCH ARTICLE | MEDICAL SCIENCES OPEN ACCESS

Histone modifications of circulating nucleosomes are associated with changes in cell-free DNA fragmentation patterns

Jinyue Bai[a,b,c,1], Peiyong Jiang[a,b,c,d,1], Lu Ji[a,b,c,1], W. K. Jacky Lam[a,b,c,d], Qing Zhou[a,b,c], Mary-Jane L. Ma[a,b,c], Spencer C. Ding[a,b,c], Saravanan Ramakrishnan[a,b,c], Chun Wai Wan[a], Tongxin Claire Yang[a,b,c], Masashi Yukawa[a,b,c], Rebecca W. Y. Chan[a,b,c], Rong Qiao[a,b,c], Stephanie C. Y. Yu[a,b,c], L. Y. Lois Choy[a,b,c,d], Yuwei Shi[a,b,c], Zilong Wang[a,b,c], Tommy H. C. Tam[e], Man Fai Law[e], Raymond S. M. Wong[e], John Wong[f], Stephen Lam Chan[d,g], Grace L. H. Wong[e], Vincent W. S. Wong[e], K. C. Allen Chan[a,b,c,d], and Y. M. Dennis Lo[a,b,c,d,2]

Affiliations are included on p. 10.

Contributed by Y. M. Dennis Lo; received February 28, 2024; accepted September 10, 2024; reviewed by Scott Bratman and Iwijn De Vlaminck

Author(s): Dennis Lo, Allen Chan, Jacky Lam, Peiyong Jiang et al.

Journal: *Proceedings of the National Academy of Sciences of the United States of America*, September 2024

The research team led by Professor Dennis Lo demonstrates for the first time in this study that histone modifications are linked to characteristic fragmentomic patterns in plasma cell-free DNA (cfDNA). Characteristic properties of plasma cfDNA, namely the size profile and end-motif patterns, were shown to be associated with regions of the genome with the histone H3 lysine 27 acetylation (H3K27ac) and histone H3 lysine 4 trimethylation (H3K4me3) modifications. In addition, differential fragmentomics profiles were observed between H3K27ac-enriched regions and H3K4me3-enriched regions. The developed technology, named FRAGmentomics-based Histone modification Analysis (FRAGHA), provides a method for deducing histone modification profiles from whole genome sequencing data, obviating the need for complex experimental processes such as chromatin immunoprecipitation (ChIP). The current work demonstrates that deduced histone modification signals offer a robust method for tissue-of-origin analysis, with strong correlations observed between deduced placental-specific H3K27ac signals and fetal DNA fractions from pregnant individuals, as well as liver-specific H3K27ac signals and donor-derived DNA from liver transplantation recipients. Deduced H3K27ac tissue-of-origin and cancer-associated signals provided important diagnostic value in cancer detection, as demonstrated by the enhanced detection of hepatocellular carcinoma (HCC), with an area under the curve (AUC) of 0.97. This work expands upon the utility of cfDNA fragmentomics and paves the way for future exploration of protein-DNA interactions in cfDNA circulation.

盧煜明教授帶領的團隊在這項研究中首次證明血漿中游離核小體的組蛋白修飾與遊離 DNA（cfDNA）中的特徵性片段組學模式相關。血漿 cfDNA 的片段大小分佈和末端基序模式，被證明與基因組中組蛋白 H3 賴氨酸 27 乙醯化（H3K27ac）和組蛋白 H3 賴氨酸 4 三甲基化（H3K4me3）修飾水平有關。此外，在 H3K27ac 富集區和 H3K4me3 富集區之間觀察到不同的片段組學譜。這項技術被命名為基於片段組學的組蛋白修飾分析（FRAGHA），它提供了一種從全基因組測序數據中推斷組蛋白修飾譜的方法，從而無需染色質免疫沉澱（ChIP）等複雜的實驗過程。目前的研究表明，推斷的組蛋白修飾訊號為血漿 cfDNA 組織來源分析提供了一種強有力的方法，推斷的胎盤特異性 H3K27ac 訊號和孕婦胎兒 DNA 分數之間以及肝臟特異性 H3K27ac 訊號和肝臟移植接受者的供體來源 DNA 之間存在很強的相關性。推斷的 H3K27ac 組織來源和癌症相關訊號在癌症檢測中提供了重要的診斷價值，如推導的肝臟特異性 H3K27ac 信號在肝細胞癌（HCC）檢測中實現了曲線下面積（AUC）為 0.97。這項工作擴展了 cfDNA 片段組學的實用性，並為未來探索血漿中的蛋白質 -DNA 相互作用鋪平了道路。

CellPress
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Cell

Article

Streptococcus anginosus promotes gastric inflammation, atrophy, and tumorigenesis in mice

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Author(s): Jun Yu et al.
Journal: *Cell*, February 2024

In the captioned study, the team led by Professor Jun Yu was the first to identify that *Streptococcus anginosus*, a non-*Helicobacter pylori* bacterium found in the stomach, as a novel pathogen of gastric cancer. *S. anginosus* was enriched in the gastric mucosa of patients with gastric cancer. In mice, the gavage of *S. anginosus* induces acute gastritis, which consequently progressed to chronic gastritis, gastric mucinous metaplasia and dysplasia. In addition, *S. anginosus* accelerated gastric malignant progression in carcinogen induced gastric tumorigenesis and YTN16 Gastric Cancer cell allografts. Consistently, S. anginosus disrupted the gastric barrier function, promoted cell proliferation, and inhibited apoptosis in the gastric mucosa. Mechanistically, we identified an *S. anginosus* surface protein, *T. pallidum* membrane protien c; (TMPC), that interacts with Annexin A2 (ANXA2) on gastric epithelial cells. Interaction of TMPC with ANXA2 mediated attachment and colonisation of *S. anginosus* and induced mitogen-activated protein kinase (MAPK) activation. Knockout of TMPC or ANXA2 abrogated the protumorigenic function of *S. anginosus*. Taken together, this study reveals *S. anginosus* as a pathogen that promotes gastric tumorigenesis via direct interaction with gastric epithelial cells in a TMPC-ANXA2-MAPK axis. This is the first report of a non-*H. pylori* pathogen involved in gastric cancer development and this finding will provide new insights for clinical intervention in the future.

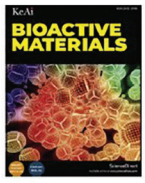
在本研究中，于君教授及其研究團隊首次發現了 *Streptococcus anginosus* 為一種新的胃癌致病細菌。*S. anginosus* 在胃癌患者的胃黏膜中富集。在小鼠上，*S. anginosus* 可誘發急性胃炎，慢性胃炎以及癌前病變，也加快了致癌物誘發的胃腫瘤發生和進展。*S. anginosus* 破壞胃屏障功能，促進細胞增殖，並抑制胃黏膜細胞凋亡。機制研究發現 *S. anginosus* 表面蛋白 TMPC 與胃上皮細胞上的 Annexin A2 (ANXA2) 相互作用，介導了 *S. anginosus* 的定植，並誘導了胃上皮細胞 MAPK 通路激活。綜上所述，本研究揭示了 *S. anginosus* 透過 TMPC-ANXA2-MAPK 軸來促進胃腫瘤發生的致病細菌。這項發現將為胃癌的臨床預防和診斷提供新的見解。

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Degradation products of magnesium implant synergistically enhance bone regeneration: Unraveling the roles of hydrogen gas and alkaline environment

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Author(s): Ling Qin et al.

Journal: *Bioactive Materials*, December 2024

Biodegradable magnesium (Mg) is an attractive biomaterial developed as orthopaedic implants for temporary fracture fixation and bone regeneration. However, the precise mechanisms by which Mg degradation products - magnesium ions (Mg^{2+}), hydrogen gas (H_2), and hydroxide ions (OH^-) - enhance fracture healing remain incompletely understood. In this study, the team led by Professor Ling Qin investigates the *in vivo* degradation of magnesium intramedullary nails (Mg-IMNs), demonstrating that these degradation products accumulate near the fracture site during early healing stages. Bulk RNA sequencing (RNA-seq) reveals that H_2 and the alkaline microenvironment promote periosteal cell proliferation, while Mg^{2+} primarily enhances extracellular matrix formation and cell adhesion in *ex vivo* femur models. Further *in vivo* experiments show that H_2, Mg^{2+}, and alkaline pH contribute equally to the Mg-IMN-induced bone regeneration. Mechanistically, these degradation products elevate levels of sensory calcitonin gene-related peptide (CGRP) while suppressing adrenergic signalling components in newly formed bones. Notably, H_2 and Mg^{2+} - but not alkaline pH - stimulate CGRP synthesis and inhibit adrenergic receptor activity. These findings reveal, for the first time, that Mg^{2+}, H_2, and the alkaline microenvironment generated by Mg-IMNs synergistically enhance bone regeneration through distinct yet complementary mechanisms mediated by skeletal interoceptive regulation. This work advances understanding of the biological roles of Mg-IMNs in fracture repair and may facilitate their applications in bone fractures with other bone metabolic pathologies.

可生物降解鎂（Mg）植入物通常用於暫時性骨折固定和骨再生。然而，鎂降解產物—鎂離子（Mg^{2+}）、氫氣（H_2）和氫氧根離子（OH^-）—增強骨折癒合的具體機制仍未完全了解。在此研究，秦嶺教授及其研究團隊監測了鎂髓內釘（Mg-IMN）的體內降解情況，顯示這些降解產物在早期癒合階段積聚在骨折部位附近。整體 RNA 測序（bulk RNA-seq）顯示，H_2 和鹼性微環境促進骨膜細胞增殖，而 Mg^{2+} 主要增強體外股骨模型中的細胞外基質形成和細胞黏附。進一步的體內實驗表明，H_2、Mg^{2+} 和鹼性 pH 各自在 Mg-IMN 促骨再生的貢獻佔比相當。機制上，這些降解產物會提高感覺降鈣素基因相關勝肽（CGRP）的水平，同時抑制新形成骨骼中的腎上腺素訊號成分。值得注意的是，H_2 和 Mg^{2+}（而非鹼性 pH）會刺激 CGRP 合成並抑制腎上腺素受體活性。上述結果首次揭示，Mg^{2+}、H_2 和 Mg-IMN 產生的鹼性微環境透過骨骼內感受調節介導的獨特但互補的機制協同增強骨再生。這項工作加深了對 Mg-IMN 在骨折修復中的生物學作用的理解，並可能為其在治療其他骨骼相關病理中的應用提供理論依據。

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Article

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INSIHGT: an accessible multi-scale, multi-modal 3D spatial biology platform

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Check for updates

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Author(s): Yun Kwok Wing, Hei Ming Lai, Bei Huang et al.

Journal: *Nature Communications*, December 2024

INSIHGT: Making 3D Tissue Imaging Accessible to Every Lab

The research team led by Professor Yun Kwok Wing and Professor Hei Ming Lai has developed INSIHGT, a breakthrough method that solves a long-standing challenge in biological tissue imaging: the limited penetration of antibodies and molecular probes into thick tissue samples.

This practical, down-to-earth approach enables researchers to visualise proteins, RNA, and other important biomolecules throughout entire tissue volumes - up to centimeter scales - with remarkable clarity and consistency. Using simple, affordable chemicals and standard laboratory equipment, INSIHGT allows complete visualisation of complex 3D structures that would be impossible to appreciate in traditional thin tissue sections.

What sets INSIHGT apart is its accessibility and compatibility with existing workflows. The method requires no specialised equipment, uses off-the-shelf reagents, and tissues can later be processed for conventional histology or genetic analysis. This pragmatic design focus makes INSIHGT immediately applicable in both research and clinical settings.

They have rigorously validated INSIHGT across multiple tissue types and hundreds of antibodies, demonstrating its reliability and versatility. Their standardised protocol is now being adopted globally and commercialised (as OmniStain kit by Illumos Ltd), potentially transforming how they study tissues in health and disease by providing comprehensive 3D molecular information while maintaining the quality and rigor essential for clinical applications.

INSIHGT: 使三維組織成像技術普及至每個實驗室

由榮潤國教授及黎曦明教授帶領的團隊開發了INSIHGT，這是一項突破性的方法，解決了生物組織成像長期面臨的挑戰：抗體和分子探針在厚組織樣本中的滲透受限問題。

這種實用、務實的方法使研究人員能夠以非凡的清晰度和一致性，在整個組織體積中（可達厘米級別）可視化蛋白質、RNA 和其他重要的生物分子。INSIHGT 僅使用簡單、經濟的化學品和標準實驗室設備，就能完整地顯示複雜的三維結構，這在傳統的薄組織切片中是不可能實現的。

INSIHGT 的獨特之處在於其易用性及與現有工作流程的兼容性。該方法不需要專門設備，使用現成的試劑，處理過的組織還可以進行常規組織學或基因分析。這種注重實用性的設計使 INSIHGT 在研究和臨床環境中都能立即應用。

他們已在多種組織類型和數百種抗體上嚴格驗證了 INSIHGT，證明了其可靠性和多功能性。他們的標準化方案現已在全球範圍內被採用並商業化（作為 Illumos Ltd 的 OmniStain 試劑盒），有望徹底改變他們研究健康和疾病中的組織的方式，通過提供全面的三維分子信息，同時保持臨床應用所必需的質量和嚴謹性。

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Article

Targeted Protein O-GlcNAcylation Using Bifunctional Small Molecules

Bowen Ma,[⊥] Khadija Shahed Khan,[⊥] Tongyang Xu, Josefina Xeque Amada, Zhihao Guo, Yunpeng Huang, Yu Yan, Henry Lam, Alfred Sze-Lok Cheng, and Billy Wai-Lung Ng*

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Author(s): Billy Ng et al.

Journal: *Journal of the American Chemical Society,* April 2024

Chemically induced proximity (CIP) is an emerging strategy in chemical biology, using small molecules to precisely control protein interactions and functions. The team led by Professor Billy Ng has developed a novel class of CIP molecules — O-GlcNAcylation Targeting Chimeras (OGTACs) — to precisely regulate O-GlcNAcylation, a type of protein glycosylation, in living cells.

Protein glycosylation involves attaching sugars to proteins, essential for normal cellular function. O-GlcNAcylation, specifically catalysed by the enzyme O-GlcNAc transferase (OGT), impacts thousands of proteins and influences numerous biological processes. Dysregulated O-GlcNAcylation is linked to diseases such as cancer and neurodegenerative disorders. However, existing methods lack specificity, limiting the ability to study individual protein modifications in detail.

OGTAC technology overcomes this limitation by selectively directing OGT to specific proteins, enhancing their O-GlcNAcylation. This precise approach enables unprecedented insights into how glycosylation affects protein functions and disease mechanisms. For instance, selectively enhancing Tau protein O-GlcNAcylation in Alzheimer's models effectively prevents pathological protein aggregation and neuronal damage, providing a promising new avenue for therapeutic intervention.

化學誘導鄰近（CIP）是一種新興的化學生物學策略，透過小分子精準調控蛋白質間的相互作用及功能。由吳瀰龍教授帶領的團隊開發出新型 CIP 分子 — O-GlcNAc 糖基化靶向嵌合體（OGTACs），在活細胞內精準調控一種重要的蛋白質糖基化修飾 — O-GlcNAc 糖基化。

蛋白質糖基化是將糖分子附著於蛋白質上，對維持正常細胞功能至關重要。其中，由單一酵素 O-GlcNAc 轉移酶（OGT）催化的 O-GlcNAc 糖基化影響著數以千計的蛋白質，調控多種生物過程。O-GlcNAc 糖基化的異常與癌症及神經退行性疾病等疾病相關。然而，現有方法缺乏對單一蛋白進行精準調控的能力，限制了對此糖基化修飾功能的深入研究。

OGTAC 技術透過將 OGT 選擇性地引導至特定蛋白，精準促進其 O-GlcNAc 糖基化，使科學家能以前所未有的精確度探索糖基化對蛋白質功能與疾病機制的影響。例如，在阿茲海默症模型中，選擇性增強 Tau 蛋白的 O-GlcNAc 糖基化可有效抑制病理性的蛋白聚集，防止神經元損傷，為治療神經退行性疾病開拓了嶄新的方向。



Grants
補助金及其他資助

Our Principal Investigators and their teams affiliated with the Institute have received grants of over **HK$1,716 million** during this reporting period. In particular, grants under the General Research Fund (GRF) scheme of the Research Grants Council (RGC) of **HK$70 million** are listed below:

此外，在本報告年度期間，研究所各項目負責人及其小組成員所取得的補助金及其他資助合計逾**港幣十七億一千八百萬**，其中研究資助局的優配研究金共逾**港幣七千萬**，獲資助研究項目的詳情如下：

Project Title 研究題目	Principal Investigators / Research Team 研究所首席研究員 / 小組	Amount (HK$)
Research Grants Council – General Research Fund (01/01/2024 – 31/12/2026) Identifying Novel Cell Subpopulation and Therapeutic Target for Adolescent Idiopathic Scoliosis through Combined Single-nucleus and Spatial Transcriptomics	**Nelson Tang**	1,500,000
Research Grants Council – General Research Fund (01/01/2023 – 31/12/2025) Development of a Single-Cell Full-Length Mitochondrial Genome Sequencing Platform Based on Droplet Microfluidics		970,181

Project Title 研究題目	Principal Investigators / Research Team 研究所首席 研究員 / 小組	Amount (HK$)
Research Grants Council – General Research Fund (01/01/2022 – 31/12/2024) Magnetic Resonance Imaging Screening for Nasopharyngeal Carcinoma: Artificial Intelligence for Automatic Detection	**Jacky Lam**	1,125,732
Research Grants Council – General Research Fund (01/01/2022 – 31/12/2024) RNA Demethylase AlkB Homolog 5 (ALKBH5) Drives Immune Suppression in Colorectal Cancer via Epitranscriptome Regulation of AXIN2-WNT-DKK1 Axis	**Jun Yu**	1,325,732
Research Grants Council – General Research Fund (01/01/2024 – 31/12/2026) RNA N6-Methyladenosine Demethylase AlkB Homolog 5 (ALKBH5) Promotes Stemness and Chemoresistance in Colorectal Cancer: Mechanisms and Novel Therapeutic Approaches		1,580,000
Research Grants Council – General Research Fund (01/01/2022 – 31/12/2024) SLC25A22 Drives Immune Suppression in KRAS-mutant Colorectal Cancer through Metabolic Regulation of CXCL1/CXCR2 Axis		1,155,532
Research Grants Council – General Research Fund (01/01/2023 – 31/12/2025) Dissecting the Role of RNA N6-methyladenosine Modification in Mutant KRAS-driven Colorectal Cancer: Molecular Mechanisms and Targeted Therapy		1,158,188
Research Grants Council – General Research Fund (01/10/2022 – 30/09/2025) Role of Intestine TM6SF2 in Protecting Non-alcoholic Fatty Liver Disease through the Maintenance of Gut Barrier Function		1,120,716
Research Grants Council – General Research Fund (01/10/2023 – 30/09/2026) Elucidating the Role and Mechanism of TM6SF2 in Suppressing Fatty Liver Disease-associated Liver Cancer through Regulating Anti-tumor Immunity		1,462,000

Project Title 研究題目	Principal Investigators / Research Team 研究所首席 研究員 / 小組	Amount (HK$)
Research Grants Council – General Research Fund (29/06/2024 – 28/06/2027) A Double Blinded Randomized Controlled Trial of a Novel Oral Synbiotic Formula in Reducing Adenoma Recurrence and Colorectal Neoplasia-related Bacterial Gene Markers	**Louis Lau** **Siew Ng**	1,400,000
Research Grants Council – General Research Fund (01/01/2024 – 31/12/2025) Monitoring Changes in Liver Fat During a Lifestyle Modification Programme by The Novel Continuous Controlled Attenuation Parameter	**Jimmy Lai**	1,400,000
Research Grants Council – General Research Fund (01/06/2023 – 31/05/2026) Sodium-glucose Co-transporter-2 Inhibitor (Sglt2i) to Prevent of Liver Complications in Patients with Chronic Hepatitis B and Diabetes Mellitus: A Double-blind, Randomised, Placebo-controlled Trial (Sglt2i-Hbv Study)	**Jimmy Lai** **Terry Yip**	1,475,271
Research Grants Council – General Research Fund (01/01/2024 – 31/12/2026) Function and Mechanism of Bacterium Fx in Suppressing Colorectal Tumorigenesis via Inhibiting Fusobacterium Nucleatum	**Siew Ng** **Jessie Liang**	1,400,000
Research Grants Council – General Research Fund (01/01/2024 – 31/12/2026) The Impact of Prenatal Exposure to Tobacco Smoke on Epigenetic Modifications, Gut Microbiome Assembly and Metabolic Consequences in Offspring	**Siew Ng**	1,384,000
Research Grants Council – General Research Fund (01/01/2023 – 31/12/2025) Characterization on the Role of Proteus Mirabilis-derived Cadaverine in Regulation of Proinflammatory Phenotype and Immune Response in Crohn's Disease		1,151,224
Research Grants Council – General Research Fund (01/07/2024 – 30/06/2027) Enhancing Psychological Wellbeing and the Patient-caregiver Relationship Through Dyadic Mindfulness: A Randomized Controlled Trial in People with Parkinson's Disease and Their Caregivers	**Hein Min Tun**	927,800
Research Grants Council – General Research Fund (01/01/2024 – 31/12/2026) The Impact of Prenatal Exposure to Tobacco Smoke on Epigenetic, Modifications, Gut Microbiome Assembly and Metabolic Consequences in Offspring		1,384,000
Research Grants Council – General Research Fund (01/01/2023 – 31/12/2025) Evolution and Determinants of Population Mental Health during the Myanmar Conflict: A Nationwide Longitudinal Study from 2021 to 2025		882,925

Project Title 研究題目	Principal Investigators / Research Team 研究所首席研究員 / 小組	Amount (HK$)
Research Grants Council – General Research Fund (01/01/2024 – 31/12/2026) Augmenting the cGAS-STING Pathway for Eliminating Helicobacter Pylori Infection	**Lin Zhang**	1,577,000
Research Grants Council – General Research Fund (01/01/2022 – 31/12/2024) The Global En Bloc Resection of Bladder Tumour Registry	**Jeremy Teoh**	1,136,432
Research Grants Council – General Research Fund (01/01/2022 – 31/12/2024) A Randomized Controlled Trial Comparing Magnetic Resonance Imaging (MRI)- Targeted Biopsy and Extended Transperineal Systematic Biopsy for Detection of Clinically Significant Prostate Cancer		1,162,247
Research Grants Council – General Research Fund (01/01/2022 – 31/12/2024) Virtual/Augmented Reality Based Planning and Intraoperative Guidance for Precise Laparoscopic Cystectomy via Advanced Human-in-the-loop Image Segmentation, Visualization, and Registration Techniques		838,393
Research Grants Council – General Research Fund (01/01/2023 – 31/12/2025) LETM-domain Containing Protein 1 as a New Player in Adipose Thermogenesis	**Xiaoqiang Yao**	1,178,251
Research Grants Council – General Research Fund (01/01/2022 – 31/12/2024) Metformin as a Neuroprotective Therapy for Glaucoma - A Randomized Controlled Trial	**Juliana Chan** **Ronald Ma**	1,160,564
Research Grants Council – General Research Fund (01/01/2024 – 31/08/2025) Impact of Diabetes-related Complications on Long-term Temporal Hospital Costs and Quality of Life In Patients with Young-onset Diabetes in Hong Kong: A 12-year Study		573,333
Research Grants Council – General Research Fund (01/01/2023 – 31/12/2025) Mechanisms of Cognitive Aging Repair via Targeting GLP-1 Signaling	**Owen Ko** **Bonaventure Ip**	1,155,631
Research Grants Council – General Research Fund (01/01/2024 – 31/12/2026) Changing Experiences of Chinese Older Couples Living with Mild Cognitive Impairment in Hong Kong: A Longitudinal Dyadic Mixed-methods Investigation	**Vincent Mok**	1,273,900
Research Grants Council – General Research Fund (01/01/2023 – 31/12/2025) Transcranial Direct Current Stimulation in Post-stroke Fatigue: A Double-blind Randomised Control Trial	**Vincent Mok** **Thomas Leung**	1,090,616

Project Title 研究題目	Principal Investigators / Research Team 研究所首席 研究員 / 小組	Amount (HK$)
Research Grants Council – General Research Fund (01/11/2021 – 31/10/2024) Progression of Prodromal Markers of α-Synucleinopathy Neurodegeneration in the First-degree Relatives of Patients with REM Sleep Behavior Disorder: A 7-Year Prospective Study	**Vincent Mok**	1,154,476
Research Grants Council – General Research Fund (01/01/2023 – 31/12/2025) Design of Elastomer-based Soft Actuator and Flexible Electronic Polymers Sensor for Rehabilitation of Hand Function after Stroke	**Thomas Leung** **Zheng Li**	844,415
Research Grants Council – General Research Fund (01/01/2024 – 31/12/2026) The Hemodynamic Mechanisms of Cortical Microinfarcts in Intracranial Arterial Stenosis: A Multimodal MRI And Computational Fluid Dynamics Study	**Thomas Leung** **Bonaventure Ip**	1,400,000
Research Grants Council – General Research Fund (01/01/2023 – 30/06/2025) Family-based Association Study in Idiopathic Rapid Eye Movement Sleep Behavior Disorder: A Two-phase Study Using Whole Exome Sequencing	**Yun Kwok Wing**	1,327,746
Research Grants Council – General Research Fund (01/01/2022 – 31/12/2024) A Randomized Placebo-controlled Trial for Adjunctive Bright Light Therapy in Patients with Bipolar Depression and Eveningness		887,716
Research Grants Council – General Research Fund (01/01/2022 – 31/12/2024) Prevention of Insomnia in At-risk Youth: A Randomized Controlled Trial Comparing Cognitive Behavioral Prevention Program for Insomnia with Active Control Condition		1,005,012
Research Grants Council – General Research Fund (01/06/2024 – 30/06/2026) Efficacy of Digital Cognitive Behavioral Therapy for Insomnia (CBT-I) with Artificial Intelligence Chatbot for Youth with Insomnia: An Assessor-blind, Randomized Controlled Trial		1,148,000
Research Grants Council – General Research Fund (01/09/2021 – 29/02/2024) Epithelium Caveolin and Its Calcium Signaling Pathway in Endometrium of Recurrent Miscarriage	**Ronald Wang**	775,732
Research Grants Council – General Research Fund (01/01/2022 – 31/12/2024) Delineating the Role of Retrotransposons in Placenta Development and Disease		1,277,532
Research Grants Council – General Research Fund (01/01/2022 – 31/12/2024) Studying the Functional Mechanism of YY1 in the Regulation of Glucose Metabolism in Pancreatic Beta Cells through O-GlcNAcylation		1,325,732

Project Title 研究題目	Principal Investigators / Research Team 研究所首席研究員 / 小組	Amount (HK$)
Research Grants Council – General Research Fund (01/01/2022 – 31/12/2024) Studying the Functional Mechanism of YY1 in the Regulation of Glucose Metabolism in Pancreatic Beta Cells through O-GlcNAcylation	**Kathy Lui**	1,325,732
Research Grants Council – General Research Fund (01/01/2024 – 31/12/2026) Identifying Novel Cell Subpopulation and Therapeutic Target for Adolescent Idiopathic Scoliosis through Combined Single-nucleus and Spatial Transcriptomics	**Wayne Lee**	1,500,000
Research Grants Council – General Research Fund (01/01/2022 – 31/12/2024) Enhancing the Therapeutic Effect of Bracing for Adolescent Idiopathic Scoliosis with a Hybrid Bracing Protocol: A Randomized Controlled Trial		977,708
Research Grants Council – General Research Fund (01/01/2022 – 31/12/2024) Magnesium Activated Progenitor Cells in Synovial Fluid to Regenerate Articular Cartilage	**Ling Qin**	1,174,492
Research Grants Council – General Research Fund (01/01/2022 – 31/12/2024) Identification of a Central to Sympathetic Neural Circuit in Magnesium-promote Bone Regeneration using Retrograde Tracing and Single-cell RNA-seq		1,126,379
Research Grants Council – General Research Fund (01/01/2023 – 31/12/2025) Design and Synthesis of Novel Carbocyclic Nucleoside Analogues as Antiviral Agents	**Billy Ng**	464,000
Research Grants Council – General Research Fund (01/01/2024 – 31/12/2026) RANKL Inhibition to Combat Sarcopenia in Hip Fracture Patients: A Pragmatic, Randomized Double-blind, Active-controlled Trial	**Louis Cheung**	1,531,620
Research Grants Council – General Research Fund (01/01/2023 – 30/06/2025) Neuromuscular Junction Ageing: Retardation of Its Degeneration in Sarcopenia by Vibration Treatment		1,160,548

Project Title 研究題目	Principal Investigators / Research Team 研究所首席 研究員 / 小組	Amount (HK$)
Research Grants Council – General Research Fund (01/08/2023 – 31/07/2026) Dissecting Breast Cancer Subtype-Dependent Aging Acceleration and Developing Molecular and Histology Image-based Aging Clocks for the Prediction of High-risk Young-onset Patients	**Xin Wang**	1,572,903
Research Grants Council – General Research Fund (01/08/2022 – 31/07/2025) Histology-omics Integrative Subtyping of Esophageal Squamous Cell Carcinoma Based on Multi-scale Geospatial Characterizations of the Tumor Microenvironment		964,828
Research Grants Council – General Research Fund (01/01/2022 – 31/12/2024) Overcoming the Intratumor Heterogeneity by Multi-scale Spatial Characterizations of Tumor Microenvironment for Integrative Colorectal Cancer Classification		723,092
Research Grants Council – General Research Fund (01/01/2021 – 30/06/2024) 3D Genome Rewiring during Muscle Stem Cell Linage Development and Aging	**Huating Wang**	1,194,637
Research Grants Council – General Research Fund (01/01/2023 – 31/12/2025) Elucidating the Novel Regulatory Function of RNA Binding Proteins in 3D Genome Organization		1,425,114
Research Grants Council – General Research Fund (01/08/2023 – 31/07/2026) In Vivo RNA Structure Probing Unveils DHX36 Binding-structure Interplay in Regulation of mRNA Abundance	**Huating Wang** **Xiaona Chen**	1,600,000
Research Grants Council – General Research Fund (01/01/2023 – 31/12/2025) Sex Differences in the Gut Colonization of Carnobacterium Maltaromaticum for Suppressing Colorectal Tumorigenesis	**William Wu**	1,180,120
Research Grants Council – General Research Fund (01/01/2024 – 31/12/2026) Augmenting the cGAS-STING Pathway for Eliminating Helicobacter Pylori Infection via Autophagy		1,577,000
Research Grants Council – General Research Fund (01/01/2023 – 31/12/2025) Delineating the Sensorimotor Cortex-spinal Cord Descending Pain Pathway and its Interaction with Gut Microbiota		1,114,323

Project Title 研究題目	Principal Investigators / Research Team 研究所首席 研究員 / 小組	Amount (HK$)
Research Grants Council – General Research Fund (01/01/2023 – 31/12/2025) Elucidating the Role of RNA N1-methyladenosine Modifications in Colorectal Cancer	**William Wu Huarong Chen**	1,130,669
Research Grants Council – General Research Fund (01/01/2022 – 31/12/2024) Elucidating the Role and Mechanism of RNA N6-methyladenosine m6A Regulator METTL3 in Promoting Colorectal Cancer through Modulating Gut Microbiota		1,150,352
Research Grants Council – General Research Fund (01/01/2024 – 31/12/2026) Toward Real-time Capsule Pan-Endoscopy Screening with A Novel Hybrid Magnetic Actuation and Sensing System	**Zheng Li**	1,122,534
Research Grants Council – General Research Fund (01/01/2023 – 31/12/2025) Magnetic Anchored and Guided Endoscope with Surgeon Preference Embedded Autonomous View Control		965,158
Research Grants Council – General Research Fund (01/01/2024 – 31/12/2026) Development of Magnetic Heterogeneous Cell Spheroid Microrobots for Active Immunotherapy of Bile Duct Cancer	**Kai Fung Chan**	797,964
Total:		**70,875,202**

Scientific Exchange and Visitors 學術交流及訪客

During the reporting period, the Institute received a number of renowned academicians, experts and delegations from within and beyond the Territory. Some of them are highlighted as follows:

過去一年，研究所接待多位本港及海外著名學者、專家及訪問團，進行學術交流及參觀，詳列如下：

26 July 2024



Visit to the Institute and the State Key Laboratory of Translational Oncology by the Assessment Panel on Restructuring of the State Key Laboratories in Hong Kong.

香港國家重點實驗室重組評審小組參觀研究所及轉化腫瘤學國家重點實驗室。

14 October 2024

Seminar by Dr Laura Zahn, Editor-in-Chief of *Cell Genomics*, on "An Editor's Perspective on Scientific Publishing".

Laura Zahn 博士（*Cell Genomics* 期刊主編）舉行研討會，題目為「An Editor's Perspective on Scientific Publishing」。



13 November 2024



Visit to the Institute by Professor Irene Tracey, Vice-Chancellor of the University of Oxford.

英國牛津大學校長 Irene Tracey 教授參觀研究所。

13 November 2024

Seminar by Dr. Robert Kruger, Senior Executive Editor of *Cancer Discovery* and Editorial Director of the Publishing Division of the American Association of Cancer Research, on "Publishing with *Cancer Discovery* and the AACR Journals".

Robert Kruger 博士（*Cancer Discovery* 期刊高級執行編輯兼美國癌症研究協會出版部門編輯總監）舉行研討會，題目為「Publishing with *Cancer Discovery* and the AACR Journals」。



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01 Molecular Diagnostics 分子診斷學



Dennis Lo 盧煜明

Dennis Lo is internationally renowned as a pioneer, innovator, and leader in liquid biopsy and molecular diagnostics. He leads a research team that develops novel technologies for circulating nucleic acids analysis, and to investigate the mechanism of cell-free DNA fragmentation. This research translates into new biomarkers supporting a broad range of applications including pregnancy, cancer detection and transplantation monitoring. In recognition of his work, Dennis has been awarded numerous international accolades in 2024, including the LV Jiménez Díaz Commemorative Lecture Award 2024 and the "Scientific Achievement Award" from The 13th Most Achieved Chinese Award.

盧煜明作為液體活檢與分子診斷技術的先驅者、創新者及領袖享譽國際。其研究團隊致力於開發循環核酸分析新技術，並探究無細胞游離 DNA 片段化機制。此項研究衍生出多種新型生物標記物，廣泛應用於妊娠監測、癌症篩檢及器官移植療效評估等領域。為表彰其工作，盧煜明於 2024 年榮獲多項國際殊榮，包括希門尼斯 - 迪亞斯講座獎及第十三屆傑出華人榜（華獎）之科學成就獎。



Nelson Tang 鄧亮生

Nelson Tang is the Principal Investigator of the Laboratory for Genetics of Disease Susceptibility. The research team led by Nelson specialised in complex traits and genetic statistics. His research covers genetic association studies, expression quantitative traits and post-genome-wide association study (GWAS) analysis. A patent has been recently granted for gene expression analyses. He is also teaching a bioinformatics course in Faculty of Engineering.

The research team has a long-standing cooperation with international researchers. Nelson is also the Associate Director of the joint laboratory with the Kunming Institute of Zoology of the Chinese Academy of Sciences (CAS). Recently, the team explored the genetic mechanism of adolescent idiopathic scoliosis and ageing.

鄧亮生是疾病易感性遺傳學實驗室的首席研究員，由他領導的研究小組專門從事複雜性狀的遺傳學和統計分析。他的研究涵蓋遺傳關聯研究、表達數量性狀和後全基因組關聯分析 (GWAS)，並於最近獲得了一項用於基因表達分析的專利。鄧亮生另亦在工程學院教授生物信息學課程。

研究小組長期與國際研究人員合作，包括中國科學院昆明動物研究所，而鄧亮生是該聯合實驗室的副主任。最近，團隊發表了一個持續了 10 年的研究結果，使人開始了解青少年特發性脊柱側彎的遺傳機制。

Allen Chan and his research team have performed a large-scale prospective study for the screening of nasopharyngeal carcinoma (NPC) through the detection of plasma Epstein-Barr virus (EBV) DNA. The team also focused on developing innovative molecular diagnostic assays with broad applications in disease detection and monitoring, including the recently developed universal targeted digital PCR haplotype sequencing (dHapSeq). In 2024, Allen was endowed with the "Tony Mok Shu Kam Professorship in Medicine" in recognition of his outstanding achievements in medical innovation and translational research.

陳君賜及其研究團隊透過檢測血漿內 EB 病毒 (Epstein-Barr virus) DNA，完成一項鼻咽癌大規模前瞻性篩檢研究。除了這項領先研究外，該團隊亦積極推動創新分子診斷技術，其應用涵蓋各類疾病檢測與監控，包含近期研發之通用靶向數字 PCR 單倍型測序技術 (digital PCR haplotype sequencing, dHapSeq)。2024 年，陳君賜獲頒「莫樹錦教授醫學教授」這一殊榮，以表彰其在醫學創新和轉化研究上的卓越成就。



Allen Chan 陳君賜



Jacky Lam 林偉棋

Jacky Lam and his research team focus on the potential clinical application of cell-free DNA in cancer diagnostics. Using nasopharyngeal cancer (NPC) as a model, the team has investigated the differentiating molecular characteristics of plasma Epstein-Barr virus (EBV) DNA between NPC and non-NPC subjects. Such discoveries have been translated into the development of novel diagnostic assays for NPC screening and prognostication, with improved performance compared to conventional testing. In addition, Jacky serves as the Clinical Lead in The Chinese University of Hong Kong / Prince of Wales Hospital Partnering Centre under the Hong Kong Genome Project.

林偉棋及其研究團隊的研究集中於游離 DNA 在癌症檢測的臨床應用。以鼻咽癌作模型，研究隊伍分析血漿 EB 病毒 DNA 在癌症及非癌症患者的分子特徵，藉此開發用以鼻咽癌篩查及預後的嶄新檢測技術，較傳統方法的表現更佳。此外，他亦出任香港基因組計劃香港中文大學 / 威爾斯親王醫院夥伴中心之臨床領導。

02 Digestive Diseases, Gastroenterology and Hepatology

消化，腸胃及肝臟疾病研究

Gastrointestinal (GI) diseases, including GI tract cancers and metabolic dysfunction-associated steatotic liver disease (MASLD) are major diseases in Hong Kong and they cause significant morbidity and mortality. **Jun Yu** and the multidisciplinary team of scientists and clinicians at the Institute of Digestive Diseases specialise in GI basic research, focusing on: 1) understanding the role of gut microbiome dysbiosis in GI cancers and MASLD; 2) genetic, epigenetic and epitranscriptomic mechanisms in the pathogenesis of GI cancers and MASLD; as well as translational research including 3) identification of probiotic bacteria that prevents disease development, and 4) the discovery of molecular diagnostic markers and therapeutic targets of GI cancers and MASLD.

消化道疾病如消化道腫瘤和脂肪性肝病是香港常見病。**于君**及其團隊的基礎和轉化研究包括：1）研究腸道微生態與消化道腫瘤和脂肪性肝病的關係；2）闡明消化道腫瘤和脂肪性肝病的分子機制；3）益生菌防治消化道腫瘤和脂肪性肝病；及4）開發新的診斷標誌和治療靶標。



Jun Yu
于君



Louis Lau
柳浩城

Louis Lau and his research team work on the clinical application of big data analytics, artificial intelligence and novel technologies in the field of digestive diseases, including gastrointestinal bleeding, early cancer detection and minimally invasive treatment.

柳浩城及其研究團隊致力於透過大數據分析、人工智能和創新技術在消化系統疾病領域的臨床應用，包括消化道出血、癌症早期檢測和微創治療。

Jimmy Lai and his research team focus on advanced liver disease, such as cirrhosis. They utilise big data from the electronic healthcare database in Hong Kong to conduct retrospective cohort studies. They also recruit suitable patients to run prospective studies so that they can better understand the clinical course and outcomes of these patients using novel and non-invasive methods. They also aim to identify and develop novel biomarkers which may serve as a useful prediction and diagnostic tool for these patients in the future. With these efforts, they engage in local and international collaborations to enhance and validate the impact of their studies.

黎梓滔及其研究團隊重點研究肝硬化，利用大型臨床數據進行分析。同時，他們的前瞻性研究使用新穎的非侵入性方法來了解患者的臨床病程和結果。他們也致力識別生物標記以作為診斷工具。他們參與多方學術合作，以增強他們研究的影響。



Jimmy Lai
黎梓滔

03 Infectious Diseases, Public Health and Microbiota
傳染病，公共衛生及腸道微生物



Siew Ng
黃秀娟

Siew Ng and her team are pioneers in transforming microbiome research to address real-world health challenges. Their AI-driven metagenomic screening platform has led to innovative multi-microbial-target stool tests - Enterosight which detects early signs of inflammatory bowel disease, and MetaGenie, which facilitates the early diagnosis of autism spectrum disorders. These diagnostic tests will enable prompt diagnoses and interventions, potentially reducing healthcare costs. In 2024, MetaGenie received Breakthrough Device Designation by the U.S. Food and Drug Administration. This screening platform lays a strong foundation for microbiome-based diagnostics applicable to other diseases including cognitive impairment, mental diseases and cancer.

黃秀娟及其團隊是將微生物組研究轉化為應對現實健康挑戰的先驅。他們開發的人工智慧驅動宏基因組篩選平台，催生了創新的多靶向微生物糞便檢測工具：用於檢測炎症性腸病早期跡象的 Enterosight，和用於促進自閉症譜系障礙早期診斷的 MetaGenie。這些測試提供快速且準確的診斷，使患者能夠及時接受治療，長遠可望降低因延誤診斷和不必要入侵性檢查所帶來的醫療成本。2024 年，MetaGenie 獲得了美國食品和藥物管理局的突破性醫療器材認証。這個篩選平台為基於微生物組的診斷奠定了穩固基礎，未來有望擴展到其他疾病，包括認知障礙、心理疾病和癌症等。

In **Renee Chan**'s laboratory, they lead pioneering research to advance the understanding, diagnosis, and treatment of paediatric respiratory diseases and obstructive airway diseases across all ages. They study respiratory virus infections in children, highlighting virus diversity and co-infections, especially post-SARS-CoV-2. They have developed respiratory organoid models from individuals with obstructive respiratory diseases, including bronchopulmonary dysplasia (BPD), allergic asthma, and chronic obstructive pulmonary disease (COPD), and from different age groups. These models are valuable tools for studying disease mechanisms and antiviral drug screening. Collaborating with chemists and structural biologists, they have created an antiviral drug screening platform. Their collective efforts aim to significantly impact the prevention and treatment of respiratory diseases.

在**陳韻怡**及其團隊的實驗室，他們領導開創性的研究，以推動對兒童呼吸道疾病和各年齡段阻塞性氣道疾病的理解、診斷和治療。他們研究兒童的呼吸道病毒感染，特別是在SARS-CoV-2之後，揭示病毒的多樣性和共同感染。他們開發了來自患有支氣管肺發育不良（BPD）、過敏性哮喘和慢性阻塞性肺病（COPD）患者的呼吸道類器官模型，這些模型是研究疾病機制和抗病毒藥物篩選的寶貴工具。他們與化學家和結構生物學家合作，創建了一個抗病毒藥物篩選平台，旨在顯著影響呼吸道疾病的預防和治療。



Renee Chan 陳韻怡



Peter Cheung 張栢恒

Peter Cheung and his team's research focuses on understanding diseases at the molecular level using computational and structural biology approaches. Their work involves developing new methods to study how viruses like influenza and coronaviruses replicate and mutate. They also analyse clinical data to evaluate medical interventions. The team's ultimate goal is to gain insights that can help design better treatments and preventions. Through both basic science and applied research, they strive to advance human health and alleviate suffering from infectious diseases.

張栢恒及其團隊的研究專注於運用計算生物學和結構生物學方法，在分子層面上了解疾病。他們的工作涉及研發新方法研究流感病毒和新冠病毒如何複製和變異。他們還分析臨床數據來評估醫療干預措施。團隊的最終目標是獲得見解以助設計更好的治療和預防措施。他們通過基礎科學和應用研究，致力推進人類健康和緩解傳染病帶來的痛苦。

The research team led by **Hein Min Tun** uses conventional microbiology and molecular biology techniques, cutting-edge sequencing technologies, coupled with bioinformatics, statistical and epidemiological approaches to study: 1) the composition, function, and dynamics of human and animal microbiomes in health and disease; and 2) monitoring antimicrobial resistance (AMR) bacteria and resistome in humans, animals, and the environment using a holistic One Health approach. Their goal is to contribute to improving scientific understanding of the impact of microbiome and AMR in public health.

由**黃世萬**領導的研究團隊運用傳統的微生物學和分子生物學技術，結合尖端的測序技術以及生物信息學、統計學和流行病學方法，開展以下的研究：1）人類和動物微生物群在健康和疾病中的組成、功能和動態；及 2）利用「One Health」方法，監測在人類、動物和環境中抗菌藥物耐藥性（AMR）細菌和耐藥基因組。團隊的目標是增強對微生物群和抗藥性的認識，理解公共衛生對科學的影響作出貢獻。



Hein Min Tun 黃世萬



Chris Mok 莫家斌

The major objective of **Chris Mok** and his research team is to understand the interplay between the host adaptive immunity and viral determinants of respiratory viruses, such as influenza viruses and coronaviruses, using a combination of clinical, virological, immunological and structural approaches. They are particularly interested to understand how adaptive immunity is regulated and sharpened by the evolution of respiratory viruses. Their work provides the scientific foundation to further improve current vaccines.

莫家斌及其研究團隊以結合臨床、病毒學、免疫學以及結構生物學方法，研究宿主適應性免疫與呼吸道病毒，如流感病毒和冠狀病毒之間的相互作用。他們著重研究呼吸道病毒的進化是如何調節與增強宿主的適應性免疫，將有助於進一步優化當前的疫苗。



Ken Chan
陳嘉鵬

Ken Chan and his team's research focus on three key areas. First, they are developing advanced diagnostic methods using modern molecular techniques to quickly and accurately identify bacterial and tuberculosis infections in the pleural space. This can reduce the need for invasive procedures. Second, they are analysing healthcare data to understand the impact of respiratory viral infections, like influenza, RSV and COVID-19, on chronic respiratory diseases. This data will guide government vaccination strategies. Third, they are also evaluating the long COVID symptoms for COVID survivors.

陳嘉鵬及其團隊的研究有三個重點方向。首先，他們開發嶄新的分子技術診斷方法，能夠快速準確地識別胸腔中的細菌和結核感染，以減少侵入性檢查的需要。其次，他們透過分析醫療數據，從而了解呼吸道病毒感染對慢性呼吸道疾病的影響，這些數據將指導政府的疫苗接種策略。最後，團隊跟進並評估新冠肺炎倖存者的新冠肺炎長期症狀。



Lin Zhang
張琳

Lin Zhang and her research team focus on host-microbe interactions, early life microbiome and infection biology. Lin has a solid track record in the study of crosstalk between microbes and the host, including antimicrobial peptides and autophagy. She is actively engaging in microbiome basic and translational microbiome research, dedicating herself to developing novel therapeutic approaches to restore the dysbiotic microbiota to prevent diseases in early life.

張琳和她的研究團隊專注於宿主 - 微生物相互作用，早期生命微生物組和感染生物學。她在微生物與宿主之間的互相研究方面有着紮實的基礎，包括抗菌肽和自噬。她積極從事生命早期微生物組基礎和轉化研究，旨在開發新的治療方法來恢復腸道菌群，以預防疾病。



Mingyuan Li
李明圓

Mingyuan Li and her team's research focus on the high throughput screening and identification of antiviral host targets replying on the platform for proteome and interactome. Her research also explores the mechanisms underlying viral manipulation of host cell biology and biochemical underpinnings of host-pathogens interactions. The overarching goal of the team is to develop innovative viral-host interference as antiviral strategies through rigorous cell biology and pre-clinical studies which lay the groundwork for the subsequent therapeutic applications.

李明圓及其團隊研究依靠蛋白質組學和蛋白互作組學平台，專注於高通量篩選和鑒定以宿主為靶向的抗病毒靶標。團隊研究同樣致力於探索及深入瞭解病毒感染後與宿主發生相互作用和對宿主細胞的生物學特性和功能的調控及作用機制。團隊的整體目標是通過嚴謹的生物學和臨床前的研究，開發新型的干擾病毒宿主互作為抗病毒策略，為後續的治療應用奠定厚實的理論基礎。



Likai Tan
譚力凱

Likai Tan and his research team are dedicated to investigating the immunological mechanisms underlying diseases such as sepsis, chronic obstructive pulmonary disease (COPD), and pneumonia. They excel at using systems immunology approaches, including single-cell multi-omics and high-parameter spectral flow cytometry, to understand complex immune networks, particularly the responses of T cells and monocytes.

譚力凱及其研究團隊致力於研究敗血症、慢性阻塞性肺病和肺炎等疾病背後的免疫學機制。他們擅長運用系統免疫學方法，包括單細胞多組學和高參數光譜流式細胞術，以了解複雜的免疫網絡，尤其是 T 細胞和單核細胞的反應。

Jake Chung is an exposure biologist with a PhD in Environmental Health Sciences from the University of California, Berkeley. His central research goal is to develop and apply measurement and computational methods to identify the elusive environmental drivers of diseases and decipher their intricate connections within the exposure-disease continuum. Recently, his group has been focusing on developing chemical biology methods to study the functional exposome and applying machine learning and ExWAS approaches to discover novel insights about mixture exposures in large health survey and healthcare datasets.

鍾明基是一位研究暴露體領域的生物學家，擁有加州大學伯克利分校的環境健康科學博士學位。他的核心研究目標是開發和應用測量及計算方法，以識別難以捉摸的疾病環境驅動因素，並解讀這些因素在暴露體引起的疾病中的複雜聯繫。最近，他的研究功能暴露體小組集中於開發化學生物學方法以研究功能暴露組，並應用機器學習和暴露組廣關聯研究（ExWAS）方法，在大型健康調查和醫療保健數據集中發現關於混合暴露的新見解。



Jake Chung
鍾明基

04 Cancers 癌症研究



Jessie Liang
梁巧儀

Gut microbiota dysbiosis has been associated with colorectal tumorigenesis. One of the research objectives of **Jessie Liang** and her team is to develop microbiome-based tests for the non-invasive diagnosis of colorectal cancer and adenoma. The diagnostic performance of the newly identified microbial markers will be further validated through targeted quantification using qPCR. Additionally, they are actively developing strategies to modulate the gut microbiota to mitigate cancer risk. Furthermore, they are engaged in functional and mechanistic investigations of bacteria that interest them. They also explore the roles and functional mechanisms of cancer-related genes in gastrointestinal cancers, including HERV-related genes and NT5E, among others.

腸道菌群失調與結直腸腫瘤發生有關。**梁巧儀**及其團隊的研究重點之一是開發一種基於微生物組的測試，用於結直腸癌和腺瘤的無創診斷。已識別的新微生物標記物的診斷性能將通過使用 qPCR 的靶向定量進一步驗證。此外，他們也致力於開發靶向調節腸道菌群以降低患癌風險。對於他們特別感興趣的菌株，也會進行進一步的功能和機制研究。此外，他們還研究了一些癌症相關基因在胃腸道癌症中的作用和功能機制，例如一些 HERV 相關的基因和 NT5E 等。

Andreas Möller and his research team focus on understanding the behaviour and interactions of cancer cells within the body. One of the key objectives is to uncover the mechanisms behind how cancer cells evade immune responses. Doing so will provide a greater understanding of cancer progression. One of the cancer-promoting components is called 'Extracellular Vesicles', which are found in the bloodstream. Investigating the role of Extracellular Vesicles will not only provide information on cancer growth, but will also aid cancer detection due to their potential to act as cancer biomarkers.

Andreas Möller 及其團隊專注於瞭解癌細胞在體內的活動及其相互作用。其中一個主要目標是揭示癌細胞如何逃避免疫反應的機制。這個研究方向會令他們對癌症進展有更深入的瞭解。其中一種促進癌症發展的成分是存在於血液內的「細胞外囊泡」。研究細胞外囊泡的作用不僅會提供有關癌症生長的資訊，而且由於細胞外囊泡有潛力成為癌症生物標誌物，所以亦有助於檢測癌症。



Andreas Möller



Chester Lai 賴宇軒

Skin cancers, including melanoma and cutaneous squamous cell cancer (cSCC), can be aggressive and fatal. Treatment with immunotherapy drugs can boost the body's immune system to attack skin cancer. However, current immunotherapies are not effective in most patients with skin cancer or with other types of cancer. **Chester Lai**'s research uses tissue samples from patients' skin cancers to investigate why the immune cells in these tumours do not effectively destroy the cancer, and to test the effectiveness of novel immunotherapies, enabling to find ways of improving treatment for skin cancer in future years by boosting immune responses in cancer.

皮膚癌，包括黑色素瘤和皮膚鱗狀細胞癌（cSCC），均具有侵略性並且致命。使用免疫治療藥物可以增強身體的免疫力，用免疫系統來對抗皮膚癌。然而，目前的免疫療法對大多數皮膚癌患者或其他類型癌症患者並不見效。**賴宇軒**的研究會利用皮膚癌患者的組織樣本，研究為何這些腫瘤中的免疫細胞無法有效地摧毀癌細胞，並測試新型免疫療法的有效性，從而能夠透過增強癌症中的免疫反應找到改善未來幾年皮膚癌治療的方法。

The team led by **Jeremy Teoh** is dedicated to advancing the understanding and treatment of urological cancers, with a particular focus on bladder cancer. The team combines insights from both clinical research, which involves working directly with patients, and laboratory research, where they study cells, tissues, and molecular processes in detail. Their primary focus is on elucidating the urinary biomarkers that could help in early detection and diagnosis, exploring tumour heterogeneity, and developing a novel molecular classification of bladder cancer. The findings from their studies have the potential to transform personalised medicine approaches, ultimately improving outcomes for bladder cancer patients.

張源津及其研究團隊致力加強大眾對泌尿系統腫瘤的了解和改善其治療效果。透過綜合研究探索早期發現和診斷膀胱癌的尿液生物標記、探索腫瘤異質性以及開發膀胱癌的分子分型。他們的研究有助實現個體化醫療，從而改善患者的預後。



Jeremy Teoh
張源津

05 Cardiovascular Medicine
心血管疾病研究



Xiaoqiang Yao and his research team have been working on Ca^{2+}-permeable ion channels in the cardiovascular system and cancer. Recently, they have uncovered a novel function of Orai1 channels in vascular endothelial cells with its related function in vascular contraction and blood pressure control. They also found important roles of Orai1 and Orai3 channels in breast cancer and ovarian cancer. They have been in the process of developing and/or repurposing Orai1-related drugs for cancer therapy.

姚曉強和其團隊一直致力於心血管系統及癌症中的鈣離子通道的研究。他們的近期研究發現了血管內皮細胞中 Orai1 離子通道在血管收縮和血壓控制中的重要功能。他們也發現了 Orai1 和 Orai3 通道在乳腺癌和卵巢癌中的重要角色。Orai1 有關的藥物在臨床上已用於免疫性疾病的治療。他們現正探索老藥新用，把其開發成治療癌症的新藥物。

Xiaoqiang Yao 姚曉強



Alex Lee 李沛威

In 2024, **Alex Lee**'s team achieved significant milestones in cardiac research: (1) Secured HK$8,084,068 in competitive funding from government and international institutions (including WUN, TEA-NET, CRF, and AEG as PI/Co-PI) to launch multiple AI-based cardiac imaging studies; (2) published over 12 high-impact papers in leading cardiac journals, advancing innovation in the field; (3) established a large-scale echocardiography database, laying the foundation for pioneering AI applications in cardiac research, and; (4) received prestigious awards, including the Hong Kong Heart Foundation Lectureship (Hong Kong College of Cardiology) and the Homobone B. Calleja Memorial Lectureship (Philippines Heart Association).

2024 年，**李沛威**的團隊在心臟研究領域取得重大突破：(1) 獲競爭性科研資助港元 8,084,068，資金來自政府及國際機構（包括以首席 / 共同首席研究員身份參與的 WUN、TEA-NET、CRF 及 AEG 項目），推動多項基於 AI 的心臟影像研究；(2) 在頂尖心臟期刊發表 12 篇高影響力論文，大幅推進領域創新；(3) 建立大規模超聲心動圖數據庫，為 AI 技術引領的心臟研究奠定基礎；(4) 榮膺多項權威獎項，包括香港心臟基金會講座獎（香港心臟病學院頒發）及 Homobone B. Calleja 紀念講座獎（菲律賓心臟協會授予）。

06 Diabetes and Obesity
糖尿病與肥胖症研究

Led by 12 principal investigators including endocrinologists, clinical pharmacologists, clinician and data scientists, **Juliana Chan** and her research team have assembled a 60-member team of knowledge workers with expertise in clinical, basic, data and experimental science, they use human data and apply a multi-method approach to redefine the causes, track trajectories, discover new mechanisms and evaluate the effects of interventions on diabetes-related outcomes. In 2024, the team was awarded an Area of Excellence (AoE) Scheme and two donations from the Hong Kong Jockey Club Charities Trust in pursuit of precision diabetes prevention and care of young-onset diabetes. Supported by more than 30 ongoing competitive/ earmarked grants and 12 post-doctoral/research fellowships, they are supervising 15 Master/PhD students, while 3 PhD students graduated in 2024 with several of their investigators receiving local and international awards recognitions.



Juliana Chan
陳重娥

在 12 位首席研究員（包括內分泌學家、臨床藥理學家、臨床醫生和數據科學家）的領導下，**陳重娥**及其研究團隊建了一支 60 人的知識工作者團隊，擁有臨床、基礎、數據和實驗科學方面的專業知識，他們使用人類數據並應用多種方法重新定義病因、追蹤病程軌跡、發現新機制並評估干預措施對糖尿病相關結果的影響。在 2024 年，團隊們獲得卓越學科領域計劃（AoE）及香港賽馬會慈善信託基金的兩筆捐款，以研究早發性糖尿病的精準預防和治理。在 30 多項持續性的競爭性 / 指定用途補助金和 12 項博士後 / 研究獎學金的支持下，他們正在指導 15 名碩士 / 博士研究生，並在 2024 年有 3 名博士生畢業，其中多位研究員獲得了本地或國際獎項和認可。



Ronald Ma
馬青雲

Ronald Ma and his research team focus on the causes and consequences of diabetes across the life course, and the identification of molecular biomarkers that would facilitate the diagnosis, stratification and treatment of individuals with diabetes. Their aim is to reveal a novel understanding of the underlying pathogenesis of diabetes and its complications, identify biomarkers that can be used clinically, and translate them to deliver precision medicine for diabetes. Given that more than 60% of the global estimate of people affected by diabetes are from Asia, their studies provide an important Asian perspective to seek the best therapeutic strategies for patients in Asia.

馬青雲和他的研究團隊的研究側重於糖尿病在整個生命過程中的成因和後果，以及鑑定有助於糖尿病患者的診斷、分類和治療的分子生物標誌物。他們的目標是揭示對糖尿病及其併發症的潛在發病機理的新穎理解，確定可在臨床上使用的生物標誌物，將其轉化並用於提供糖尿病的精準醫療。鑑於全球估計有 60% 以上的糖尿病患者來自亞洲，他們的研究更提供了重要的亞洲視角，可以尋找最適合亞洲患者的解決方案。

07 Neuroscience and Neurotechnology
神經科學及神經技術



Owen Ko 高浩

Owen Ko's team seeks to uncover the pathogenesis of neurodegenerative diseases and develop disease-modifying therapeutics. To this end, they utilise a combination of molecular, chemical and optical tools to (1) study gliovascular dysfunction in ageing and neurodegeneration, (2) develop biomedical methods for revealing the fundamental principles governing the operation of neural circuits, and their dysfunction in pathological conditions.

高浩團隊的研究目標是以揭示神經退行性疾病的發病機制去推進疾病療法的開發。為此，他們利用生物分子，化學和光學工具來（1）研究衰老和腦部退化過程中的神經血管和膠質細胞功能障礙，和（2）開發新的生物醫學工具，以揭示神經系統病理情況下的神經迴路功能缺失。



Hei Ming Lai 黎曦明

The research team led by **Hei Ming Lai** has developed a method for the world's first 3D histology, allowing detailed examination of large tissue samples like human tumours in three dimensions. They have overcome challenges in antibody penetration into tissues by using innovative chemical and physical models. This includes the use of special agents to help antibodies spread evenly through tissues and a new, room-temperature method to retrieve antigens from old, preserved samples. Their work not only improves 3D imaging but also has implications for 2D histology. Their start-up, Illumos Ltd, is commercialising these technologies, attracting partnerships and investments, and has been recognised at international conferences.

由**黎曦明**領導的研究團隊開發了全球首創的 3D 組織學方法，讓他們能夠詳細檢查如人類腫瘤等大型組織樣本的三維結構。他們通過創新的化學及物理模型，克服了抗體滲透組織的挑戰。這包括使用特殊的試劑幫助抗體均勻分布於組織中，以及一種新型的室溫抗原提取方法，能夠從舊的、保存好的樣本上做 3D 組織學。這個工作不僅首創了 3D 成像技術，對 2D 組織學也有影響。他們的初創公司 Illumos Ltd 正將這些技術商業化，吸引了合作夥伴和投資，並在國際會議上獲得認可。



Vincent Mok 莫仲棠

Vincent Mok's team focuses on Alzheimer's disease, stroke, cerebral small vessel disease, and Parkinson's disease. With the rapidly aging populations worldwide, developing innovative technologies to tackle aging-associated disorders is becoming a priority of the global societies. Given the complexity of cellular and physiological changes involved in aging, and the lack of easily targetable driving pathways, it remains a formidable challenge to develop therapeutic approaches that can slow, or even reverse, the age-related functional decline in any body organ system. To this end, the team aims to develop novel diagnostic and prognostic methods, as well as treatment strategies of common age-related brain diseases among our local population.

莫仲棠的研究團隊專注於阿茲海默症、中風、腦小血管病和柏金遜症。鑑於全球人口老化問題日趨嚴重，以及衰老過程中細胞和生理變化的複雜性，團隊的研究目標旨在研發嶄新的診斷，預測與治療策略，以應對常見於本地華人的腦部退化性疾病。



Thomas Leung 梁慧康

Thomas Leung's team focuses on intracranial atherosclerosis, stroke imaging, treatment, and outcome. The team aims to understand the pathogenesis and stroke mechanisms of intracranial atherosclerotic disease, alongside its imaging features, outcomes, and revascularisation therapies for cerebral ischemia. The overarching goal is to advance preventive and therapeutic interventions for enhancing stroke care and preserving brain function amidst rapid population aging.

梁慧康教授的團隊研究顱內動脈粥樣硬化、影像學技術、治療效果評估及癒後，旨在探討中風發病機制、影像特徵、臨床預後，以及針對腦缺血的再灌注治療方案。團隊冀能在人口急速老化的趨勢下，推進中風防治，維護腦部健康。



Bonaventure Ip 葉耀明

Bonaventure Ip and his research team focus on various aspects of cerebrovascular diseases, including stroke epidemiology, intracranial atherosclerosis, advanced neuroimaging, stroke-related big data analytics, treatment and outcome, and cerebral small vessel disease. Their research team seeks to gain deeper insights into the pathogenesis, prognosis, and therapeutic avenues for neurological diseases.

葉耀明及其研究團隊專注於腦血管疾病的各個層面，涵蓋中風流行病學、顱內動脈粥樣硬化、腦神經影像學技術、大數據分析、治療效果評估及癒後，以及腦小血管病等範疇。團隊的目標是深入探究腦神經系統疾病的發病機轉、預測疾病走向，並開拓嶄新的治療方法。



Yun Kwok Wing 榮潤國

Idiopathic REM sleep behaviour disorder (iRBD) is considered an early warning sign of certain neurodegenerative diseases, particularly Parkinson's disease, with more than 90% of patients with iRBD developing neurodegeneration within 15 years. To help with early prevention, identification and intervention of iRBD, **Yun Kwok Wing** and his research team have established a large study in Hong Kong involving iRBD patients and their family relatives. The study uses digital assessments (e.g., smartphone-App) to monitor early signs of neurodegeneration and cutting-edge technologies for detecting multiple biological markers, which will ultimately advance understanding of disease causes, as well as identify diagnostic and progression markers for neurodegeneration.

特發性快眼動睡眠期行為障礙（iRBD）被視為帕金遜病的早期警號。**榮潤國**及其研究團隊利用數字評估和多種尖端技術來識別、評估和監測 iRBD 患者，包括手機應用程式及基於血漿和糞便的標誌物，促進對神經退行性疾病的早期預防和干預。



Bei Huang
黃蓓

Bei Huang and her team focus on identifying and monitoring people at risk for neurodegenerative diseases, especially early stages of Parkinson's disease. They study gut health and its connection to these conditions, finding specific gut bacteria that might help detect early signs of disease. The team is also developing a mobile app-based approach to screen for those at risk of developing Parkinson's disease and exploring how gut-related issues, like constipation, relate to the origins of neurodegeneration. Their ultimate goal is to enhance early detection and treatment options for at-risk individuals in Hong Kong.

黃蓓及其研究團隊專注於研究腸道健康與神經退行性疾病（特別是帕金遜病）的關聯，以及開發基於手機應用程式的篩查方法，找出疾病的高風險人群。他們的最終目標是理解神經退化性疾病的機制，並促進高風險人士的早期檢測和治療。



Petrina Lau
劉友璞

Petrina Lau's research team focuses on understanding the biological mechanisms behind heritable psychiatric disorders like schizophrenia, bipolar disorder, and autism spectrum disorder (ASD). These conditions, while rooted in genetics, are traditionally studied through subjective clinical measures. To address this gap, her team uses advanced techniques such as high-density brain recordings and computational modelling to analyse brain network activity and its link to perception, cognition, and symptoms. By studying both human and animal models, her team aims to uncover how factors like gut microbiomes, sleep, and stress interact with brain function. Ultimately, their goal is to develop better diagnostics and targeted treatments for neuropsychiatric disorders.

劉友璞與其團隊研究精神疾病（如自閉症）的生物機制。利用高電生理學和計算模型，分析腦網絡活動與症狀的關聯，通過人類和動物模型研究遺傳與環境因素如何影響腦功能。團隊致力於開發診斷工具和促進對神經精神疾病的理解。

08 Reproduction and Development
生殖與發育研究





Ronald Wang and his team focus on research in reproduction and development, and are actively involved in clinical, basic and translational studies of reproductive medicine and maternal medicine, including but not limited to endometriosis, endometrium imaging, endometrial cancer, reproductive failure, polycystic ovary syndrome, preterm birth, preeclampsia, gestational diabetes mellitus, and cord blood stem cells, with significant research collaboration, excellent progress and fruitful research output.

黃志超及其團隊主要的研究工作以生殖和發育為主，積極參與生殖醫學和母胎醫學的臨床、基礎及轉化研究。團隊建立重大的研究合作，工作進展傑出，研究成果卓越。

Ronald Wang
黃志超



Max Wang and his team's research focuses on advancing maternal and neonatal health through innovative and multidisciplinary approaches, including biomarker discovery, microbiome-targeted therapy, and wearable technologies. By identifying novel biomarkers through advanced proteomics and machine learning, they aim to enhance early diagnosis and prediction of pregnancy complications such as miscarriage and neonatal jaundice, while conducting mechanistic studies to uncover their underlying molecular pathways. Their work also investigates how probiotics and the maternal microbiome impact pregnancy outcomes and neonatal health. Additionally, they apply wearable devices to monitor and manage women's reproductive diseases, such as endometriosis and menstrual disorders, bridging scientific discovery with clinical applications to address pressing challenges in maternal-fetal medicine.

王堯及其研究團隊的研究致力於通過創新和多學科方法改善母嬰健康，包括生物標誌物發現、靶向微生物組療法和可穿戴技術。他們利用蛋白質組學和機器學習等先進技術識別新型生物標誌物，以提升妊娠併發症（如流產和新生兒黃疸）的早期診斷和預測能力，同時開展機制研究以揭示其潛在的分子機制。他們的研究還探索益生菌和母體微生物組如何影響妊娠結局和新生兒健康。此外，他們應用可穿戴設備監測和治療女性生殖疾病，例如子宮內膜異位症和月經失調等。王堯的課題組注重臨床轉換，並將科學發現與臨床應用相結合，以解決母胎醫學中的關鍵問題。

Max Wang
王堯

09 Stem Cells and Tissue Regeneration
幹細胞及組織再生研究

Cardiovascular disease has been the leading cause of death worldwide over the past three decades. **Kathy Lui** and her team are dedicated to regenerating the aged or damaged cardiovascular system. They have extensively studied the pathogenesis of cardiovascular diseases and the interplay between cardiovascular cells and immune cells, particularly T cells during disease progression. More recently, they have explored the epigenetic mechanisms regulating blood pressure traits and hypertension, major risk factors for cardiovascular complications. Their laboratory has utilised human pluripotent stem cells as a platform; and mRNA, siRNA, as well as monoclonal antibodies as therapeutic agents for disease modelling and drug screening.

在過去三十年裡，心血管疾病是全世界人類死亡的主要原因。**呂愛蘭**及其團隊一直致力於研究老化或受損的心血管系統的再生。他們研究了心血管疾病的發病機制，以及在發病過程中，心血管細胞和免疫細胞（特別是T細胞）之間的相互作用。最近，團隊還研究了能調控血壓等心血管疾病風險因素的表觀遺傳機制。他們的實驗室還利用人類多能幹細胞，使用信使核糖核酸(mRNA)、小分子干擾核糖核酸(siRNA)及單株抗體作為治療劑來構建用於疾病建模和藥物篩選的平台。



Kathy Lui
呂愛蘭



Wayne Lee
李郁偉

Wayne Lee and his team's research focuses on three important areas in bone and joint health. First, the team is developing advanced cell-based treatments to help people with knee and muscle problems, like osteoarthritis, and is preparing for clinical trials. Second, they are studying why some teens develop severe curved spines (adolescent idiopathic scoliosis) while others don't, aiming to find causes and better treatments. Lastly, they are exploring the role of osteocytes, the most abundant and long-lasting bone cells, in bone issues, hoping to develop new therapies. Together, these efforts aim to improve patient care through innovative solutions for joint, spine, and bone health.

李郁偉與其團隊的研究專注於三個重要的骨骼和關節健康領域。首先，團隊正在開發先進的細胞治療方法，以幫助患有膝蓋和肌肉問題（如骨關節炎）的患者，並正在準備進行臨床試驗。其次，團隊正在研究為什麼有些青少年會發展出嚴重的脊柱側彎（青少年特發性脊柱側彎），而其他人則不會，目的是找出原因並開發更好的治療方法。最後，團隊正在探索骨細胞（骨骼中最豐富且壽命最長的細胞）在骨骼問題中的作用，希望能夠開發出新的治療方法。這些努力共同旨在通過創新解決方案改善關節、脊柱和骨骼健康的患者護理。

Ning Zhang and his team focus on using various methods to enhance tissue repair and regeneration for musculoskeletal disorders. This includes employing immunization approaches to modulate specific overactive factors to enhance the healing of sarco-osteoporotic fractures and biophysical interventions to modulate the niche microenvironment to strengthen stem cell therapies for bone defect repair. Additionally, based on previous research and new findings from collaborators, the team actively engages in interdisciplinary research to explore new potential factors affecting the musculoskeletal system.

張寧及其團隊專注於利用多種方法來加強骨骼肌肉系統疾病的組織修復和再生。這包括使用免疫調節方法來調控特定過度活化的因子，以增強少肌症合併骨質疏鬆骨折的愈合，以及利用生物物理干預來調節微環境，以加強幹細胞療法對骨缺損的修復。此外，基於之前的研究和與合作者的新研究成果，團隊積極開展跨學科研究，探索影響骨骼肌肉系統的新潛在因素。



Ning Zhang 張寧

10 Biomaterial, Chemical Biology and Drug Translational Research

生物材料，化學生物學與藥物轉譯研究



Ling Qin 秦嶺

Ling Qin and his research team have been dedicated to the research and development of innovative orthopaedic implants to address the high incidence of refractory musculoskeletal diseases associated with the aging society. Based on the basic research on bioactive and biodegradable Magnesium (Mg), the research team has developed various innovative products (e.g. Mg-based hybrid devices and Mg-containing hydrogels) to facilitate musculoskeletal tissue regeneration and functional restoration. Currently, the team is focused on bridging pre-clinical research and clinical applications, with the goal of accelerating rehabilitation, reducing disease incidence and mortality, and alleviating the healthcare and economic burden associated with related diseases.

秦嶺及其團隊多年專注於研究和開發創新型骨科植入物以應對與社會老齡化相伴的高發難愈型肌肉系統疾病。該團隊基於具有生物活性及生物可降解性鎂金屬為核心，開發用於促進肌肉骨骼組織再生及功能恢復的各類創新產品（如鎂基組合臨床器械、骨缺損修复水凝胶等）。目前，團隊致力於推動研究成果從基礎研究向臨床應用轉化，以期縮短臨床康復時間，降低相關疾病發病率與死亡率，減輕社會醫療經濟負擔。



Billy Ng 吳瀰龍

Billy Ng and his team's research interests are chemical biology, drug discovery, and medicinal chemistry. The team uses chemical and biological tools to develop: (i) novel small molecules to target these dysregulated pathways and (ii) novel and safe medicines for treating serious diseases, including cancers, infectious and neurodegenerative diseases. They also collaborate closely with physicians and entrepreneurs to translate their findings from bench to bedside.

吳瀰龍及其研究團隊的研究興趣是利用合成化學、生物化學和分子生物學來研究疾病的分子機制，從而開發出新型的安全藥物，用於治療癌症、傳染病和神經退行性等疾病。他們更致力於與醫生和企業密切合作，將研究成果轉化到臨床應用。



Louis 張穎愷 Cheung

Louis Cheung and his research team focus on the mechanisms and treatments for sarcopenia. They investigate the roles of neuromuscular junction degeneration, mitochondrial dysfunction, and myosteatosis in the development of sarcopenia. Based on the pathogenic mechanisms, they employ biophysical stimulation, nutritional supplements, novel nanomaterials, and potential drugs to intervene and treat sarcopenia. Additionally, they conduct community programs and clinical trials to raise awareness and emphasize the importance of sarcopenia in society. By combining preclinical models and clinical interventions, they aim to elucidate the mechanisms of sarcopenia and provide safer and more effective treatments.

張穎愷及其研究團隊致力於少肌症的機理研究與治療。團隊探究肌肉神經接頭退化、線粒體功能障礙、肌肉脂肪變性等在少肌症發病過程中的作用。針對少肌症的的發病機理，利用生物物理刺激、營養補充、新納米材料以及潛在藥物對少肌症進行干預與治療。同時開展相關的社區計劃以及臨床試驗，加強社會對於少肌症的認知與重視。結合前臨床模型以及臨床干預，致力於理清少肌症發病機理，為少肌症帶來更加安全有效的治療方法。

11 Genomics and Bioinformatics
基因組學與生物訊息學



Peiyong Jiang 江培勇

In 2024, **Peiyong Jiang** and his team have achieved a number of significant advancements in cfDNA fragmentomics and its clinical applications. Utilizing long-read sequencing, they revealed an uneven distribution of long molecules across the human genome, especially in euchromatic regions. Moreover, their research established a crucial link between histone modifications and cfDNA fragmentation patterns in plasma. They also developed a novel methodology, named FRAGmentomics-based Histone modification Analysis (FRAGHA), to deduce histone modifications through cfDNA fragmentomics. This innovative approach enables the assessment of histone modifications in the placenta during pregnancy and facilitates the detection of cancer and hematological disorders, significantly enhancing the diagnostic potential of liquid biopsy.

在本學年，**江培勇**及其團隊在 cfDNA 片段組學及其臨床應用方面取得了顯著進展。他們利用長讀序列技術揭示了人類基因組中長分子的分布不均，特別是在常染色質區域。進一步研究表明，組蛋白修飾與血漿中 cfDNA 片段化模式之間存在重要聯繫。團隊還開發了一種新方法（FRAGHA），通過 cfDNA 片段組學推導組蛋白修飾。這一創新方法不僅能評估妊娠期間胎盤中的組蛋白修飾，還能檢測癌症和血液系統疾病，顯著提升了液體活檢的診斷潛力。



Ken Sung 宋永健

In this academic year, **Ken Sung** and his Laboratory of Computational Genomics achieved several significant accomplishments. With advancement of long-read sequencing technologies (ONT and HiFi), the team has accelerated the development of *de novo* genome assemblers. The team is dedicated to developing innovative bioinformatics algorithms and software to generate more efficient, accurate, and continuous genomes. They utilised the Illumina short reads to polish an ONT-based draft assembly (hypo-short) and further refined diploid genomes (hypo-hybrid) by incorporating the long-read characteristics of ONT, producing continuous and nearly complete genomes. Additionally, the team developed a new CNV calling algorithm (SurVIndel2) based on hidden split reads of short-read, which is used to produce a remarkably complete catalogue of variants in an individual.

本學年，**宋永健**和他的計算基因組實驗室取得了多項重大成就。隨著長讀取定序技術（ONT 和 HiFi）的進步，加速了從頭基因組組裝器的發展。該團隊致力於開發創新的生物資訊演算法和軟體，以產生更高效率、更高準確度、且更具連續性的基因組。他們利用 Illumina 短讀長技術完善了基於 ONT 的草圖組裝（hypo-short），並透過結合 ONT 的長讀長特性進一步完善了二倍體基因組（hypo-hybrid），從而產生了連續且近乎完整的基因組。此外，該團隊還開發了一種基於短讀隱藏分割讀取的新型 CNV 呼叫演算法（SurVIndel2），該演算法用於產生個體中非常完整的變異目錄。



Xin Wang
王鑫

Xin Wang's major research field is translational genomics and bioinformatics. He has been focusing on mechanistic and translational research in major human cancers by developing novel methodologies integrating computational biology, systems biology, machine learning and artificial intelligence. In collaboration with molecular biologists and experimental oncologists, he is especially fascinated by the research into the mechanisms underlying cancer initiation, development and metastasis. Together with clinicians, his group has also been dedicating to multi-center studies about molecular and image-based biomarkers for cancer early detection, diagnosis, prognosis and subtyping.

王鑫的主要研究領域為轉化基因組學和生物信息學。利用計算生物學、系統生物學、機器學習與人工智能新方法研究腫瘤的發生、發展、轉移機制，並研發分子標誌物和醫學圖像AI模型，用於癌症早期檢測、診斷、預後和分型。



Terry Yip
葉卓風

Terry Yip and his team specialise in leveraging big clinical data to answer important research questions using advanced statistical methodologies and AI analytics. Their primary focus lies in investigating chronic liver diseases such as chronic hepatitis B and metabolic dysfunction-associated steatotic liver disease. Proficient in harnessing the Hospital Authority's electronic healthcare database in Hong Kong and other important publicly available datasets such as the UK Biobank, they engage in impactful collaborations with colleagues in the Faculty of Medicine. These collaborations involve guiding data acquisition, statistical expertise, and support in developing grant proposals to enhance the scope and impact of their clinical investigations.

葉卓風和他的團隊善於運用大型臨床數據，利用先進的統計學方法和人工智能分析來解答慢性肝病的研究問題。他們擅長利用香港醫院管理局的電子醫療數據庫以及其他重要的公開數據庫，與醫學院的同事合作，以增強其臨床研究的影響力。

12 Non-Coding RNAs and Cellular Signalling
非編碼核糖核苷酸研究及細胞訊號轉導

Skeletal muscle has a remarkable ability to regenerate after injury, owing to adult muscle stem cells (MuSC). These cells are normally in a quiescent stage but can be rapidly activated upon injury, followed by proliferative expansion and differentiation into multinucleated myofiber to repair the damaged muscle tissues. Understanding how each phase of stem cell activities is regulated is the first step toward harnessing their regenerative potential for therapeutic treatments of many skeletal muscle-related diseases such as aging inflicted Sarcopenia and Duchenne Muscular Dystrophy. **Huating Wang** and her research team thus dedicate their efforts to deciphering both intrinsic and extrinsic mechanisms governing MuSC activity in both physiological and pathological settings.

骨骼肌具有強大的再生能力，這是由於成年肌肉幹細胞的存在。這些細胞通常處於靜息狀態，但是在受傷時可以被快速激活，然後進行增殖性擴張並分化為多核肌纖維，以修復受損的肌肉組織。研究肌肉幹細胞活性如何在每個階段被調控，**王華婷**及其研究團隊才有可能將它們用於衰老引起的肌少症等肌肉相關疾病的治療。因此，團隊致力於解密在生理和病理條件下調控肌肉幹細胞活性的內源和外源機制。



Huating Wang 王華婷



William Wu 胡嘉麒

William Wu and his research team are devoted to the pursuit of excellence in research on the molecular mechanisms of diseases of public health significance, including infection/sepsis, chronic pain and cancer. They are particularly interested in the role of gut microbes and the use of omics platforms and big data.

胡嘉麒及其研究團隊致力於開展與公眾健康密切相關的前沿性科學研究，包括感染 / 敗血症、慢性疼痛、癌症等的分子機制研究。團隊尤其對腸道微生物及利用跨組學平台和大數據發掘與疾病相關的治療靶點感興趣。



Huarong Chen 陳華溶

Huarong Chen and his research team focus on RNA modifications, sepsis and gastrointestinal (GI) cancer, encompassing both basic and translational research. Their research endeavours are centred around several key areas: (1) Exploring the composition and function of gut microbiota in sepsis patients; (2) Elucidating the role of RNA modification in sepsis-associated dysfunction; and (3) Unravelling the role of deregulated RNA modification in gut dysbiosis and the development of GI cancer.

陳華溶及其團隊專注於RNA修飾、膿毒症和胃腸道癌症的基礎研究和轉化研究，包括：(1) 探討膿毒症相關腸道微生物的組成和功能；(2) 闡明RNA修飾在膿毒症相關功能障礙中的作用；和 (3) 揭示RNA修飾失調對腸道微生態和胃腸道腫瘤發生發展的影響。



Xiaona Chen 陳小娜

The research team led by **Xiaona Chen** aims to understand the functional roles of long non-coding RNAs, RNA-binding proteins, and nucleic acid structures such as DNA/RNA G-quadruplexes (G4) in controlling gene activity and related molecular mechanisms in skeletal muscle stem cells (also called muscle satellite cells, SC) during adult muscle regeneration and muscle ageing.

由**陳小娜**領導的研究團隊旨在探究長鏈非編碼RNA、RNA結合蛋白以及DNA/RNA四鏈體（G-quadruplex，G4）等核酸結構在成年骨胳肌幹細胞（亦稱肌肉衛星細胞，SC）中調控基因活性的功能及相關分子機制，重點關注其在肌肉再生和衰老過程中的作用。

13 Nephrology 腎臟疾病研究



Cheuk Chun Szeto 司徒卓俊

The research team, led by **Cheuk Chun Szeto**, investigates the use of urinary biomarkers for the diagnosis and monitoring of chronic kidney diseases such as diabetic kidney disease, IgA nephropathy, and lupus nephritis. They explore the potential of various urinary biomarkers, including cytokines, transcription factor mRNA, nucleic acid fragments, and podocyte-associated molecules. In addition, they analyse the adipokine and metabolomic signature in obesity and diabetic nephropathy, as well as the role of circulating bacterial and nucleic acid fragments as cardiovascular risk factors in kidney diseases.

由**司徒卓俊**帶領的研究團隊重點研究尿液生物標誌物在慢性腎臟疾病的診斷和監測中的應用，包括糖尿病腎病、IgA 腎病和紅斑狼瘡性腎炎。他們探索了各種尿液生物標誌物，包括細胞因子、轉錄因子核酸、核酸片段和足細胞相關分子的臨床應用。此外，他們也有研究肥胖和糖尿病腎病中的脂聯素和代謝組學的特徵，以及循環細菌和核酸片段在腎臟疾病中作為心血管風險因素的角色。



Jack Ng 吳傑聰

Jack Ng and his research team are devoted to studying the assessment of nutrition and frailty assessment in patients on peritoneal dialysis. Patients on dialysis may gradually lose their muscle mass without it being unnoticed. The research team developed a simple mathematical formula, which showed good consistency with measurements from bioimpedance spectroscopy, to evaluate muscle mass which can be easily adopted in clinical practice. They are also interested in identifying novel disease biomarkers in diabetic kidney disease and developing new diagnostic methods for peritoneal dialysis-associated peritonitis.

吳傑聰及其研究團隊致力於研究腹膜透析病人的營養和衰弱症評估。研究團隊開發了一個簡單的數學公式來評估肌肉量，易於在臨床實踐中採用。他們還致力於識別糖尿病腎病的新型疾病生物標誌物，並開發腹膜透析相關腹膜炎的新診斷方法。

14 Robotics & Artificial Intelligence
機械人與人工智能



Zheng Li 李崢

The research team led by **Zheng Li** mainly focuses on the research and development of innovative medical robots and devices, including intelligent flexible surgical robots for minimally invasive surgery, soft medical robots for gastrointestinal tract inspection, soft medical robots for rehabilitation, magnetic anchored and guided system for Video-Assisted Thoracic Surgery (VATS), semi-autonomous robots for stereotactic brain biopsy and semi-autonomous robotic system for transperineal prostate biopsy and real time surgical instrument detection and tracking with AI-assistance.

由**李崢**帶領的研究團隊致力研究醫療機械人和手術設備的創新和開發，包括用於微創手術的智能柔性機械人、用於胃腸道檢查的軟體機械人、用於康復的軟體醫療機械人、用於胸腔內視鏡影像輔助手術的智能磁錨定內窺鏡、幫助進行腦內立體定位術的半自動機械人、用於經會陰前列腺刺穿活檢的半自動機械人以及利用人工智能進行實時探測和追蹤手術工具。



Kai Fung Chan 陳啟楓

Gastrointestinal (GI) diseases affect millions worldwide. **Kai Fung Chan** and his research team focus on the development of specialised medical devices for diagnosis and treatment. Micro-/nanorobotic platforms offer innovative therapeutic possibilities in the GI tract, as their small size allows them to navigate hard-to-reach areas that conventional devices cannot access. They may also serve as microrobotic tools for in vivo applications such as health monitoring, early diagnosis, targeted therapy and minimally invasive medicine. Besides, endoluminal miniature devices that can be implanted in the GI tract for long-term diagnosis and therapy also open up new possibilities to diagnose and treat disease in a minimally invasive fashion.

消化道疾病影響著數百萬人，**陳啟楓**及其團隊致力開發用於診斷和治療消化道疾病的設備。微納米機械人平台因小尺寸，使它們能夠導航至傳統工具無法到達的區域作治療，提供了新的可能性。腔內微型裝置也為微創式診斷或治療開闢了新的方向。



Molecular Diagnostics

Circulating Fetal Nucleic Acids

分子診斷學

PRINCIPAL INVESTIGATOR

Dennis Lo

TEAM MEMBERS

Allen Chan, Rossa Chiu, Peiyong Jiang, Jacky Lam, Peter Cheung, Guanhua Zhu, Qing Zhou, Stephanie Yu, Lois Choy, Alice Cheng, Rebecca Chan, Charles Chan, Lu Ji, Huimin Shang, Wenlei Peng, Vicky Lee, Wanxia Gai, Mary Jane Ma, Guannan Kang, Jinyue Bai, Christina Liu, Rong Qiao, Dongyan Xiong, Linjing Liu, Qian Qian Mou, Irene Tse, Patty Tse, Vivien Lin, Amy Tsang, Maggie Li, Saravanan Ramakrishnan, Angel Lai, Lilian Zhong, Manna Law, Winsome Wong, Chris Kum, Patrick Tin, Xingfu Qin, Yasine Malki, Rachel Wong, Ka Wai Ng, Justin Zhang, Gigi Cheung, Howard Chan, Bonnie Lee, Wai Fung Cheung

Research Progress Summary

The research team led by **Dennis Lo** has continued to be at the forefront of studying the mechanisms of cell-free DNA (cfDNA) fragmentation. These characteristics of cfDNA fragmentation, also known as "fragmentomics" have contributed to a greater understanding of the biology of cfDNA, and have provided novel biomarkers to support a wide range of applications, such as cancer diagnosis. Several fragmentomic features have been defined, including the DNA fragment size profiles, end motifs, preferred ends and jagged ends (Lo et al. *Science* 2021; aaw3616). Several key nucleases have been identified to contribute to cfDNA fragmentation, including the apoptotic nuclease DNA fragmentation factor subunit beta (DFFB), and subsequent cleavage by deoxyribonuclease1-like 3 (DNASE1L3) and deoxyribonuclease1 (DNASE1) in circulation (Han et al. *Am J Hum Genet* 2020;106:202-214).

With the advent of single-molecule sequencing technologies, including the Pacific Biosciences (PacBio) single-molecule real-time (SMRT) sequencing and Oxford Nanopore Technologies (ONT) sequencing, the research team has previously uncovered a substantial population of long cfDNA molecules (above 500 bp) in plasma, providing novel insights in studying pregnant individuals and patients with cancer (Yu et al. *Proc Natl Acad Sci USA* 2021; 118(50):e2114937118,

and Choy et al. *Clinical Chemistry* 2022. 68(9):1151-1163.). The team's most recent work has revealed that long cfDNA molecules were preferentially originated from open chromatin regions and transcriptionally active regions of the genome. Therefore, the use of long cfDNA could provide a method for inferring gene expression, and show strong diagnostic ability for patients with hepatocellular carcinoma (HCC) when assessed with cancer-related genes. The results from this study have been published in *Genome Research* (Che et al. *Genome Research* 2024 20;34(2):189-200).

The fragmentomic profiles of plasma cfDNA were previously shown to be strongly associated with DNA methylation status (Zhou et al. *Proc Natl Acad Sci USA* 2022; 119 (44) e2209852119). The research team has continued to expand the scope of cfDNA fragmentomics, through identifying characteristic fragmentomic patterns associated with histone modifications. Characteristic properties of plasma cfDNA, namely the size profile and end motif patterns, were associated with regions of the human genome with the histone H3 lysine 27 acetylation (H3K27ac) and histone H3 lysine 4 trimethylation (H3K4me3) modifications. Deduced H3K27ac signals were shown to provide tissue-of-origin information, with strong correlations observed between deduced placental-specific H3K27ac signals and fetal DNA fractions from pregnant individuals, as well as liver-specific H3K27ac signals and donor-derived DNA from liver transplantation recipients. Deduced H3K27ac tissue-of-origin and cancer-associated signals provided important diagnostic value in cancer detection, as demonstrated by the enhanced HCC detection, with an area under the curve (AUC) of 0.97. This technology, named FRAGmentomics-based Histone modification Analysis (FRAGHA), has been published in the *Proceedings of the National Academy of Sciences of the United States of America* (Bai et al. *Proc Natl Acad Sci USA* 2024; 121(42):e2404058121).

The concentration of plasma cfDNA serves as an important determinant of the accuracy of liquid biopsy tests. It has been recognised that large inter-individual variability exists in the concentrations of plasma cfDNA, while little is known regarding the biological of large variations. The research team has studied the distribution of plasma cfDNA concentrations in a cohort of 862 individuals from their existing nasopharyngeal carcinoma (NPC) screening studies. It was identified that fragmentomic features, including the size profile and end motif patterns, showed distinct patterns associated with cfDNA concentrations. These characteristic patterns, as well as nuclease levels in plasma, showed that differences in nuclease contributions, particularly DNASE1L3 and DFFB, are key factors that regulate the concentration of cfDNA. Additionally, differences in the fractional DNA concentration of clinically relevant cfDNA species, such as the tumour and fetal fractions, were also associated with characteristic fragmentomic patterns in cfDNA. It was demonstrated that machine learning approaches incorporating fragmentomic features could accurately infer both the total and fractional DNA concentration, with implications in the utility of fragmentomics for cancer diagnosis and monitoring. This work has been published in *Genome Research* (Malki et al. *Genome Research* 2024; 22;35(1):31-42)

Research and Scholarship

Research Awards and Recognitions

Name	Details	
	Award	Organisation
Dennis Lo	Golden Medal of the Palacký University in Olomouc & Honorary Membership of the Czech Society of Perinatal Medicine	FETMED and SPADIA, in collaboration with the Society of Medical Genetics and Genomics in Olomouc, Czech Republic
	LV Jiménez Díaz Commemorative Lecture	Fundación Conchita Rábago
	第五屆醫學界價值醫療泰山獎—臨床研究獎	2024 醫學界價值醫療大會
	第十三屆華人榜—科學成就獎 (The 13th Most Achieved Chinese Award – Scientific Achievement Award 2024)	第十三屆華人榜 (The 13th Most Achieved Chinese Award)
Lois Choy	Best Presentation Prize	Hong Kong College of Pathologists

Fellowships

Name	Details	
	Fellowship	Organisation
Dennis Lo	Member	Sigma Xi
Allen Chan	Tony Mok Shu Kam Professorship in Medicine	The Chinese University of Hong Kong
Yasine Malki	Sir Edward Youde Memorial Fellowship 2024/25	Sir Edward Youde Memorial Fund

Grant and Consultancy

Name	Project Title	Funding Source	Start Date (dd/mm/yyyy)	End Date (dd/mm/yyyy)	Amount (HK$)
Dennis Lo	Centre for Novostics	Innovation and Technology Commission – InnoHK Scheme	01/05/2020	30/04/2025	Not to be disclosed

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A. Journal Papers

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10. Zhu G, Jiang P, Li X, Peng W, Choy LYL, Yu SCY, Zhou Q, Ma M-JL, Kang G, Bai J, Qiao R, Xi C, Deng S, Ding SC, Kei W, Lam J, Chan SL, Lau SL, Leung TY, Wong J, Chan KCA, Lo YMD. Methylation-associated nucleosomal patterns of cell-free DNA in cancer patients and pregnant women. *Clinical Chemistry*. 2024;70(11):1355-1365. doi:10.1093/clinchem/hvae118.
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Dennis Lo received the Jiménez Díaz Lecture Award. He is the first Chinese scholar to receive this honour.

Source: Dennis Lo



Molecular Diagnostics

Genetics of Disease Susceptibility

分子診斷學

PRINCIPAL INVESTIGATOR | **Nelson Tang**

TEAM MEMBERS | Paul Chan, Linda Lam, Suk Ling Ma

Research Progress Summary

Research Directions:

1. Genetics of complex traits: To identify prevalent genetic variants causing common diseases in Han Chinese;
2. Statistical genetics and computational statistical analysis of big genetic and biological datasets;
3. Analysis of variation of the transcriptome using the latest technology of next-generation sequencing.

Research into Genetics of Disease Susceptibility (GDS):

The mission of the GDS laboratory is to identify disease predisposition genes for common diseases, also known as complex traits. The research group led by **Nelson Tang** is involved in the development of various analysis methods and wet laboratory validation of the results generated from such analysis. The team also participates in international consortiums in studies of healthy aging (including bone and other phenotypes), breast cancer, and genetic susceptibility to adolescent idiopathic scoliosis and tuberculosis. With the advances in sequencing and other technologies, they acquire biological data in an unprecedented volume nowadays. The analysis and statistical method become limiting factors in handling such a huge volume of data.

Research and Scholarship

Academic Editorship

Name	Details	
	Role	Journal
Nelson Tang	Editorial Board Member	Pathology

Reviewers of Journal / Conference

Name	Details	
	Role	Journal / Conference
Nelson Tang	Reviewer	Scientific Reports
		The Union World Conference on Lung Health 2024
		Biomedicines
		Cancers
		Diagnostics

Grants and Consultancies

Name	Project Title	Funding Source	Start Date (dd/mm/yyyy)	End Date (dd/mm/yyyy)	Amount (HK$)
Nelson Tang	KIZ-CUHK Joint Laboratory of Bioresources and Molecular Research of Common Diseases	Research Grants Council – Joint Laboratory Funding Scheme	01/01/2024	31/12/2028	1,875,000
	Identifying Novel Cell Subpopulation and Therapeutic Target for Adolescent Idiopathic Scoliosis through Combined Single-Nucleus and Spatial Transcriptomics	Research Grants Council – General Research Fund	01/01/2024	31/12/2026	1,500,000
	Modified Creatinine Index as A Non-invasive Tool for the Monitoring of Muscle Mass in Peritoneal Dialysis	Health Bureau – Health and Medical Research Fund	01/04/2024	31/03/2026	1,025,344

Grants and Consultancies

Name	Project Title	Funding Source	Start Date (dd/mm/yyyy)	End Date (dd/mm/yyyy)	Amount (HK$)
Nelson Tang	Development of a Single-Cell Full-Length Mitochondrial Genome Sequencing Platform Based on Droplet Microfluidics	Research Grants Council – General Research Fund	01/01/2023	31/12/2025	970,181
	Paediatric Biomonitoring Reference Values for Metals and Trace Elements in Urine: A Survey of Hong Kong Children	Health Bureau	04/10/2021	03/10/2024	1,009,167
	Establishment Hong Kong Branch of CAS Center for Excellence in Animal Evolution and Genetics	The Chinese University of Hong Kong – Vice-Chancellor's One-off Discretionary Fund	01/06/2020	31/05/2025	12,000,000

Publications

A. Journal Papers

1. Huang B, Huang J, Chiang NH, Chen Z, Lui G, Ling L, Kwan MYW, Wong JSC, Mak PQ, Ling JWH, Lam ICS, Ng RWY, Wang X, Gao R, Hui DSC, Ma SL, Chan PKS, Tang NLS. Interferon response and profiling of interferon response genes in peripheral blood of vaccine-naive COVID-19 patients. *Frontiers in Immunology*. 2023;14:1315602. doi:10.3389/fimmu.2023.1315602.
2. Huang J, Chow AC, Tang NL, Chi Phillip S, Tang N. Low-Rank Full Matrix Factorization for dropout imputation in single cell RNA-seq and benchmarking with imputation algorithms for downstream applications. *bioRxiv*. Published online October 23, 2024:2024.10.21.619343. doi:10.1101/2024.10.21.619343. (Epub ahead of print)

B. Conference Paper

1. Ou M, Tang NLS. Implication of variants with residual activity in SLC22A5 (OCTN2) in newborn screening for primary carnitine deficiency: A comparison between ethnic groups. *The 15th International Symposium of Variants in the Genome*. 2024.05.

C. Patent

1. **China Patent:**

   Title: Method for quantifying telomere length and genomic motifs
   Inventors: Tang NLS, Ma SL, Woo J
   Patent No.: CN112029841B
   Filing Date: 9 February 2024





Nelson Tang gave an invited lecture called 廣東省醫學會兒科年會 in 2024. They took a photo with other panel experts.

Source: 2024 廣東省醫學會兒科年會



Molecular Diagnostics

Plasma Nucleic Acids Research

分子診斷學

PRINCIPAL INVESTIGATOR | **Allen Chan**

TEAM MEMBERS | Jacky Lam, Wanxia Gai, Charles Chan, Vicky Lee, Irene Tse, Amy Tsang, Maggie Li, Vivien Lin, Jack Cheung, Kaede Chau, Olive Wong, Sze Wan Wong

Research Progress Summary

The analysis of haplotypes of variants is important in a wide range of clinical applications, including non-invasive prenatal testing (NIPT) to detect monogenic diseases from maternal plasma cell-free DNA (cfDNA). Current approaches to DNA haplotyping primarily rely on genome-wide, non-targeted haplotype assemblies, highlighting the need for a more accurate, cost-effective and targeted method of haplotyping.

The research team led by **Allen Chan** has developed a novel approach, the 'digital PCR haplotype sequencing' (dHapSeq), for targeted haplotyping of variants. This method employs a high throughput droplet generation system to partition individual DNA molecules. Within each droplet, tens of target regions can be amplified and fused in a pairwise manner for sequencing by Illumina platform, providing a method of accurate and targeted genotyping and phasing. This method provides a cost-effective system for analysing target regions of clinical interest, providing a robust and scalable method of obtaining SNP genotypes from multiple regions for numerous clinical applications.

One application includes the use of dHapMap technology for NIPT testing, where genotyping achieved 100% accuracy when assessed in seven trio families. In detail, genotyping was performed in four families at risk of α^0-thalassemia, where genomic deletions and SNPs were successfully phased, and non-invasive determination of fetal inheritance could be determined. The team also investigated the application of this method in pharmacogenomics analysis, where *NUDT15* variants could be accurately genotyped across patients with acute lymphoblastic leukemia and their family members. Accurate genotyping of *NUDT15* variants play a major role in individualising thiopurine dosing for each patient to avoid complications. Overall, this technology would facilitate the applications of genomic haplotyping for clinical research and practice, paving the way for more personalised medical treatments. The results of this study have been published in *Clinical Chemistry*. (Gai et al. *Clinical Chemistry* 2024; 70(8):1046-1055)

Research and Scholarship

Grant and Consultancy

Name	Project Title	Funding Source	Start Date (dd/mm/yyyy)	End Date (dd/mm/yyyy)	Amount (HK$)
Allen Chan	Centre for Novostics	Innovation and Technology Commission – InnoHK Scheme	01/05/2020	30/04/2025	Not to be disclosed

Publications

A. Journal Papers

1. Lam WKJ, Chan ATC. Nasopharyngeal cancer screening with an anti-BNLF2b antibody: A new arrow in the quiver? *Nature Reviews Clinical Oncology.* 2024;21(1):6-7. doi:10.1038/s41571-023-00827-1. (Editorial)
2. Che H, Jiang P, Choy LYL, Cheng SH, Peng W, Chan RWY, Liu J, Zhou Q, Lam WKJ, Yu SCY, Lau SL, Leung TY, Wong J, Wong VWS, Wong GLH, Chan SL, Chan KCA, Lo YMD. Genomic origin, fragmentomics, and transcriptional properties of long cell-free DNA molecules in human plasma. *Genome Research.* 2024;34(2):189-200. doi:10.1101/gr.278556.123.
3. Cai L, Zhu H, Mou Q, Wong PY, Lan L, Ng CWK, Lei P, Cheung MK, Wang D, Wong EWY, Lau EHL, Yeung ZWC, Lai R, Meehan K, Fung S, Chan KCA, Lui VWY, Cheng ASL, Yu J, Chan PKS, Chan JYK, Chen Z. Integrative analysis reveals associations between oral microbiota dysbiosis and host genetic and epigenetic aberrations in oral cavity squamous cell carcinoma. *npj Biofilms and Microbiomes*. 2024;10(1). doi:10.1038/s41522-024-00511-x.
4. Cheng JYK, Subramaniam SR, Leung HS, Wong SWC, Kwok JSS, Lam WKJ. THRB gene mosaicism confirmed by next-generation sequencing in a clinically symptomatic infant. *JCEM Case Reports.* 2024;2(5). doi:10.1210/jcemcr/luae075.
5. King AD, Ai QYH, Lam WKJ, Tse IOL, So TY, Wong LM, Tsang JYM, Leung HS, Zee BCY, Hui EP, Ma BBY, Vlantis AC, van Hasselt AC, Chan ATC, Woo JKS, Chan KCA. Early detection of nasopharyngeal carcinoma: Performance of a short contrast-free screening magnetic resonance imaging. *Journal of the National Cancer Institute.* 2024;116(5):665-672. doi:10.1093/jnci/djad260.

6. Lam WKJ, Bai J, Ma M-JL, Cheung YTT, Jiang P. Circulating tumour DNA analysis for early detection of lung cancer: A systematic review. *Annals of Translational Medicine*. 2024;12(4):64-64. doi:10.21037/atm-23-1572. (Review)

7. Gai W, Wang G, Lam WKJ, Yuen LYP, Jiang P, Yu SCY, Leung TY, Lau SL, Lo YMD, Chan KCA. Universal targeted haplotyping by droplet digital PCR sequencing and its applications in noninvasive prenatal testing and pharmacogenetics analysis. *Clinical Chemistry*. 2024;70(8):1046-1055. doi:10.1093/clinchem/hvae076.

8. Lam WKJ, Gai W, Bai J, Tam THC, Cheung WF, Ji L, Tse IOL, Tsang AFC, Li MZJ, Jiang P, Law MF, Wong RSM, Chan KCA, Lo YMD. Differential detection of megakaryocytic and erythroid DNA in plasma in hematological disorders. *npj Genomic Medicine*. 2024;9(1). doi:10.1038/s41525-024-00423-x.

9. Bai J, Jiang P, Ji L, Lam WKJ, Zhou Q, Ma MJL, Ding SC, Ramakrishnan S, Wan CW, Yang TC, Yukawa M, Chan RWY, Qiao R, Yu SCY, Choy LYL, Shi Y, Wang Z, Tam THC, Law MF, Wong RSM, Wong J, Chan SL, Wong GLH, Wong VWS, Chan KCA, Lo YMD. Histone modifications of circulating nucleosomes are associated with changes in cell-free DNA fragmentation patterns. *Proceedings of the National Academy of Sciences of the United States of America*. 2024;121(42). doi:10.1073/pnas.2404058121.

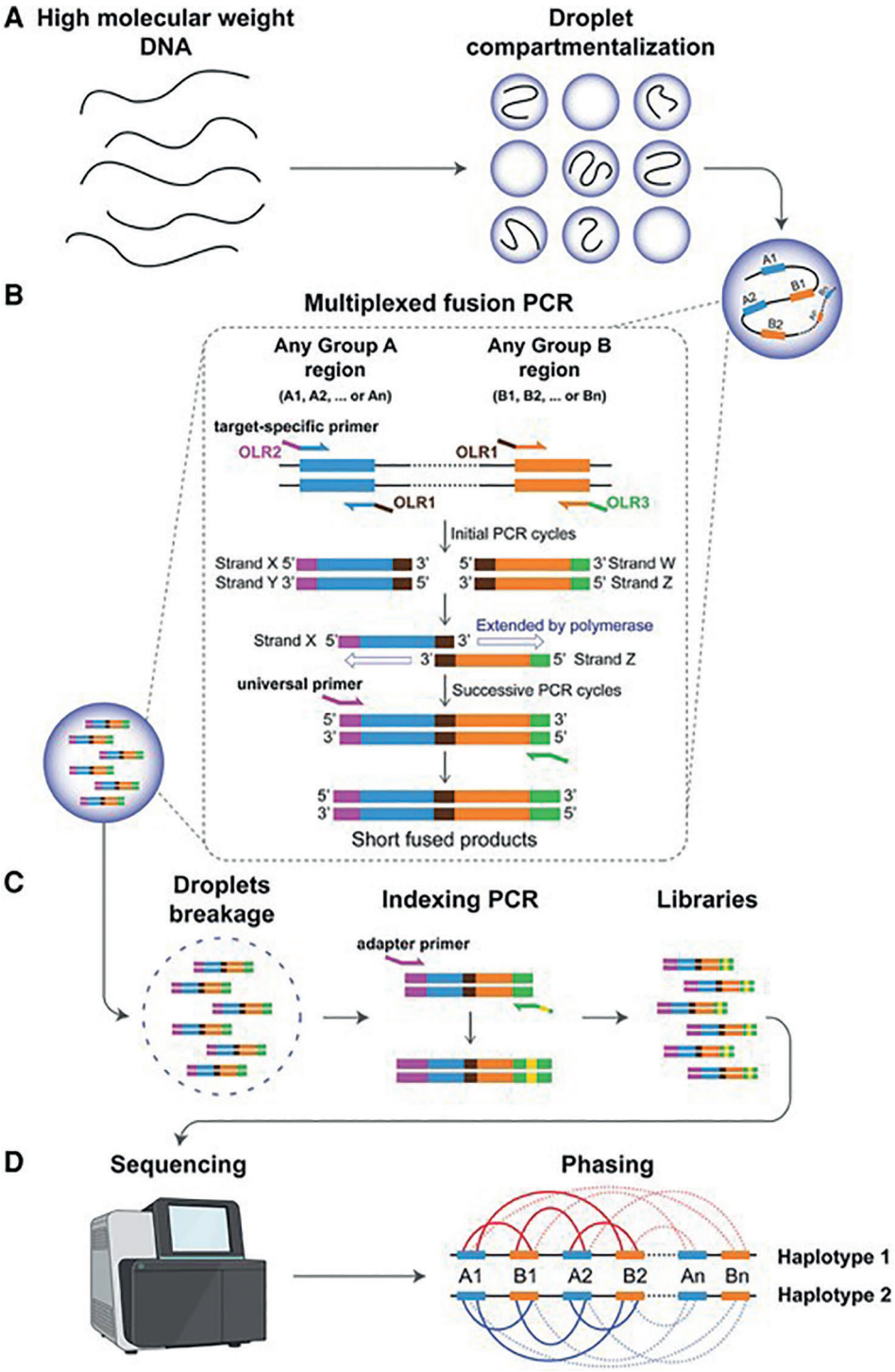
10. Zhu G, Jiang P, Li X, Peng W, Choy LYL, Yu SCY, Zhou Q, Ma M-JL, Kang G, Bai J, Qiao R, Deng CXS, Ding SC, Lam WKJ, Chan SL, Lau SL, Leung TY, Wong J, Chan KCA, Lo YMD. Methylation-associated nucleosomal patterns of cell-free DNA in cancer patients and pregnant women. *Clinical Chemistry*. Published online November 4, 2024. doi:10.1093/clinchem/hvae118.

11. Malki Y, Kang G, Lam WKJ, Zhou Q, Cheng SH, Cheung PPH, Bai J, Chan ML, Lee CT, Peng W, Zhang Y, Gai W, Wong WWS, Ma MJL, Li W, Xu X, Gao Z, Tse IOL, Shang H, Choy LYL, Jiang P, Chan KCA, Lo YMD. Analysis of a cell-free DNA–based cancer screening cohort links fragmentomic profiles, nuclease levels, and plasma DNA concentrations. *Genome Research*. 2025;35(1):31-42. doi:10.1101/gr.279667.124.



Allen Chan was endowed with the Tony Mok Shu Kam Professorship in Medicine

Source: Allen Chan



Schematic illustration of the dHapSeq method.

Source: Gai W, Wang G, Lam WKJ, Yuen LYP, Jiang P, Yu SCY, Leung TY, Lau SL, Lo YMD, Chan KCA. Universal targeted haplotyping by droplet digital PCR sequencing and its applications in noninvasive prenatal testing and pharmacogenetics analysis. Clinical Chemistry. 2024;70(8):1046-1055. doi:10.1093/clinchem/hvae076.



Molecular Diagnostics

Plasma Nucleic Acids Research

分子診斷學

PRINCIPAL INVESTIGATOR | **Jacky Lam**

TEAM MEMBERS | Irene Tse, Vivien Lin, Man Na Law, Jack Cheung

Research Progress Summary

There exist inconsistencies in previous findings regarding the contributions of DNA from megakaryocytes and erythroblasts in plasma DNA. **Jacky Lam** and his research team have developed droplet digital PCR (ddPCR) assays targeting cell-type-specific methylation markers for the differential detection of contributions from the two cell types in plasma. This approach was shown to provide valuable insights into hematological disorders and offer a potential tool for disease monitoring and diagnosis (Lam et al. *npj Genom Med* 2024;9(1):39).

Jacky also serves as the Clinical Lead in The Chinese University of Hong Kong / Prince of Wales Hospital Partnering Centre under the Hong Kong Genome Project (HKGP). HKGP is the first and largest genome project in Hong Kong. This ambitious initiative aims to sequence 40,000 to 50,000 genomes across two phases: the pilot and main phases, with subject recruitment from the Prince of Wales Hospital, Queen Mary Hospital and the Hong Kong Children's Hospital in Hong Kong. The team has presented the first report from the pilot phase of the HKGP. The research demonstrates that

genome sequencing, particularly short-read genome sequencing complemented by long-read genome sequencing in challenging cases, significantly improves diagnostic yield in patients with rare genetic diseases. A diagnosis was achieved in 28% of probands, with substantial impacts on clinical management in over three-quarters of cases. Additionally, the study findings contributed to increasing the representation of Chinese genomic data by identifying novel and region-specific variants, helping to address the long diagnostic odyssey, which averaged 15 years. This pioneering work underscores the importance of integrating both GS modalities into clinical workflows, advancing personalised medicine, and enhancing diagnostic outcomes for diverse populations in Hong Kong and across Asia. This work has been published in *The Lancet Regional Health Western Pacific* (Lam et al. *Lancet Reg Health West Pac* 2025 55:101473).

Research and Scholarship

Grants and Consultancies

Name	Project Title	Funding Source	Start Date (dd/mm/yyyy)	End Date (dd/mm/yyyy)	Amount (HK$)
Jacky Lam	Analysis of Plasma Epstein-Barr Virus (EBV) DNA and EBV Antibody for Early Detection of Nasopharyngeal Carcinoma and Protocol Optimisation	National Natural Science Foundation of China / Research Grants Council Joint Research Scheme 2022/23	01/01/2023	31/12/2026	662,366
	Magnetic Resonance Imaging Screening for Nasopharyngeal Carcinoma: Artificial Intelligence for Automatic Detection	Research Grant Council – General Research Fund	01/01/2022	31/12/2024	1,125,732
	Evaluation of Intra-treatment Response: Is the RECIST Guideline Applied to Nasopharyngeal Carcinoma Treated with Induction Chemotherap	Health Bureau – Health and Medical Research Fund	01/08/2023	31/10/2024	327,500
	Molecular Analysis of Plasma Epstein-Barr Virus DNA by Targeted Sequencing in Virus-associated Lymphoma	The Chinese University of Hong Kong Research Committee – Direct Grant	30/06/2023	29/06/2024	50,000

Publications

A. Journal Papers

1. Che H, Jiang P, Choy LYL, Cheng SH, Peng W, Chan RWY, Liu J, Zhou Q, Lam WKJ, Yu SCY, Lau SL, Leung TY, Wong J, Wong VWS, Wong GLH, Chan SL, Chan KCA, Lo YMD. Genomic origin, fragmentomics, and transcriptional properties of long cell-free DNA molecules in human plasma. *Genome Research*. 2024;34(2):189-200. doi:10.1101/gr.278556.123.
2. Cheng JYK, Subramaniam SR, Leung HS, Wong SWC, Kwok JSS, Lam WKJ. THRB gene mosaicism confirmed by next-generation sequencing in a clinically symptomatic infant. *JCEM Case Reports*. 2024;2(5). doi:10.1210/jcemcr/luae075.
3. King AD, Ai QYH, Lam WKJ, Tse IOL, So TY, Wong LM, Tsang JYM, Leung HS, Zee BCY, Hui EP, Ma BBY, Vlantis AC, van Hasselt AC, Chan ATC, Woo JKS, Chan KCA. Early detection of nasopharyngeal carcinoma: Performance of a short contrast-free screening magnetic resonance imaging. *JNCI: Journal of the National Cancer Institute*. 2024;116(5):665-672. doi:10.1093/jnci/djad260.
4. Lam WKJ, Bai J, Ma M-JL, Cheung YTT, Jiang P. Circulating tumour DNA analysis for early detection of lung cancer: A systematic review. *Annals of Translational Medicine*. 2024;12(4):64-64. doi:10.21037/atm-23-1572. (Review)
5. Gai W, Wang G, Lam WKJ, Yuen LYP, Jiang P, Yu SCY, Leung TY, Lau SL, Lo YMD, Chan KCA. Universal targeted haplotyping by droplet digital PCR sequencing and its applications in noninvasive prenatal testing and pharmacogenetics analysis. *Clinical Chemistry*. 2024;70(8):1046-1055. doi:10.1093/clinchem/hvae076.
6. Lam WKJ, Gai W, Ba iJ, Tam THC, Cheung WF, Ji L, Tse IOL, Tsang AFC, Li MZJ, Jiang P, Law MF, Wong RSM, Chan KCA, Lo YMD. Differential detection of megakaryocytic and erythroid DNA in plasma in hematological disorders. *npj Genomic Medicine*. 2024;9(1):1-8. doi:10.1038/s41525-024-00423-x.
7. Bai J, Jiang P, Ji L, Lam WKJ, Zhou Q, Ma MJL, Ding SC, Ramakrishnan S, Wan CW, Yang TC, Yukawa M, Chan RWY, Qiao R, Yu SCY, Choy LYL, ShiY, WangZ, Tam THC, Law MF, Wong RSM, Wong J, Chan SL, Wong GLH, Wong VWS, Chan KCA, Lo YMD. Histone modifications of circulating nucleosomes are associated with changes in cell-free DNA fragmentation patterns. *Proceedings of the National Academy of Sciences of the United States of America*. 2024;121(42):e2404058121. doi:10.1073/pnas.2404058121.
8. Zhu G, Jiang P, Li X, Peng W, Choy LYL, Yu SCY, Zhou Q, Ma MJL, Kang G, Bai J, Qiao R, Xi C, Deng S, Ding SC, Kei W, Lam J, Chan SL, Lau SL, Leung TY, Wong J, Chan KCA, Dennis Lo YMD. Methylation-associated nucleosomal patterns of cell-free DNA in cancer patients and pregnant women. *Clinical Chemistry*. 2024;70(11):1355-1365. doi:10.1093/clinchem/hvae118.
9. Malki Y, Kang G, Lam WKJ, Zhou Q, Cheng SH, Cheung PPH, Bai J, Chan ML, Lee CT, Peng W, Zhang Y, Gai W, Wong WWS, Ma MJL, Li W, Xu X, Gao Z, Tse IOL, Shang H, Choy LYL, Jiang P, Chan KCA, Lo YMD. Analysis of a cell-free DNA–based cancer screening cohort links fragmentomic profiles, nuclease levels, and plasma DNA concentrations. *Genome Research*. 2025;35(1):31-42. doi:10.1101/gr.279667.124. (Epub ahead of print)



The research team at The Chinese University of Hong Kong / Prince of Wales Hospital Partnering Centre under the Hong Kong Genome Project (HKGP).

Source: Jacky Lam



Digestive Diseases, Gastroenterology and Hepatology

Digestive Diseases

消化、腸胃及肝臟疾病研究

PRINCIPAL INVESTIGATOR | Jun Yu

TEAM MEMBERS | Vincent Wong, Dennis Wong, Jennifer Zhang, Hongyan Gou

Research Progress Summary

Gut microbiota in Gastric Cancer

The research team led by **Jun Yu** first identified that *Streptococcus anginosus*, a non-*Helicobacter pylori* bacterium, as a pathogen of gastric cancer. *S. anginosus* was enriched in the gastric mucosa of patients with gastric cancer. In mice, the gavage of *S. anginosus* induces acute gastritis in mice, which consequently progressed to chronic gastritis, gastric mucinous metaplasia and dysplasia and it also accelerates carcinogen-induced carcinogenesis. They have also unravelled the mechanism of its colonisation of the stomach. The bacterium colonises gastric cells through its surface protein TMPC directly binding to receptor protein ANXA2 expressed on gastric cells, which triggers oncogenic MAPK signalling to promote gastric cancer progression. This is the first report of a non-pylori pathogen involved in gastric cancer and this finding will provide new insights for clinical intervention in the future (*Cell,* 2024).

Gut microbiota in Colorectal Cancer

Fusobacterium nucleatum is a well-established pathogen in colorectal cancer, however, its potential role in immunotherapy response is unknown. Here, the team demonstrated that *F. nucleatum* paradoxically promotes immune checkpoint blockade therapy (anti-PD-1) in microsatellite stable colorectal cancer (MSS CRC). Single *F.*

nucleatum administration potentiates anti-PD-1 efficacy in both murine allografts and CD34+-humanised mice bearing MSS CRC. Mechanistically, intratumoral Fn generates butyric acid, which inhibits histone deacetylase 3/8 in $CD8^+$ T cells and induces TBX21 expression through an epigenetic mechanism. TBX21 in turn represses PD-1 to alleviate $CD8^+$ T cell exhaustion and boost effector function. In MSS CRC patients, high intratumoral *F. nucleatum* predicts favorable response to anti-PD-1 therapy, inferring *F. nucleatum* as a potential biomarker of immunotherapy response in MSS CRC *(Cancer Cell,* 2024).

Oral pathogens are often elevated in colorectal cancer, however, their implications in tumorigenesis and therapy response are poorly understood. The research team has identified that a novel immunomodulatory bacterium *Peptostreptococcus anaerobius* that impairs the efficacy of antitumour immune checkpoint blockade therapy in colorectal cancer in multiple mouse models. *P. anaerobius* induces intratumoral myeloid-derived suppressor cells (MDSCs) to impair effective T cell responses. Mechanistically, *P. anaerobius* activates integrin α2β1–NF-κB in CRC cells to induce secretion of CXCL1 and recruits MDSCs into tumours. It also activates immunosuppressive activity of MDSCs by secreting lytC_22, which binds and activates Slamf4 receptor on MDSCs. Targeting of either integrin α2β1 or the Slamf4 receptor were revealed as promising strategies to overcome *P. anaerobius*-mediated resistance to anti-PD1 therapy in CRC (*Nat Microbiol,* 2024).

Moreover, they first elucidated potential function of *Peptostreptococcus stomatis* in colorectal tumorigenesis. *P. stomatis* is enriched in colorectal cancer patients, and *P. stomatis* gavage accelerates colonic tumorigenesis in $Apc^{Min/+}$ and carcinogen-induced colorectal cancer models. *P. stomatis* works by adhering to colorectal cancer cells through its surface protein fructose-1,6-bisphosphate aldolase (FBA), which binds to integrin α6/β4 receptor on CRC cells, leading to the activation of ERBB2 and the downstream MEK-ERK-p90 cascade. Beyond its effect on tumorigenesis *P. stomatis*-driven ERBB2 activation bypasses receptor tyrosine kinase (RTK) blockade by EGFR inhibitors (cetuximab, erlotinib), leading to drug resistance in xenograft and spontaneous colorectal cancer models. Thus, they identified *P. stomatis* as an oncogenic bacterium and a contributory factor for non-responsiveness to RTK inhibitors in CRC (*Cell Host Microbe*, 2024).

Probiotics are potential chemopreventive agents against colorectal cancer. The team isolated a novel probiotic *Lactococcus lactis* strain (HkyuLL 10) with tumour suppressive potential. HkyuLL 10 administration inhibits tumorigenesis in $Apc^{Min/+}$ and carcinogen-induced colorectal cancer models. The conditioned medium of HkyuLL 10 demonstrates significant tumour inhibitory effect in human colorectal cancer cells and patient-derived organoids, inferring the role of a secreted molecule. Such protective effect is attributed to HkyuLL 10-secreted proteins, and they further identified that α-mannosidase is the functional protein. Consistent with this, α-mannosidase exerts antitumorigenic effect in human colorectal cancer cells, organoids and in xenograft tumours in mice. Collectively, HkyuLL 10 administration may serve as a prophylactic measure against colorectal cancer (*Gut*, 2024).

Archaea are important components of the host microbiome, but their roles in colorectal cancer remain unclear. Here, they incorporated faecal metagenomic data from 10 independent cohorts from 7 countries and an additional in-house cohort, totalling 2101 metagenomes (748 CRC, 471 adenoma, and 882 healthy controls). Overall archaeal diversity shifted from healthy controls, patients with adenoma, to colorectal cancer patients. At species level, *Methanobrevibacter_A smithii* and *Methanobrevibacter_A sp002496065* are enriched in colorectal cancer, whereas 8 species are depleted in patients with CRC across multiple cohorts. A model incorporating archaeal and bacterial biomarkers discriminates colorectal cancer patients from healthy individuals with the area under the curve ranging from 0.744 to 0.931. Hence, archaeal biomarkers combined with bacterial features are promising diagnostic biomarkers for CRC (*Gastroenterology*, 2024).

Metabolic dysfunction-associated steatotic liver disease (MASLD)-associated Hepatocellular Carcinoma (HCC)

Squalene epoxidase (SQLE) promotes MASLD-HCC, but its role in modulating the tumour immune microenvironment remains unclear. They established hepatocyte-specific Sqle transgenic (tg) and knockout mice, and revealed that SQLE downregulates tumour-infiltrating functional IFN-γ^+ and Granzyme B^+ $CD8^+$ T cells while enriching Arg-1^+ myeloid-derived suppressor cells (MDSCs) in MASLD-HCC, thereby promoting immunosuppression. Mechanistically, SQLE-promoted cholesterol accumulation underlies its effect on $CD8^+$ T cells and MDSCs. Cholesterol depletion abolished the effect of SQLE-overexpressing on $CD8^+$ T cell suppression and MDSC activation, whereas cholesterol supplementation

had contrasting functions. Targeting SQLE with genetic or pharmacological inhibitor, terbinafine, rescued anti-PD-1 efficacy in MASLD-HCC models. SQLE is a thus promising target in boosting anti-PD-1 immunotherapy for MASLD-HCC (*Gut*, 2024).

Transmembrane 6 superfamily member 2 (TM6SF2) has a protective role against MASLD, but its role in MASLD-HCC is unclear. TM6SF2 is downregulated in tumours compared with adjacent normal tissues from MASLD-HCC patients. Hepatocyte-specific Tm6sf2 knockout accelerates tumorigenesis in mice with diet-induced or diet plus carcinogen-induced MASLD-HCC. They observed that Tm6sf2 knockout suppressed interferon-gamma (IFN-γ)$^{+}$CD8^{+} T cells, suggesting the Tm6sf2 might modulate antitumour immunity to suppress MASLD-HCC development. Mechanistically, TM6SF2 directly bound to IKKβ and inhibits NF-κB signalling to reduce interleukin (IL)-6 secretion, thereby activating cytotoxic CD8^{+} T cells. Accordingly, hepatic delivery of Tm6sf2 by adenovirus improved immunotherapy response in MASLD-HCC in mice. Collectively, their results suggest that TM6SF2 could be harnessed to boost MASLD-HCC immunotherapy (*Gut*, 2024).

Non-invasive biomarkers for digestive diseases

The current diagnosis of MASLD and its severe form, metabolic dysfunction-associated steatohepatitis (MASH), is suboptimal. In this study, the team recruited 700 individuals, including 184 from Hong Kong as a discovery cohort and 516 from San Diego, Wenzhou, and Hong Kong as three validation cohorts. A panel of 3 parameters (C-X-C motif chemokine ligand 10, cytokeratin 18 fragments M30, adjusted body mass index) was formulated (termed N3-MASH), which discriminates MASLD patients from healthy controls with an area under the receiver operating characteristic (AUROC) of 0.954. Among MASLD patients, N3-MASH identifies MASH with an AUROC of 0.823. Diagnostic performance of N3-MASH was confirmed in three validation cohorts Thus, they developed a robust blood-based panel for the non-invasive diagnosis of MASH, which might help clinicians reduce unnecessary liver biopsies (*Cell Metabolism*, 2024).

Recent studies have implicated metabolites as promising biomarkers in colorectal cancer. However, changes in plasma and faecal metabolomes during colorectal cancer progression (normal-adenoma-CRC) remain unclear. Here, plasma and faecal samples were collected from four independent cohorts of 1,251 individuals (422 CRC, 399 colorectal adenoma, and 430 normal controls). Metabolomic profiling revealed with consistent shift across disease progression are identified, including colorectal cancer-enriched oleic acid and -depleted alcoholic acid. Oleic acid exhibits pro-tumorigenic effects in cancer cells *in vitro* and *in vivo*, whereas alcoholic acid has opposite effects. Clinically, they establish a panel of 17 plasma metabolites that accurately diagnoses colorectal cancer in a discovery and three validation cohorts (AUC = 0.848–0.987). Overall, they characterise metabolite signatures, mechanistic significance, and diagnostic potential of plasma and faecal metabolomes in CRC (*Cancer Cell*, 2024).

Research and Scholarship

Research Awards and Recognitions

Name	Details	
	Award	Organisation
Jun Yu	Top Ten Academic Progress in Traditional Chinese Medicine in 2023	China Association of Traditional Chinese Medicine
	Outstanding Research Impact Award in the Faculty of Medicine	The Chinese University of Hong Kong
	Research Excellence Award 2023-24 in the Faculty of Medicine	The Chinese University of Hong Kong
	Ranked Top 1 in China and Top 96 in the world among Top Female Scientists for 2024	Best Global Scientists - issued by Research.com
	World's Top 2% Scientist	Stanford University

Research Awards and Recognitions

Name	Details	
	Award	Organisation
Jun Yu	Highly Cited Researchers	Clarivate
	National Top 100 Excellent Clinician	National Health Commission of China

Fellowships

Name	Details	
	Fellowship	Organisation
Jun Yu	Academician	Academia Europaea
		Academia Hong Kong
	Fellow	Academic Advisory Committee of Chinese Academy of Medical Sciences
		American Gastroenterology Association, USA
	Vice President	China Medical Women's Association Division of Digestive Disease
		Guangdong-Hong Kong-Macao Greater Bay Area Gastroenterology Association
	Vice Chairman	Cancer and Gut Microbiome Committee of China Anti-Cancer Association
		Chronic Disease Management Branch of China Medical Biotechnology Association
		Hong Kong Scientist Association, HK
		Digestive Disease Branch of the Cross-Strait Medicine and Health Exchange Association
	Member	International Cancer Genome Consortium, USA
		American Association for Cancer Research, USA
		Australian Medical Association, Australia
	Council Member	Hong Kong Immunology Association, HK
		China Anti-Cancer Association
		Microecology Branch of Chinese Preventive Medicine Association
	Expert Member	Expert Committee of the Collaborative Development Center of Gastroenterology Department of Beijing Hospital Administration

Fellowships

Name	Details	
	Fellowship	Organisation
Jun Yu	Executive Committee	Hong Kong Cancer Institute
	Admission Panel Member	The Incubation Programmes Run by the Hong Kong Science & Technology Park (HKSTP) under the Category "Biomedical Technology–Medical Devices/ Diagnostics".
	CPPCC Member	Hebei Committee of the Chinese People's Political Consultative Conference
	Committee Member	Professional Committee of Cancer Screening, Early Diagnosis and Early Treatment of China Anti-Cancer Association
	Advisory Board Member	Oncology & Cancer Research - Regional Advisory Board
	Nominating Committee	Microbiome & Microbial Therapy Section, AGA
	Deputy Chairman	Hebei Provincial Overseas Chinese Federation Expert Committee
Vincent Wong	Member	American Association for the Study of Liver Diseases
		European Association for the Study of the Liver
	Council Member	AsiaHep
		Hong Kong Association for the Study of Liver Diseases
Dennis Wong	Member	American Gastroenterology Association, USA
		Tumor Microecology of China Anti-Cancer Association
		China Anti-Cancer Association
	Council Member	Hong Kong Society for Immunology
Jennifer Zhang	Youth Vice Chairman	Cross-Strait Medical and Health Exchange Association Gastroenterology Branch
	Youth Member	Microecology Branch of Chinese Society of Preventive Medicine
	Member	American Gastroenterology Association, USA
		Tumor microecology of China Anti-Cancer Association
		Chronic Disease Management of China Medicinal Biotech Association
	Council Member	Hong Kong Society for Immunology

Fellowships

Name	Details	
	Fellowship	Organisation
Hongyan Gou	Member	Hong Kong Society for Immunology
		China Medical Education Association Traditional Chinese Medicine Chronic Disease Prevention and Treatment Project
		Beijing-Tianjin-Hebei Microbial Immunity Alliance
	Youth Vice Member	Cross-Strait Medical and Health Exchange Association Gastroenterology Branch

Academic Editorships

Name	Details	
	Role	Journal
Jun Yu	Associate Editor	Gut
		Oncogene
		Life Sciences
		Journal of Digestive Disease
		Journal of Pathology Research
		World Journal of Gastroenterology
		Hepatoma Research
		Oncogenesis
	Advisory Board	Cancer Cell
		EbioMedicine
	Associate Board	Molecular Oncology
	Deputy Chief Editor	Journal of Gastroenterology and Hepatology
		Chinese Medical Journal (English)
	Regional Advisory Board	Springer Nature
	Editor	Scientific Reports
		The Open Hepatology Journal
		Pragmatic and Observational Research
		ISRN Gastroenterology
		International Journal of Clinical Medicine
		Insight Knowledge

Academic Editorships

Name	Details	
	Role	Journal
Jun Yu	Editor	The Open Gastroenterology Journal
		Journal of Gastroenterology & Hepatology Research
Vincent Wong	Editorial Board Member	JHEP Reports
		Hepatology Communications
		Alimentary Pharmacology & Therapeutics
	Associate Editor	Clinical Gastroenterology and Hepatology
Dennis Wong	Associate Editor	Journal of Gastroenterology and Hepatology
	Editorial Board Member	Frontiers in Medicine
		Oncogene
	Guest Editorial Member	Cells
	Guest Associate Editor	Biomedicine
Jennifer Zhang	Editorial Board Member	Frontiers in Oncology
		Frontiers in Cell and Developmental Biology
		Frontiers in Microbiology
		International Journal of Medical Sciences
	Youth Editorial Board Member	Chinese Medical Journal
		Gastroenterology

Reviewers of Journal / Conference

Name	Details	
	Role	Journal / Conference
Jun Yu	Chair	AGA Abstract Review Committee-Microbiome
	Reviewer	Advanced Science
		Alimentary Pharmacology & Therapeutics
		American Journal of Gastroenterology
		American Journal of Pathology
		Annals of Internal Medicine
		Annals of Oncology

Reviewers of Journal / Conference

Name	Details	
	Role	Journal / Conference
Jun Yu	Reviewer	BioMed Research International
		BMC Cancer
		BMC Gastroenterology
		British Journal of Cancer
		Cancer
		Cancer Cell
		Cancer Discovery
		Cancer Letters
		Cancer Research
		Carcinogenesis
		Cell
		Cell & Bioscience
		Cell Death & Disease
		Cell Host & Microbe
		Cell Metabolism
		Cell Reports
		Cellular and Molecular Gastroenterology and Hepatology
		Clinical and Experimental Pharmacology and Physiology
		Clinical Cancer Research
		Clinical Gastroenterology and Hepatology
		Digestion
		Digestive Diseases and Sciences
		eBioMedicine
		FEBS Letters
		Gastroenterology
		Genomics Proteinomics & Bioinformatics
		BioMed Research International
		Gut
		Gut Microbes
		Hepatology
		HPDI

Reviewers of Journal / Conference

Name	Details	
	Role	Journal / Conference
Jun Yu	Reviewer	Human Molecular Genetics
		The International Journal of Biochemistry & Cell Biology
		International Journal of Cancer
		International Journal of Oncology
		ISRN Gastroenterology
		Journal of Clinical Investigation
		Journal of Current Pharmaceutical Design
		Journal of Gastroenterology and Hepatology
		Journal of Hepatology
		Lancet
		Microbiome
		Nature Communication
		Nature Medicine
		Nature Methods
		Nature Microbiology
		Nature Reviews Clinical Oncology
		Nature Reviews Gastroenterology and Hepatology
		New England Journal of Medicine
		Oncogene
		Science
		Signal Transduction and Targeted Therapy
Vincent Wong	Reviewer	Gastroenterology
		Gut
		Hepatology
		Journal of Hepatology
Dennis Wong	Reviewer	Gut
		Oncogene
		Pathology
		Pharmacological Research
		Pharmaceutics
		Theranostics

Reviewers of Journal / Conference

Name	Details	
	Role	Journal / Conference
Dennis Wong	Reviewer	Expert Opinion on Investigational Drugs
		Journal of Gastroenterology & Hepatology
		Molecules
		Metabolites
		Nature Communications
Jennifer Zhang	Reviewer	Cell Metabolism
		Gastroenterology
		Advanced Sciences
		Frontiers in Oncology
		Journal of Gastroenterology & Hepatology
		Journal of Leukocyte Biology
		Cancer Letters
		Gut
		Oncogene
		Med
		Cellular and Molecular Hepatology
		Life Sciences
		Frontiers in Immunology
		Alimentary Pharmacology & Therapeutics
		Experimental Cell Research
		Cell & Bioscience
		Cell Reports
		Engineering
		Health Sciences Report
Hongyan Gou	Reviewer	Oncogene
		Cancer Research
		Frontiers in Pharmacology
		Cancer Letters
		Experimental Cell Research
		Frontiers in Molecular Neuroscience

Grants and Consultancies

Name	Project Title	Funding Source	Start Date (dd/mm/yyyy)	End Date (dd/mm/yyyy)	Amount (HK$)
Jun Yu	RNA Demethylase AlkB Homolog 5 (ALKBH5) Drives Immune Suppression in Colorectal Cancer via Epitranscriptome Regulation of AXIN2-WNT-DKK1 Axis	Research Grants Council – General Research Fund	01/01/2022	31/12/2024	1,325,732
	Developing Probiotics into High-efficacy and Safe Prophylactics and Adjuvant Therapies for Colorectal Cancer	Research Grants Council – Research Impact Fund	30/06/2022	29/06/2027	9,790,000
	Non-invasive Diagnosis of Colorectal Cancer Using Microbiome Markers	Shenzhen-Hong Kong-Macau Technology Scheme	30/04/2022	30/04/2024	1,065,564
	Evaluation of the Combination of Mebendazole Plus Navitoclax for the Treatment of Non-alcoholic Fatty Liver Disease Associated-hepatocellular Carcinoma	Health Bureau – Health and Medical Research Fund	01/05/2022	30/04/2025	1,499,880
	Developing Mechanism-driven Probiotics for Improving Response to Immunotherapy in Colorectal Cancer	Innovation and Technology Commission – Innovation and Technology Fund - Research Talent Hub	01/11/2022	30/10/2024	3,994,999
	Fighting Disease Recurrence and Promoting Tissue Repair after Liver Transplantation: Translating Basic Discoveries to Clinical Excellence	Research Grants Council – Theme-based Research Scheme	01/12/2019	30/11/2024	45,000,000
	The Interaction of Key Intestinal Pathogens and Host Factors in Promoting the Development of Colorectal Cancer	National Key R&D Program of China	01/11/2020	30/10/2025	23,439,042

Grants and Consultancies

Name	Project Title	Funding Source	Start Date (dd/mm/yyyy)	End Date (dd/mm/yyyy)	Amount (HK$)
Jun Yu	Assess Antibiotic Resistome Flows from Pollution Hotspots to Environments and Explore the Control Strategies	Research Grants Council – Theme-based Research Scheme	01/12/2020	30/11/2025	29,000,000
	The Mechanism and Clinical Translation of the Gut Microbiota in Non-alcoholic Fatty Liver Disease	Guangdong-Hong Kong Technology Cooperation Scheme	01/07/2023	30/06/2025	2,200,000
	RNA N6-Methyladenosine Demethylase AlkB Homolog 5 (ALKBH5) Promotes Stemness and Chemoresistance in Colorectal Cancer: Mechanisms and Novel Therapeutic Approaches	Research Grants Council – General Research Fund	01/01/2024	31/12/2026	1,580,000
	Exploiting Epitranscriptome Dysregulation in Colorectal Carcinogenesis and Metastasis: Mechanisms and Novel Therapeutic Approaches	Research Grants Council – Collaborative Research Fund	30/06/2024	29/06/2027	76,000,000
	Research on the Composition Changes of Intestinal Microecology, its Interaction with the Host, and Prevention and Treatment Strategies in Gastrointestinal Cancer	National Science and Technology Major Project of China	01/08/2024	31/07/2028	8,522,688
Dennis Wong	Branched Chain Amino Acids (BCAA) Restriction to Alleviate Colorectal Cancer Metastasis	Health and Medical Research Fund	01/12/2021	30/11/2024	1,499,880
	SLC25A22 Drives Immune Suppression in KRAS-Mutant Colorectal Cancer through Metabolic Regulation of CXCL1/CXCR2 Axis	Research Grants Council – General Research Fund	01/01/2022	31/12/2024	1,155,532

Grants and Consultancies

Name	Project Title	Funding Source	Start Date (dd/mm/yyyy)	End Date (dd/mm/yyyy)	Amount (HK$)
Dennis Wong	Dissecting the Role of RNA N6-Methyladenosine Modification in Mutant KRAS-Driven Colorectal Cancer: Molecular Mechanisms and Targeted Therapy	Research Grants Council – General Research Fund	01/01/2023	31/12/2025	1,158,188
	Functional Investigation of Novel Oncogenic Bacterium Peptostreptococcus Stomatis in Colorectal Carcinogenesis and Chemoresistance	Health Bureau – Health and Medical Research Fund	01/08/2023	31/07/2026	1,499,880
Jennifer Zhang	Mechanism of Dietary Cholesterol-induced Mitochondrial Dysfunction in Fatty Liver Associated Liver Cancer	National Natural Sciences Fund of China	01/01/2022	31/12/2024	319,635
	Selective Blockade of p38α Alternative Activation in T Cells as A Novel Therapeutic Strategy for Non-alcoholic Steatohepatiti	Health Bureau – Health and Medical Research Fund	01/01/2022	31/12/2024	1,288,600
	Role of Intestine TM6SF2 in Protecting Non-alcoholic Fatty Liver Disease through the Maintenance of Gut Barrier Function	Research Grants Council – General Research Fund	01/10/2022	30/09/2025	1,120,716
	Basic and Translational Research of Non-alcoholic Fatty Liver Disease	National Natural Science Foundation of China – Excellent Young Scientists Fund (Hong Kong and Macao)	01/01/2023	31/12/2026	2,130,508
	Evaluation of Bifidobacterium pseudolongum as Prophylaxis Against Fatty Liver Disease-associated Liver Cancer through Gut-liver Axis	National Natural Sciences Fund of China	01/01/2023	31/12/2026	553,906

Grants and Consultancies

Name	Project Title	Funding Source	Start Date (dd/mm/yyyy)	End Date (dd/mm/yyyy)	Amount (HK$)
Jennifer Zhang	Establishing an Optimal Biomarker Panel for Non-invasive Diagnosis of Non-alcoholic Steatohepatitis	Health Bureau – Health and Medical Research Fund Research Fellowship Scheme, Hong Kong	01/04/2023	31/12/2025	1,080,920
	Elucidating the Role and Mechanism of TM6SF2 in Suppressing Fatty Liver Disease-associated Liver Cancer through Regulating Anti-tumor Immunity	Research Grants Council – General Research Fund	01/10/2023	30/09/2026	1,462,000
	Research on Steatotic Liver Disease and its Related Liver Cancer	The Chinese University of Hong Kong Research Start-up Fund – Improvement on Competitiveness in Hiring New Faculties Funding Scheme	01/11/2023	30/10/2025	1,500,000
Hongyan Gou	Study on the Mechanism of TRIP6 Promoting Colorectal Cancer Metastasis by Regulating Cancer Stem Cells	National Natural Sciences Foundation of China	01/01/2022	31/12/2024	319,606
	The Mechanism and Potential Clinical Application of Chinese Medicine Pien Tze Huang in Boosting Immunotherapy for Colorectal Cancer	Health Bureau – Health and Medical Research Fund	01/06/2024	31/05/2027	1,330,000

Publications

A. Journal Papers

1. Ha S, Zhang X, Yu J. Probiotics intervention in colorectal cancer: From traditional approaches to novel strategies. *Chinese Medical Journal*. 2024;137(1):8-20. doi:10.1097/cm9.0000000000002955. (Review)
2. She JJ, Liu WX, Ding XM, Guo G, Han J, Shi FY, Lau HCH, Ding CG, Xue WJ, Shi W, Liu GX, Zhang Z, Hu CH, Chen Y, Wong CC, Yu J. Defining the biogeographical map and potential bacterial translocation of microbiome in human 'surface organs'. *Nature Communications*. 2024;15(1). doi:10.1038/s41467-024-44720-6.
3. Wu WKK, Yu J. Microbiota-based biomarkers and therapeutics for cancer management. *Nature Reviews Gastroenterology and Hepatology*. 2024;21(2):72-73. doi:10.1038/s41575-023-00879-9. (Editorial)
4. Yang J, Wei H, Lin Y, Chu ESH, Zhou Y, Gou H, Guo S, Lau HCH, Cheung AHK, Chen H, To KF, Sung JJY, Wang Y, Yu J. High soluble fiber promotes colorectal tumorigenesis through modulating gut microbiota and metabolites in mice. *Gastroenterology*. 2024;166(2):323-337.e7. doi:10.1053/j.gastro.2023.10.012.
5. Kang ZR, Jiang S, Han JX, Gao Y, Xie Y, Chen J, Liu Q, Yu J, Zhao X, Hong J, Chen H, Chen YX, Chen H, Fang JY. Deficiency of BCAT2-mediated branched-chain amino acid catabolism promotes colorectal cancer development. *Biochimica et Biophysica Acta - Molecular Basis of Disease*. 2024;1870(2). doi:10.1016/j.bbadis.2023.166941.
6. Lyu Y, Xie F, Chen B, Shin WS, Chen W, He Y, Leung KT, Tse GMK, Yu J, To KF, Kang W. The nerve cells in gastrointestinal cancers: From molecular mechanisms to clinical intervention. *Oncogene*. 2024;43(2):77-91. doi:10.1038/s41388-023-02909-x. (Review)
7. Fu K, Cheung AHK, Wong CC, Liu W, Zhou Y, Wang F, Huang P, Yuan K, Coker OO, Pan Y, Chen D, Lam NM, Gao M, Zhang X, Huang H, To KF, Sung JJY, Yu J. Streptococcus anginosus promotes gastric inflammation, atrophy, and tumorigenesis in mice. *Cell*. 2024;187(4):882-896.e17. doi:10.1016/j.cell.2024.01.004.
8. Pan Z, Sharkway R El, Bayoumi A, Metwally M, Gloss BS, Brink R, Lu DB, Liddle C, Alqahtani SA, Yu J, O'Connell PJ, George J, Eslam M. Inhibition of MERTK reduces organ fibrosis in mouse models of fibrotic disease. *Science Translational Medicine*. 2024;16(741). doi:10.1126/scitranslmed.adj0133.
9. Lau HCH, Zhang X, Ji F, Lin Y, Liang W, Li Q, Chen D, Fong W, Kang X, Liu W, Chu ESH, Ng QWY, Yu J. Lactobacillus acidophilus suppresses non-alcoholic fatty liver disease-associated hepatocellular carcinoma through producing valeric acid. *eBioMedicine*. 2024;100. doi:10.1016/j.ebiom.2023.104952.
10. Wong CC, Yu J. Mapping the pancancer metastasis tumor microbiome. *Cell*. 2024;187(9):2126-2128. doi:10.1016/j.cell.2024.03.040. (Editorial)
11. Kang X, Lau HCH, Yu J. Modulating gut microbiome in cancer immunotherapy: Harnessing microbes to enhance treatment efficacy. *Cell Reports Medicine*. 2024;5(4). doi:10.1016/j.xcrm.2024.101478. (Review)
12. Zeng J, Xie C, Huang Z, Cho CH, Chan H, Li Q, Ashktorab H, Smoot DT, Wong SH, Yu J, Gong W, Liang C, Xu H, Chen H, Liu X, Wu JCY, Ip M, Gin T, Zhang L, Chan MTV, Hu W, Wu WKK. LOX-1 acts as an N^6-methyladenosine-regulated receptor for *helicobacter pylori* by binding to the bacterial catalase. *Nature Communications*. 2024;15(1). doi:10.1038/s41467-024-44860-9.
13. Su ACY, Ding X, Lau HCH, Kang X, Li Q, Wang X, Liu Y, Jiang L, Lu Y, Liu W, Ding Y, Cheung AHK, To KF, Yu J. Lactococcus lactis HkyuLL 10 suppresses colorectal tumourigenesis and restores gut microbiota through its generated alpha-mannosidase. *Gut*. Published online August 8, 2024. doi:10.1136/gutjnl-2023-330835.
14. Shi L, Wang X, Guo S, Gou H, Shang H, Jiang X, Wei C, Wang J, Li C, Wang L, Zhao Z, Yu W, Yu J. TMEM65 promotes gastric tumorigenesis by targeting YWHAZ to activate PI3K-Akt-mTOR pathway and is a therapeutic target. *Oncogene*. 2024;43(13):931-943. doi:10.1038/s41388-024-02959-9.
15. Wen J, Zhang X, Wong CC, Zhang Y, Pan Y, Zhou Y, Cheung AHK, Liu Y, Ji F, Kang X, Liu D, Yu J. Targeting squalene epoxidase restores anti-PD-1 efficacy in metabolic dysfunction-associated steatohepatitis-induced hepatocellular carcinoma. *Gut*. Published online November 11, 2024. doi:10.1136/gutjnl-2023-331117.

16. Liu Y, Wong CC, Ding Y, Gao M, Wen J, Lau HCH, Cheung AHK, Huang D, Huang H, Yu J. Peptostreptococcus anaerobius mediates anti-PD1 therapy resistance and exacerbates colorectal cancer via myeloid-derived suppressor cells in mice. *Nature Microbiology*. 2024;9(6):1467-1482. doi:10.1038/s41564-024-01695-w.

17. Zeng R, Gou H, Lau HCH, Yu J. Stomach microbiota in gastric cancer development and clinical implications. *Gut*. Published online November 11, 2024. doi:10.1136/gutjnl-2024-332815.

18. Chen D, Ji F, Zhou Q, Cheung H, Pan Y, Lau HCH, Liang C, Yang Z, Huang P, Wei Q, Cheung AHK, Kang W, Chen H, Yu J, Wong CC. RUVBL1/2 blockade targets YTHDF1 activity to suppress m6A-dependent oncogenic translation and colorectal tumorigenesis. *Cancer Research*. 2024;84(17):2856-2872. doi:10.1158/0008-5472.can-23-2081.

19. Huang P, Ji F, Cheung AHK, Fu K, Zhou Q, Ding X, Chen D, Lin Y, Wang L, Jiao Y, Chu ESH, Kang W, To KF, Yu J, Wong CC. Peptostreptococcus stomatis promotes colonic tumorigenesis and receptor tyrosine kinase inhibitor resistance by activating ERBB2-MAPK. *Cell Host and Microbe*. 2024;32(8):1365-1379.e10. doi:10.1016/j.chom.2024.07.001.

20. Liu X, Chen B, Xie F, Wong KY, Cheung AH-K, Zhang J, Wu Q, Fang C, Hu J, Wang S, Xu D, Chen J, Wang Y, Wong CC, Chen H, Wu WKK, Yu J, Chan MWY, Tsang CM, Lo KW, Tse GMK, To KF, Kang W. FOXP4 is a direct YAP1 target that promotes gastric cancer stemness and drives metastasis. *Cancer Research*. Published online November 4, 2024. doi:10.1158/0008-5472.can-23-3074.

21. Wang S, Zeng Y, Zhu L, Zhang M, Zhou L, Yang W, Luo W, Wang L, Liu Y, Zhu H, Xu X, Su P, Zhang X, Ahmed M, Chen W, Chen M, Chen S, Slobodyanyuk M, Xie Z, Guan J, Zhang W, Khan AA, Sakashita S, Liu N, Pham N-A, Boutros PC, Ke Z, Moran MF, Cai Z, Cheng C, Yu J, Tsao MS, He HH. The N^6-methyladenosine epitranscriptomic landscape of lung adenocarcinoma. *Cancer Discovery*. Published online November 1, 2024:OF1-OF21. doi:10.1158/2159-8290.cd-23-1212.

22. Yang Z, Yu J, Wong CC. Gastrointestinal cancer patient derived organoids at the frontier of personalized medicine and drug screening. *Cells*. 2024;13(16). doi:10.3390/cells13161312. (Review)

23. Cheng H, Yu J, Wong CC. Adenosine-to-inosine RNA editing in cancer: Molecular mechanisms and downstream targets. *Protein & Cell*. Published online August 10, 2024. doi:10.1093/procel/pwae039. (Review)

24. Sun Y, Zhang X, Hang D, Lau HCH, Du J, Liu C, Xie M, Pan Y, Wang L, Liang C, Zhou X, Chen D, Rong J, Zhao Z, Cheung AHK, Wu Y, Gou H, Wong CC, Du L, Deng J, Hu Z, Shen H, Miao Y, Yu J. Integrative plasma and fecal metabolomics identify functional metabolites in adenoma-colorectal cancer progression and as early diagnostic biomarkers. *Cancer Cell*. 2024;42(8):1386-1400.e8. doi:10.1016/j.ccell.2024.07.005.

25. Xu W, Zhang Y, Chen D, Huang D, Zhao Y, Hu W, Lin L, Liu Y, Wang S, Zeng J, Xie C, Chan H, Li Q, Chen H, Liu X, Wong SH, Yu J, Chan FKL, Chan MTV, Ng SC, Wu WKK, Zhang L. Elucidating the genotoxicity of *Fusobacterium nucleatum*-secreted mutagens in colorectal cancer carcinogenesis. *Gut Pathogens*. 2024;16(1). doi:10.1186/s13099-024-00640-w.

26. Li S, Zhu S, Yu J. The role of gut microbiota and metabolites in cancer chemotherapy. *Journal of Advanced Research*. Published online October 1, 2023. doi:10.1016/j.jare.2023.11.027. (Review)

27. Wang X, Fang Y, Liang W, Wong CC, Qin H, Gao Y, Liang M, Song L, Zhang Y, Fan M, Liu C, Lau HCH, Xu L, Li X, Song W, Wang J, Wang N, Yang T, Mo M, Zhang X, Fang J, Liao B, Sung JJY, Yu J. *Fusobacterium nucleatum* facilitates anti-PD-1 therapy in microsatellite stable colorectal cancer. *Cancer cell*. 2024;42(10):1729-1746. doi:10.1016/j.ccell.2024.08.019.

28. Gou H, Zeng R, Lau HCH, Yu J. Gut microbial metabolites: Shaping future diagnosis and treatment against gastrointestinal cancer. *Pharmacological Research*. 2024;208. doi:10.1016/j.phrs.2024.107373.

29. Li T, Coker OO, Sun Y, Li S, Liu C, Lin Y, Wong SH, Miao Y, Sung JJY, Yu J. Multi-cohort analysis reveals altered archaea in colorectal cancer fecal samples across populations. *Gastroenterology*. 2025;168(3):525-538.e2. doi:10.1053/j.gastro.2024.10.023. (Epub ahead of print)

30. Zhang X, Zheng MH, Liu D, Lin Y, Song SJ, Chu ESH, Liu D, Singh S, Berman M, Lau HCH, Gou H, Wong GLH, Zhang N, Yuan HY, Loomba R, Wong VWS, Yu J. A blood-based biomarker panel for non-invasive diagnosis of metabolic dysfunction-associated steatohepatitis. *Cell Metabolism*. Published online January 7, 2024. doi:10.1016/j.cmet.2024.10.008. (Epub ahead of print)

31. Lin Y, Xie M, Lau HCH, Zeng R, Zhang R, Wang L, Li Q, Wang Y, Chen D, Jiang L, Damsky W, Yu J. Effects of gut microbiota on immune checkpoint inhibitors in multi-cancer and as microbial biomarkers for predicting therapeutic response. *Med (New York, NY)*. Published online 2024. doi:10.1016/j.medj.2024.10.007. (Epub ahead of print)

32. Xu Z, Yeoh YK, Tun HM, Fei N, Zhang J, Morrison M, Kamm MA, Yu J, Chan FKL, Ng SC. Variation in the metagenomic analysis of fecal microbiome composition calls for a standardized operating approach. *Microbiology spectrum*. 2024;12(12):e0151624. doi:10.1128/spectrum.01516-24.

33. Wong CC, Yu J. Redefining the gastric microbes in promoting gastric tumorigenesis: The rise of the Non-H. pylori microbiome. *Cancer discovery*. 2024;14(11):2051-2054. doi:10.1158/2159-8290.cd-24-0835. (Editorial)

34. Dong Y, Liu JJ, Zhou Y, Kang W, Li S, Cheung AHK, Yi H, Liao R, Wong N, Wong CC, Ng SSM, Yu J. VSTM2A reverses immunosuppression in colorectal cancer by antagonizing the PD-L1/PD-1 interaction. *Molecular Therapy*. Published online November 6, 2024. doi:10.1016/j.ymthe.2024.09.023.

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36. Ha S, Wong VWS, Zhang X, Yu J. Interplay between gut microbiome, host genetic and epigenetic modifications in MASLD and MASLD-related hepatocellular carcinoma. *Gut*. Published online December 10, 2024. doi:10.1136/gutjnl-2024-332398. (Epub ahead of print)

37. Zeng R, Sung JJY, Yu J. New pathogen for gastric cancer: *Streptococcus anginosus*. *Clinical and Translational Medicine*. 2024;14(12). doi:10.1002/ctm2.70104. (Editorial)

38. Zhang Y, Xie M, Wen J, Liang C, Song Q, Liu W, Liu Y, Song Y, Lau HCH, Cheung AHK, Man K, Yu J, Zhang X. Hepatic TM6SF2 activates antitumour immunity to suppress metabolic dysfunction-associated steatotic liver disease-related hepatocellular carcinoma and boosts immunotherapy. *Gut*. Published online 2024. doi:10.1136/gutjnl-2024-333154.

39. Yu Y, Farooq MS, Eberhart Meessen S, Jiang Y, Kato D, Zhan T, Weiss C, Seger R, Kang W, Zhang X, Yu J, Ebert MPA, Burgermeister E. Nuclear pore protein POM121 regulates subcellular localization and transcriptional activity of PPARγ. *Cell Death and Disease*. 2024;15(1). doi:10.1038/s41419-023-06371-1.

B. Patents

1. **China Patent:**

   Title: TTPAL as a marker for monitoring and prognosis in gastric cancer (Granted)
   Inventors: Jun Yu, Hongyan Gou
   Filing Date: 29 September 2020
   Application No.: CN202011051380.3
   Publication Date: 12 April 2022
   Publication No.: CN114317730A
   Grant Date: 9 January 2024
   Patent No.: ZL202011051380.3

   Title: Biomarker combinations for liver cancer diagnosis and their applications
   Inventors: Jun Yu, Jennifer Zhang
   File No.: 202410658838.3
   Filing Date: 24 March 2024

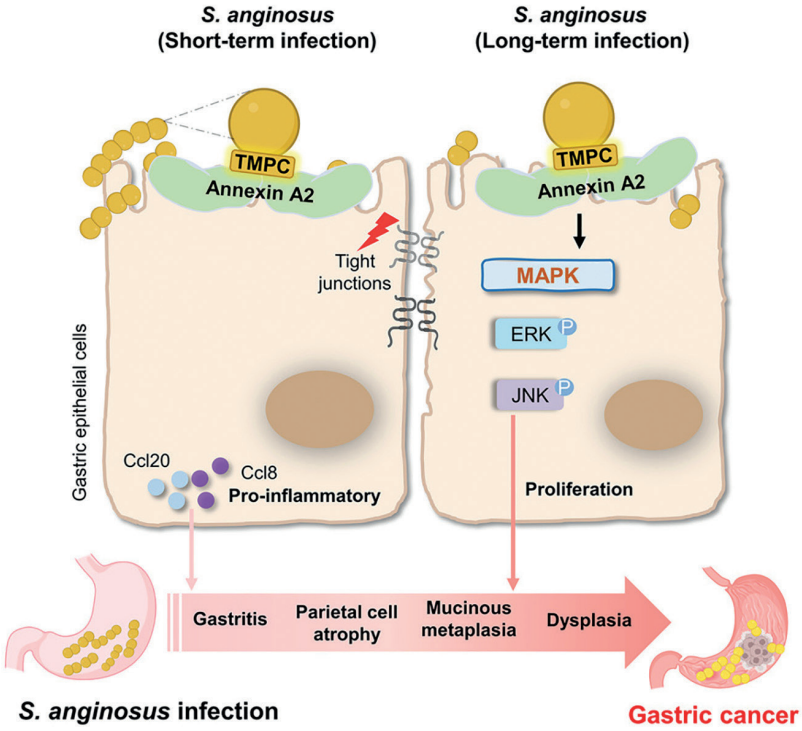
2. **Hong Kong Patent**

Title: The use of TTPAL as a marker for monitoring or prognosis determination of gastric cancer
Inventors: Jun Yu, Hongyan Gou
Application No.: 42022061023.2
Publication Date: 9 December 2022
Publication No.: CN114317730A
Grant Date: 15 July 2024
Patent No.: CN 114317730 B

3. **The United States Patent**

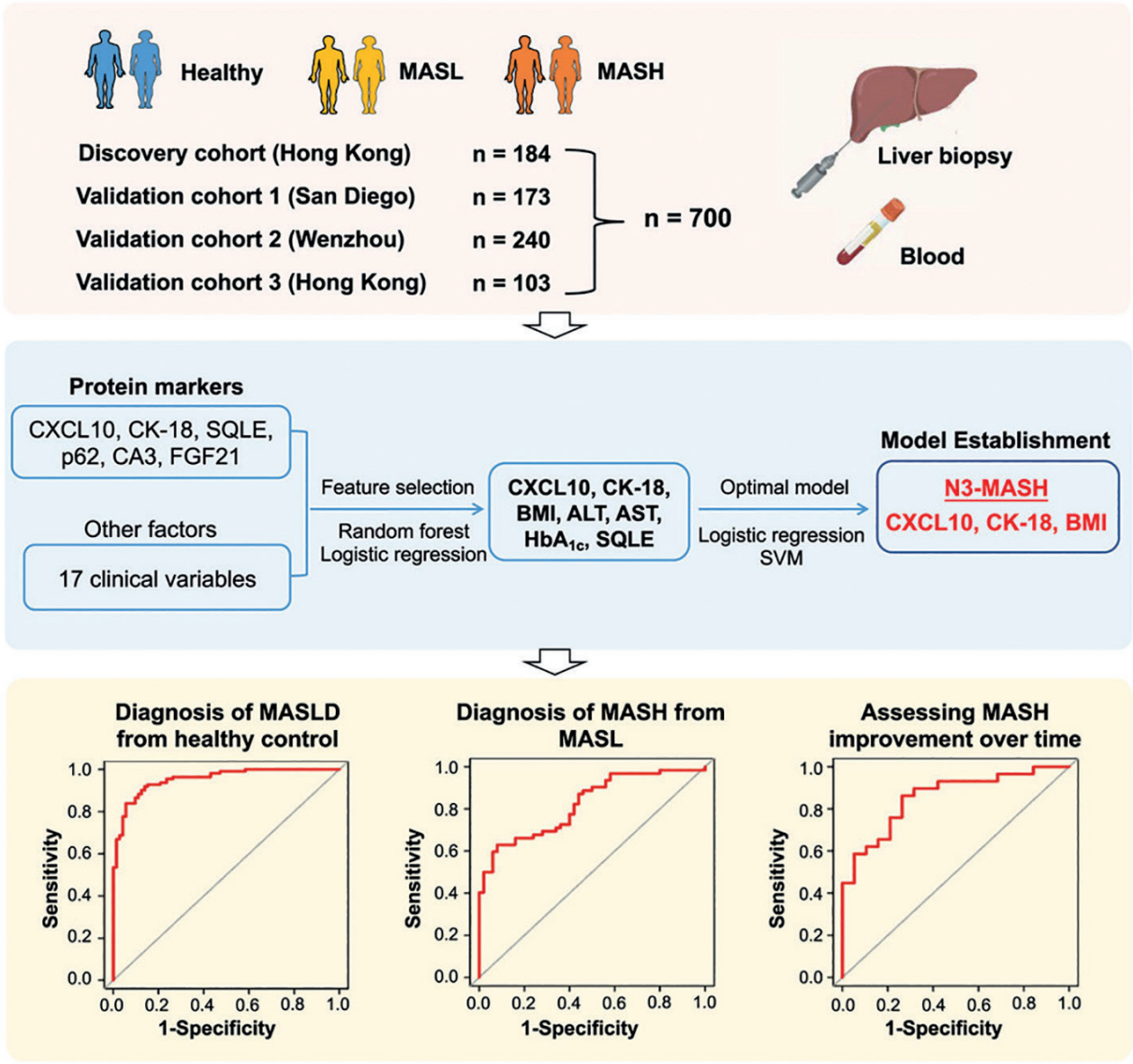
Title: Probiotic compositions for treating and preventing colorectal cancer (Granted)
Inventors: Jun Yu, William Wu, Qing Li
File Date: 4 August 2022
Application No.: US17/881,498
Date of Patent: 7 May 2024
Patent No.: US 11,975,034B2

Title: Compositions and methods for treating metabolic dysfunction-associated steatotic liver diseases
Inventors: Jun Yu, Jennifer Zhang
File No.: 63/728,068
Filing Date: 4 December 2024



The team led by Jun Yu identified a novel *S. anginosus* that is enriched in gastric cancer patients. *S. anginosus* induces gastritis-atrophy-metaplasia-dysplasia sequence in mice via TMPC-Annexin A2 axis to activate MAPK signalling in gastric cancer cells.

Source: Fu K, Cheung AHK, Wong CC, Liu W, Zhou Y, Wang F, Huang P, Yuan K, Coker OO, Pan Y, Chen D, Lam NM, Gao M, Zhang X, Huang H, To KF, Sung JJY, Yu J. Streptococcus anginosus promotes gastric inflammation, atrophy, and tumorigenesis in mice. Cell. 2024;187(4):882-896.e17. doi:10.1016/j.cell.2024.01.004.



The team led by Jun Yu developed a robust blood-based panel N3-MASH for the non-invasive diagnosis of MASH. Among MAFLD patients, N3-MASH can identify MASH with an AUROC of 0.823. Its diagnostic performance was confirmed in three validation cohorts from Hong Kong, China and USA with AUROC >0.800.

Source: Zhang X, Zheng MH, Liu D, Lin Y, Song SJ, Chu ESH, Liu D, Singh S, Berman M, Lau HCH, Gou H, Wong GLH, Zhang N, Yuan HY, Loomba R, Wong VWS, Yu J. A blood-based biomarker panel for non-invasive diagnosis of metabolic dysfunction-associated steatohepatitis. Cell Metabolism. Published online January 7, 2024. doi:10.1016/j.cmet.2024.10.008.



Digestive Diseases, Gastroenterology and Hepatology

Gastroenterology and Hepatology

消化、腸胃及肝臟疾病研究

PRINCIPAL INVESTIGATOR | **Louis Lau**

TEAM MEMBERS | Min Dai, Hau Yin Hui, Pok Nga Lai, Chiu Wai Li, Zhouyao Qian, Wai Yi Seto, Felix Sia, Xiang Xiao, Jeffrey Yu

Research Progress Summary

Publications

Louis Lau and his research team have published several original research articles in first-quartile journals in the field of gastroenterology and hepatology. One of the top research articles has attracted public awareness on the clinical use of artificial intelligence in colonoscopy through press conferences and media exposure.

Academic Conferences

They have active participation in different regional and international academic conferences this year, including Digestive Disease Week (DDW), Asian Pacific Digestive Week (APDW), ENDO2024 and International Digestive Disease Forum (IDDF). Several oral and poster presentations were given by the principal investigator and team members.

Research Collaborations

They have established ongoing collaborations with other academic institutes and commercial industries. They are involved in many multi-centre international clinical trials in the field of gastroenterology as both the leading and participating institute.

Research and Scholarship

Research Awards and Recognitions

Name	Details	
	Award	Organisation
Louis Lau	Prize for Best Original Research by Young Fellows (Bronze Medal)	Hong Kong Academy of Medicine
	WEO Best Abstract Award	ENDO2024, World Endoscopy Organisation
	Emerging Stars	World Endoscopy Organisation
Xiang Xiao	HKSGE Travel Scholarship (for APDW 2024)	The Hong Kong Society of Gastroenterology

Fellowship

Name	Details	
	Fellowship	Organisation
Louis Lau	SH Ho Visiting Professorship Exchange Programme	Faculty of Medicine, The Chinese University of Hong Kong and Stanford University

Academic Editorships

Name	Details	
	Role	Journal
Louis Lau	Editorial Board	Gastroenterology
		Alimentary Pharmacology & Therapeutics

Reviewers of Journal / Conference

Name	Details	
	Role	Journal / Conference
Louis Lau	Reviewer	Endoscopy International Open
		Gut
		Gastrointestinal Endoscopy
		Journal of Gastroenterology and Hepatology
		Techniques and Innovations in Gastrointestinal Endoscopy
	Abstract reviewer	International Digestive Disease Forum

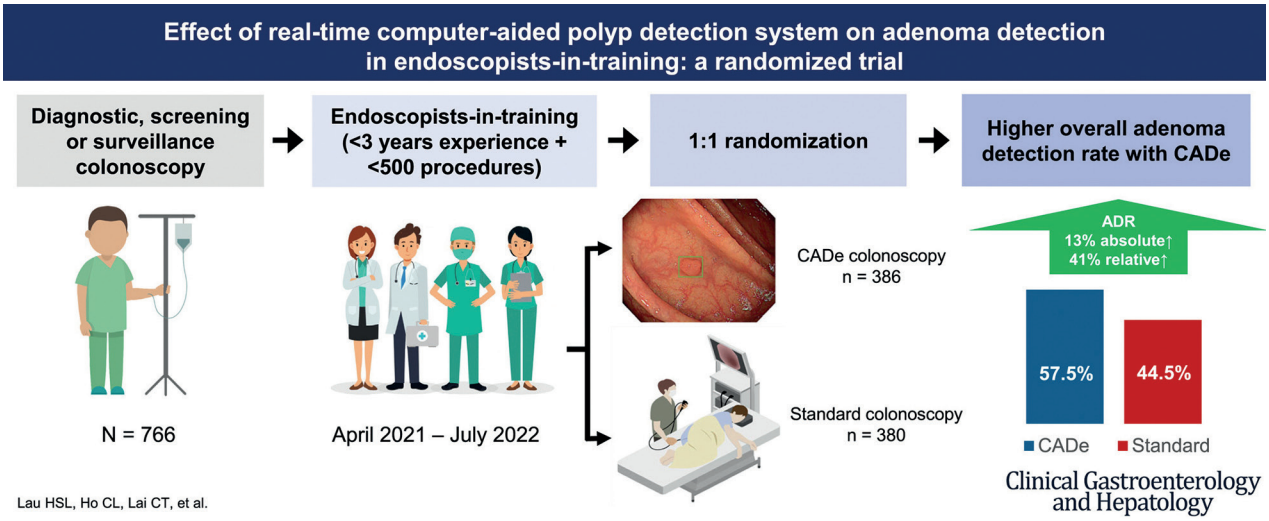
Grants and Consultancies

Name	Project Title	Funding Source	Start Date (dd/mm/yyyy)	End Date (dd/mm/yyyy)	Amount (HK$)
Louis Lau	A Prospective Multicentre Study to Assess the Diagnostic Accuracy of a Panel of Bacterial Gene	New Zealand Society of Gastroenterology – APAGE Research Programme Award	01/01/2024	31/12/2025	156,400
	A Double Blinded Randomised Controlled Trial of a Novel Oral Synbiotic Formula in Reducing Adenoma Recurrence and Colorectal Neoplasia-related Bacterial Gene Markers	Research Grants Council – General Research Fund	29/06/2024	28/06/2027	1,400,000
	Combination of Artificial Intelligence (ENDOAID) and Mucosal Exposure Device (Endocuff Vision®) to Enhance Colorectal Neoplasia Detection: A Randomised Controlled Trial	Health Bureau – Health and Medical Research Fund	01/07/2023	30/06/2026	1,499,240
	A Double Blinded Randomised Controlled Trial on Prophylactic Clipping to Prevent Post-polypectomy Bleeding after Colonoscopy in Direct Oral Anticoagulant Users (PROCLIP Study)	Research Grants Council – Early Career Scheme	01/01/2023	31/12/2025	858,524
	Prediction of Gastric Cancer in Intestinal Metaplasia and Atrophic Gastritis – Application of Artificial Intelligence in Histology and Clinical Data (GIMA Study)	Health Bureau – Health and Medical Research Fund Research Fellowship Scheme	01/10/2022	30/09/2024	1,082,716

Publications

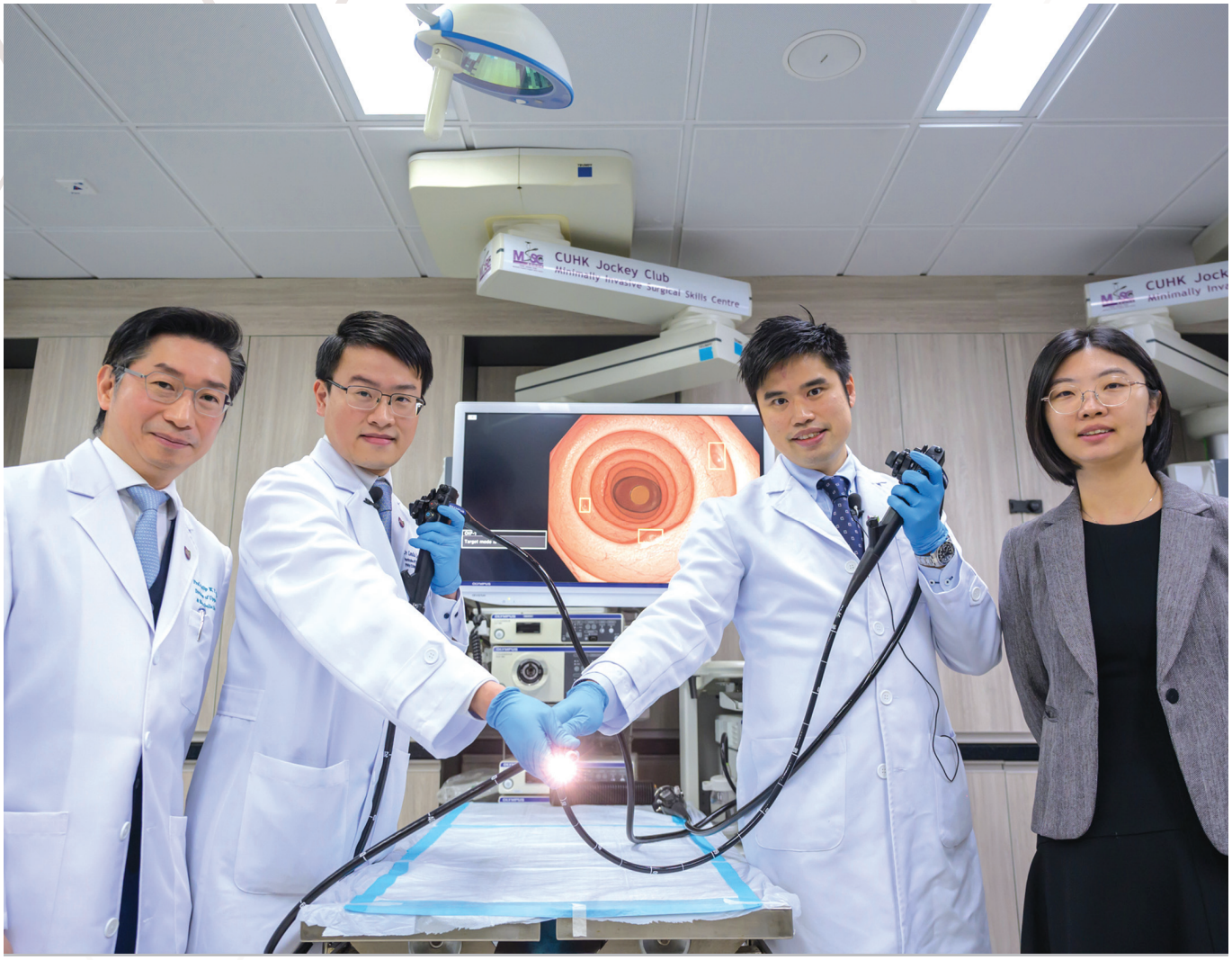
A. Journal Papers

1. Lau LHS, Ho JCL, Lai JCT, Ho AHY, Wu CWK, Lo VWH, Lai CMS, Scheppach MW, Sia F, Ho KHK, Xiao X, Yip TCF, Lam TYT, Kwok HYH, Chan HCH, Lui RN, Chan TT, Wong MTL, Ho MF, Ko RCW, Hon SF, Chu S, Futaba K, Ng SSM, Yip HC, Tang RSY, Wong VWS, Chan FKL, Chiu PWY. Effect of real-time computer-aided polyp detection system (ENDO-AID) on adenoma detection in endoscopists-in-training: A randomised trial. *Clinical Gastroenterology and Hepatology*. 2024;22(3):630-641.e4. doi:10.1016/j.cgh.2023.10.019.
2. Dai M, Xiao X, Guo CLT, Lui RN, Yip HC, Chu S, Hon SF, Ng SSM, Chiu PWY, Ng SC, Chan FKL, Lau LHS. The long-term risk of metachronous advanced adenoma recurrence after endoscopic submucosal dissection for colorectal neoplasia: A propensity-score matched longitudinal cohort with 5-year follow-up. *United European Gastroenterology Journal*. Published online 2024. doi:10.1002/ueg2.12735.



Graphical abstract of research article on artificial intelligence-assisted colonoscopy

Source: Lau LHS, Ho JCL, Lai JCT, Ho AHY, Wu CWK, Lo VWH, Lai CMS, Scheppach MW, Sia F, Ho KHK, Xiao X, Yip TCF, Lam TYT, Kwok HYH, Chan HCH, Lui RN, Chan TT, Wong MTL, Ho MF, Ko RCW, Hon SF, Chu S, Futaba K, Ng SSM, Yip HC, Tang RSY, Wong VWS, Chan FKL, Chiu PWY. Effect of real-time computer-aided polyp detection system (ENDO-AID) on adenoma detection in endoscopists-in-training: A randomised trial. Clinical Gastroenterology and Hepatology. 2024;22(3):630-641.e4. doi:10.1016/j.cgh.2023.10.019



Press release on artificial intelligence-assisted colonoscopy research

Source: Press Release on 26 December 2023



Digestive Diseases, Gastroenterology and Hepatology

Advanced Liver Diseases & Viral Hepatitis

消化、腸胃及肝臟疾病研究

PRINCIPAL INVESTIGATOR | **Jimmy Lai**

TEAM MEMBERS | Vincent Wong, Grace Wong, Terry Yip, Yee Kit Tse, Vicki Hui, Mandy Lai, Angel Chim, Yan Liang, Sally Shu, Julie Leung, Yin Lam Huen, Kam Wing Cheung, Cheuk Kwan Lai, Sze Yi Wong, Wun Lam, Pete Tse, Katherine Kwan, Cheuk Man Lai, Siu Yuen Ng, Wai Yan Yau, Man Ki Chiu

Research Progress Summary

Research Summary

Jimmy Lai joined the Li Ka Shing Institute of Health Sciences on 1 July 2024. His research team performed a few key studies regarding multiple liver diseases, namely chronic hepatitis B (CHB), metabolic dysfunction-associated steatotic liver disease (MASLD) and cirrhosis and portal hypertension. For instance, they studied the risk of fracture among patients with CHB taking entecavir or tenofovir disoproxil fumarate (*Journal of Hepatology* 2024; 10.1016/j.jhep.2023.12.001). The team also initiated a systematic review and meta-analysis on the histological severity, clinical outcomes and the impact of antiviral treatment in patients with CHB in the indeterminate phase (*Journal of Hepatology* 2025; doi: 10.1016/j.jhep.2024.11.018). He also conducted studies regarding cirrhosis and portal hypertension, such as the safety of anticoagulants in cirrhosis and the secular trend of comorbidities and co-medications in patients with cirrhosis over the past decades. These results were presented as oral and poster presentations in international conferences listed below.

Research Collaboration

In 2024, Jimmy collaborated with different Asian and European centres to conduct studies related to cirrhosis and portal hypertension. He is leading a multicentre randomised controlled trial entitled "Baveno VII Criteria-guided Initiation of Non-selective Beta Blocker in Patients with Compensated Advanced Chronic Liver Disease to Reduce Hepatic Decompensation: An Open-label Randomised Controlled Trial" (registration number NCT06449339). He collaborated with the Baveno Cooperation, including multiple study sites around the world on hepatic recompensation in alcohol-related cirrhosis. Jimmy, being a member in the Emerging Leaders Committee of the Asian Pacific Association of Gastroenterology, collaborated with other members in the committee to write a comprehensive review on liver diseases and hepatocellular carcinoma in the Asia-Pacific region (*Nature Reviews Gastroenterology and Hepatology* 2024; doi: 10.1038/s41575-024-00967-4). He also collaborated with investigators from Stanford University to look into the incidence of alcohol-associated hepatitis in Hong Kong and the United States following the onset of the COVID-19 pandemic (*JHEP Reports*; doi: 10.1016/j.jhepr.2024.101254). Moreover, he collaborated with investigators from Yokohama City University on the performance of continuous controlled attenuation parameter and liver stiffness measurement by the novel SmartExam in MASLD (*Liver International 2024*, doi: 10.1111/liv.15862).

Academic Conferences

In 2024, Jimmy had two oral presentations on cirrhosis and portal hypertension at the Annual Meeting of the Asian Pacific Association for the Study of the Live (APASL) in Kyoto, Japan, as well as another oral presentation on treatment of chronic hepatitis B at the Asian Pacific Digestive Week (APDW) in Bali, Indonesia. He also had one poster presentation on chronic hepatitis B at the Liver Meeting by The American Association for the Study of Liver Diseases (AASLD) in San Diego, USA. He also attended the European Association for the Study of the Liver (EASL) Congress in Milan, Italy to discuss and cultivate international collaborations with researchers around the world. Lastly, He was invited to Yangon, Myanmar in December 2024 to give a talk on portal hypertension at the Myanmar Hepatology and Gastroenterology Conference.

Research and Scholarship

Research Awards and Recognitions

Name	Details	
	Award	Organisation
Jimmy Lai	Investigator Award	Asian Pacific Association for the Study of the Liver
	Travel Award	
	Distinguished Research Paper Award for Young Investigators	Hong Kong College of Physicians
	HKASLD Future Leaders Incubator Scheme	Hong Kong Association for the Study of Liver Diseases
Terry Yip	Outstanding Reviewer Award	Hepatoma Research
	Best Poster Presentation Award - Clinical Viral Hepatitis	European Association for the Study of the Liver Congress 2024

Academic Editorships

Name	Details	
	Role	Journal
Jimmy Lai	Review Editor	Frontiers in Gastroenterology – Hepatology
		Frontiers in Medicine – Hepatobiliary Diseases
	Junior Editorial Board	Metabolism and Target Organ Damage
Terry Yip	Associate Editor	Journal of Hepatology
		Frontiers in Gastroenterology - Hepatology Section
		Frontiers in Medicine - Hepatobiliary Diseases
	Editorial Board Member	Clinical Gastroenterology and Hepatology
		Alimentary Pharmacology & Therapeutics
		Hepatology Communications
		Hepatoma Research

Reviewers of Journal / Conference

Name	Details	
	Role	Journal / Conference
Jimmy Lai	Reviewer	Alimentary Pharmacology & Therapeutics
		BMC Infectious Diseases
		Cancer Medicine
		Frontiers in Endocrinology
		Frontiers in Gastroenterology
		Frontiers in Medicine
		Hong Kong Medical Journal
		Journal of Gastroenterology and Hepatology
		Journal of Hepatology
		World Journal of Gastroenterology
Terry Yip	Reviewer	Alimentary Pharmacology & Therapeutics
		Annals of Hepatology
		Arab Journal of Gastroenterology
		Asian Pacific Digestive Week 2024
		Asia-Pacific Journal of Clinical Oncology
		Cancer Medicine
		Clinical and Molecular Hepatology
		Clinical Gastroenterology and Hepatology

Reviewers of Journal / Conference

Name	Details	
	Role	Journal / Conference
Terry Yip	Reviewer	Clinical Nutrition ESPEN
		Clinics and Research in Hepatology and Gastroenterology
		Cochrane
		Computers in Biology and Medicine
		Diabetes Research and Clinical Practice
		Digital Health
		eClinicalMedicine
		Expert Review of Anticancer Therapy
		Exploration of Digestive Diseases
		Frontiers in Medicine
		Frontiers in Oncology
		Gastroenterology Report
		Gastrointestinal Tumors
		Gut
		Hepatology
		Hepatology Communications
		Hepatology International
		International Digestive Disease Forum 2024
		International Immunopharmacology
		JACI in Practice
		Journal of Clinical and Experimental Hepatology
		JHEP Reports
		Journal of Cancer Metastasis and Treatment
		Journal of Gastroenterology and Hepatology
		Journal of Hepatocellular Carcinoma
		Journal of Medical Virology
		Kidney International
		Liver Cancer
		Liver International
		Nephrology
		Public Health
		World Journal of Gastroenterology

Grants and Consultancies

Name	Project Title	Funding Source	Start Date (dd/mm/yyyy)	End Date (dd/mm/yyyy)	Amount (HK$)
Chester Lai	Prospective Evaluation of a Fast-track Treatment Pathway for Patients with Chronic Hepatitis B under Primary Care	Hong Kong College of Physicians – Young Investigator Research Grant	01/05/2022	31/12/2025	80,000
Vincent Wong Terry Yip	Monitoring Changes in Liver Fat during a Lifestyle Modification Programme by the Novel Continuous Controlled Attenuation Parameter	Research Grants Council – General Research Fund	01/01/2024	31/12/2025	1,400,000
Terry Yip	Workshops on Research Data Management for Patient and Healthcare Data	The Chinese University of Hong Kong Library Committee on Research Data Management – Faculty RDM Incentivising Programme Fund	02/01/2024	31/12/2025	100,000
	Secular Trends of Diabetic Care in Patients with Liver Cirrhosis	Research Grants Council – Early Career Scheme	01/01/2024	31/12/2026	1,084,888
	Unsupervised Trajectory Clustering of Monitoring Biomarkers for Predicting Risk of Liver-related Complications in Patients with Type 2 Diabetes Mellitus: A Territory-wide Cohort Study	Health Bureau – Health and Medical Research Fund	01/08/2023	31/07/2025	863,380
	A Novel Risk-stratified Screening for Non-alcoholic Fatty Liver Disease in Patients with Type 2 Diabetes Mellitus: A Territory-Wide Cohort Study	Health Bureau – Health and Medical Research Fund	01/09/2022	31/08/2024	1,297,284

Grants and Consultancies

Name	Project Title	Funding Source	Start Date (dd/mm/yyyy)	End Date (dd/mm/yyyy)	Amount (HK$)
Terry Yip	Novel Strategies to Facilitate Early Detection, Prevention and Intervention for Long-term Health Problems related to COVID-19 (NoviTor-COVID Study)	Health Bureau – Health and Medical Research Fund	01/04/2021	31/03/2026	45,991,725
Grace Wong	Sodium-glucose Co-transporter-2 Inhibitor (SGLT2i) to Prevent of Liver Complications in Patients with Chronic Hepatitis B and Diabetes Mellitus: A Double-blind, Randomised, Placebo-Controlled Trial (SGLT2i-HBV Study)	Research Grants Council – General Research Fund	01/06/2023	31/05/2026	1,475,271
	Elimination of Chronic Hepatitis B in Hong Kong to Meet the WHO Goals (Short title: HBV Elimination Study)	Health Bureau – Commissioned Studies	01/10/2020	30/09/2024	2,212,992

Publications

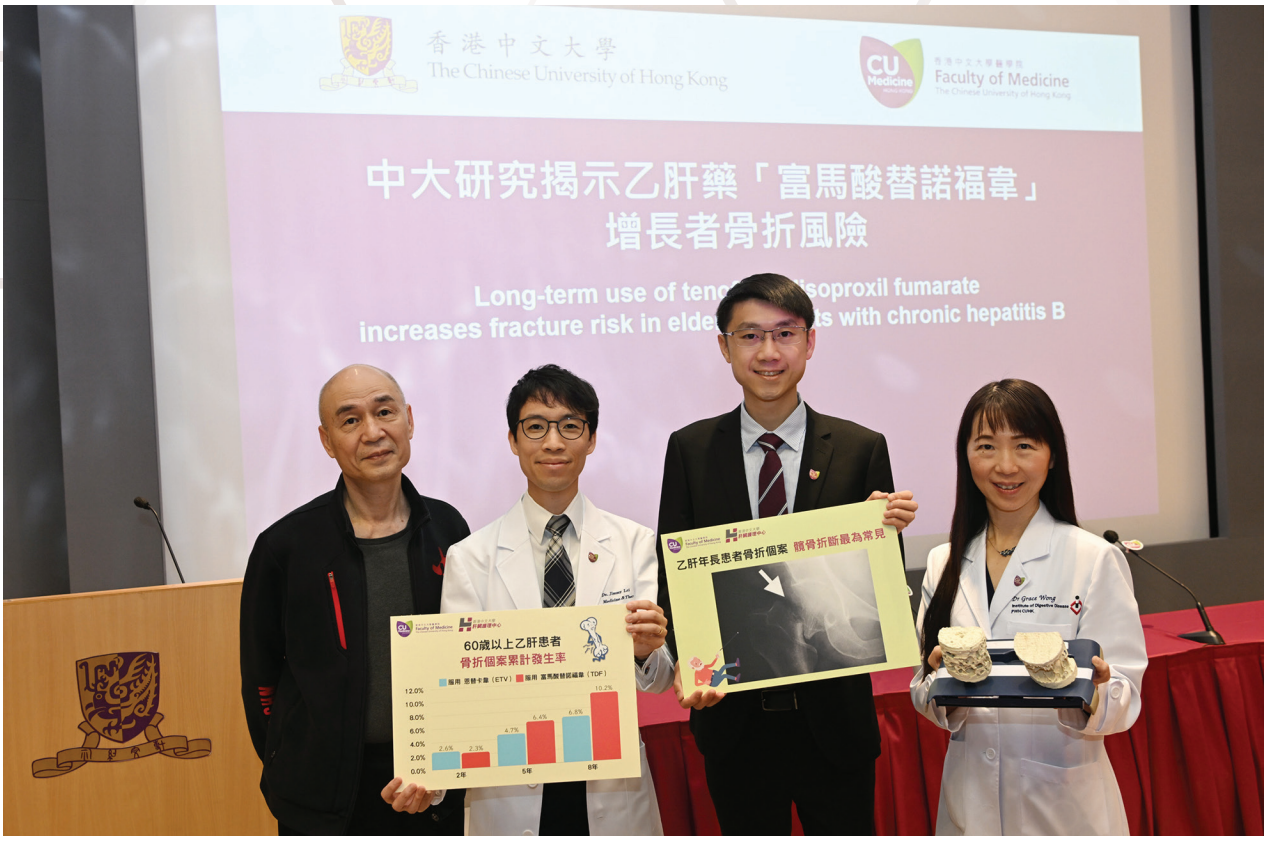
A. Journal Papers

1. Yang Z, Hui VWK, Yip TCF, Lai MSM, Lai JCT, Wong VWS, Cheung R, Wong GLH, Wong RJ. Alcohol-associated hepatitis trends before and following the onset of the COVID-19 pandemic across two distinct cohorts in the United States and Hong Kong. *JHEP Reports*. 2025;7(1). doi:10.1016/j.jhepr.2024.101254. (Epub ahead of print)
2. Lai JCT, Wong GLH, Tse YK, Hui VWK, Lai MSM, Chan HLY, Wong VWS, Yip TCF. Histological severity, clinical outcomes and impact of antiviral treatment in indeterminate phase of chronic hepatitis B: A systematic review and meta-analysis. *Journal of Hepatology*. Published online November 2024. doi:10.1016/j.jhep.2024.11.018. (Review) (Epub ahead of print)
3. Yang L, Liu C, Lai JCT, Qi X. Editorial: Non-selective beta-blockers: A lifesaving shield for critically ill patients with acute decompensation of cirrhosis? *Alimentary Pharmacology and Therapeutics*. Published online October 1, 2024. doi:10.1111/apt.18207. (Editorial)
4. Yip TCF, Peng N, Lai JCT. Reply to: Correspondence on "long-term use of tenofovir disoproxil fumarate increases fracture risk in elderly patients with chronic hepatitis B." *Journal of Hepatology*. 2025;82(2):e89-e90. doi:10.1016/j.jhep.2024.10.013. (Letter) (Epub ahead of print)
5. Liang LY, Yip TCF, Lai JCT, Lam ASM, Tse YK, Hui VWK, Chan HLY, Wong VWS, Wong GLH. Dynamic changes in ELF score predict hepatocellular carcinoma in chronic hepatitis B patients receiving antiviral treatment. *Journal of Viral Hepatitis*. Published online December 1, 2024. doi:10.1111/jvh.14004.



A team photo of the four PIs at the Liver Meeting 2024

Source: Grace Wong



A latest study CU Medicine shows antiviral tenofovir disoproxil fumarate (TDF) TDF is associated with a higher fracture risk than entecavir ETV for patients with chronic hepatitis B aged 60 or above, after two years of treatment.

(From left) Mr Lei, patient with chronic hepatitis B; Jimmy Lai, Specialist in Gastroenterology and Hepatology, Department of Medicine and Therapeutics, Prince of Wales Hospital and Clinician Clinical Lecturer (honorary), Department of Medicine and Therapeutics, CU Medicine; Terry Yip, Assistant Professor in the Department of Medicine and Therapeutics, CU Medicine and Deputy Director of MDAC; and Grace Wong, Professor in the Department of Medicine and Therapeutics, CU Medicine; Director of the Medical Data Analytics Centre (MDAC) and Deputy Director of CUHK Center for Liver Health.

Source: Press Release on 21 March 2024



Infectious Diseases, Public Health and Microbiota

Fecal Microbiota Transplantation

傳染病、公共衛生及腸道微生物學

PRINCIPAL INVESTIGATOR | **Siew Ng**

TEAM MEMBERS | Francis Chan, Hein Min Tun, Lin Zhang, Jingwan Zhang, Zhilu Xu, Qi Su, Whitney Tang, Chun Pan Cheung, Gabriel Lee, Ye Peng, Suisha Liang, Wenyi Zhu, Yating Wan, Yingzhi Liu, Wenye Xu, Qianru Sun, Min Dai, Jiaying Zheng, Shilan Wang, Jessica Ching, Alicia Chan, Clinical IBD Team, Clinical FMT Team

Research Progress Summary

The gut microbiome profile has been linked to various common diseases. However, utilising the use of microbiome for diagnostics and therapeutic targets involves a complex discovery and validation process for each condition. To address this challenge, **Siew Ng** and her team have streamlined the process, establishing a robust platform for microbial-targeted metagenomic screening. This platform is powered by a comprehensive database that has now accumulated data from over 8,000 individuals, allowing the team to effectively harness gut microbial signatures for diagnostic applications across multiple diseases. With this foundation, the team has developed AI models that translate these microbial signatures into personalised disease prediction models, targeting inflammatory bowel disease (IBD) and autism spectrum disorder (ASD). These AI models have been further transformed into non-invasive diagnostic technologies, leading to the development of the stool tests Enterosight and MetaGenie respectively.

IBD is a debilitating chronic condition that causes prolonged inflammation of the digestive tract, affecting approximately 8 million individuals annually who experience gastrointestinal symptoms without a definitive diagnosis. Enterosight has achieved an area under the curve (AUC) greater than 0.90 for distinguishing IBD patients from controls

and has shown strong performance in over 5,000 transethnic validation cohorts across eight populations. ASD is a heterogeneous neurodevelopmental disorder characterised by social, cognitive, and behavioural impairments. It is estimated that over 75 million children worldwide have neurodevelopmental conditions, including ASD. MetaGenie has demonstrated high predictive values for diagnosing ASD, with AUCs of 0.87, sensitivity of 91%, and specificity of 73% in an independent cohort. This accuracy has been replicated in six public datasets across Asia, Europe, and America. These diagnostic technologies, facilitating early diagnosis and timely intervention, hold promise to reduce healthcare costs associated with delayed diagnoses and unnecessary invasive procedures.

In addition, the team has recently completed a pilot clinical study to investigate the use of a gut microbiome modulator that aims to boost the abundance of γ-Aminobutyric acid (GABA) in children with ASD. r-Aminobutyric acid (GABA) is a neurotransmitter that, when depleted, can be associated with sensory hypersensitivity and anxiety. In this pilot study, the team showed that modulation of the gut microbiome alleviated symptoms of anxiety in children with ASD, introducing the possibility of a new therapeutic paradigm for the condition.

These scientific advancements have been published in leading journals such as *Nature Medicine* and *Nature Microbiology*. In 2024, MetaGenie received Breakthrough Device Designation from the U.S. Food and Drug Administration to aid in diagnosing ASD in children at risk of developmental delay. The technologies have also won Silver Medals at the International Exhibition of Inventions Geneva in 2024 and a Gold Medal at the 13th IIFME – International Invention Fair of the Middle East in 2023.

For these groundbreaking discoveries, Siew has been awarded the Bank of China Hong Kong Science and Technology Innovation Prize in the field of Life and Health. She has also received a Foreign Fellowship from Academia Europaea and has been recognised as a Highly Cited Researcher by Clarivate for the fifth consecutive year. The team had filed 25 patents and been granted 4 patents in Hong Kong, China, the United States and the United Kingdom, in addition to publishing 26 peer-reviewed papers.

Research and Scholarship

Research Awards and Recognitions

Name	Details	
	Award	Organisation
Siew Ng	Bank of China Hong Kong Science and Technology Innovation Prize (STIP) Life and Health	Bank of China Hong Kong
Siew Ng Francis Chan	Highly Cited Researcher 2024	Clarivate
	Top Cited Scholar 2024	Scilit
Siew Ng Francis Chan Qi Su	Best Invention Medal Project Title: A synbiotic preparation (SIM01) for post-COVID conditions	International Federation of Inventors' Association
	Gold Medal Project Title: A synbiotic preparation (SIM01) for post-COVID conditions	Silicon Valley International Inventions Festival 2024
	Gold Medal Invention: Precision Oral Microbiome Formula SIM01: Alleviating Multiple Symptoms of Long-COVID	International Exhibition of Inventions Geneva 2024
	Silver Medal Invention: MetaGenie - Stool Test for Early Diagnosis of Autism Spectrum Disorder	

Research Awards and Recognitions

Name	Details	
	Award	Organisation
Siew Ng Francis Chan Jingwan Zhang Jiaying Zheng	Silver Medal Invention: Stool MicrobiAI Biomarker Test to aid diagnosis of Inflammatory Bowel Disease (IBD-SMART)	International Exhibition of Inventions Geneva 2024
Francis Chan	Outstanding Project Team on COVID-19 Research Award	Health Bureau
	Guanghua Engineering Science and Technology Prize 2024	Chinese Academy of Engineering
	Distinguished Medical Alumni Award	Faculty of Medicine, The Chinese University of Hong Kong
Qi Su	Young Scientist Award	Hong Kong Institution of Science
Qi Su Zhilu Xu	Young Scientists Fund	The National Natural Science Foundation of China

Fellowships

Name	Details	
	Fellowship	Organisation
Siew Ng Francis Chan	Foreign Member	Academia Europaea
Yingzhi Liu	RGC Postdoctoral Fellowship	Research Grants Council
Shilan Wang	Faculty Postdoctoral Fellowship	The Chinese University of Hong Kong

Academic Editorships

Name	Details	
	Role	Journal
Siew Ng	Board Member	Cell Genomics
	Advisory Board	Cell Host & Microbe
	Associate Editor	GUT
	Editorial Board Member	Journal of Gastroenterology and Hepatology
		Gastroenterology
		Journal of Crohn's and Colitis
	International Editorial Board Member	Indonesian Journal of Gastroenterology
Francis Chan	Senior Associate Editor	Gastroenterology
	Guest Editor	Alimentary Pharmacology & Therapeutics Symposium Series
	Editorial Board Member	Digestive Endoscopy

Academic Editorships

Name	Details	
	Role	Journal
Francis Chan	Editorial Board Member	Digestive & Liver Diseases
		Journal of Digestive Diseases
Siew Ng Jingwan Zhang	Editorial Board Member	World Journal of Gastroenterology
Lin Zhang	Editorial Board Member	Frontiers in Oral Health (Infections and Microbes)
		Frontiers in Nutrition and Microbes
		iMeta
Qi Su	Associate Editor	Frontiers in Veterinary Science
	Guest Associate Editor	Frontiers in Food Science and Technology

Reviewers of Journal / Conference

Name	Details	
	Role	Journal / Conference
Siew Ng	Chair Abstract Reviewer	Digestive Disease Week 2024, American Gastroenterological Association (AGA) Institute Council
	Reviewer	Journal of Hepatology
		New England Journal of Medicine
		Nature Medicine
		Nature Reviews Gastroenterology & Hepatology
		Gastroenterology
		Gut
		American Journal of Gastroenterology
		Clinical Gastroenterology and Hepatology
		Journal of Crohn's and Colitis
		Alimentary Pharmacology and Therapeutics
		Gastrointestinal Endoscopy
		Journal of Gastroenterology
		Inflammatory Bowel Disease
		Journal of Gastroenterology and Hepatology
		World Journal of Gastroenterology
		Digestive Diseases and Sciences
		BMC Gastroenterology
		European Journal of Gastroenterol and Hepatology

Grants and Consultancies

Name	Project Title	Funding Source	Start Date (dd/mm/yyyy)	End Date (dd/mm/yyyy)	Amount (HK$)
Siew Ng	New Cornerstone Investigator	New Cornerstone Science Foundation	01/2024	12/2028	RMB 25,000,000
	HKSTP-KingMed Co-Incubation Scheme	Hong Kong Science and Technology Parks Corporation	01/2021	12/2024	4,000,000
	Croucher Senior Medical Research Fellowships	Croucher Foundation	01/03/2021	31/03/2027	1,000,000
	Establishment of the Hub of Advanced Technology for Child Health (HATCH)	D.H. Chen Foundation	10/2021	09/2024	48,240,000
	A Double Blinded Randomized Controlled Trial of a Novel Oral Synbiotic Formula in Reducing Adenoma Recurrence and Colorectal Neoplasia-Related Bacterial Gene Markers	Research Grants Council – General Research Fund	29/06/2024	28/06/2027	1,400,000
	Function and Mechanism of Bacterium Fx in Suppressing Colorectal Tumorigenesis via Inhibiting Fusobacterium Nucleatum	Research Grants Council – General Research Fund	01/01/2024	31/12/2026	1,400,000
	The Impact of Prenatal Exposure to Tobacco Smoke on Epigenetic Modifications, Gut Microbiome Assembly and Metabolic Consequences in Offspring	Research Grants Council – General Research Fund	01/01/2024	31/12/2026	1,384,000

Grants and Consultancies

Name	Project Title	Funding Source	Start Date (dd/mm/yyyy)	End Date (dd/mm/yyyy)	Amount (HK$)
Siew Ng Lin Zhang Jingwan Zhang	Translating Microbiome, Multi-Omics and Dietary Innovations to Enhance Inflammatory Bowel Disease Diagnosis and Outcome	Research Grants Council – Research Impact Fund	29/06/2023	28/06/2026	7,750,000
Siew Ng Francis Chan	Health@InnoHK: Microbiota I-Center (MagIC)	Innovation and Technology Commission	08/05/2020	07/05/2025	Not to be disclosed
	Modulation of Gut Microbiota to Enhance Health and Immunity in Vulnerable Individuals during COVID-19 Pandemic	Health Bureau – Health and Medical Research Fund	01/04/2021	31/03/2024	9,980,840
Siew Ng Francis Chan Lin Zhang	Gut Microbiota in Adults with Chronic Widespread Pain	The Chinese University of Hong Kong Peter Hung Pain Research Institute – Peter Hung Pain Research Institute Research Grant	01/12/2022	30/11/2024	602,810
	Novel Strategies to Facilitate Early Detection, Prevention and Intervention for Long-term Health Problems Related to COVID-19 (NovITor-COVID study)	Health Bureau – Health and Medical Research Fund	01/04/2021	31/03/2026	45,991,725
Jingwan Zhang Siew Ng	Characterization on the Role of Proteus Mirabilis-derived Cadaverine in Regulation of Proinflammatory Phenotype and Immune Response in Crohn's Disease	Research Grants Council – General Research Fund	01/01/2023	31/12/2025	1,151,224

Grants and Consultancies

Name	Project Title	Funding Source	Start Date (dd/mm/yyyy)	End Date (dd/mm/yyyy)	Amount (HK$)
Jingwan Zhang Siew Ng	Developing Microbiome Risk Profiles as Biomarkers for Predicting Relapse in Crohn's Disease	Health Bureau – Health and Medical Research Fund	01/08/2023	31/07/2027	1,461,440
Lin Zhang	Gut Microbiota Activates the Impaired Lysosome Acidification against SARS-CoV-2 non-structural Protein 6 Triggered NLRP3-dependent Pyrolosis	The Chinese University of Hong Kong Research Committee – Direct Grant	30/06/2023	29/06/2024	75,000
	Optimisation of Clinical Treatment of Severe Influenza to Reduce Morbidity and Mortality (INF-CUHK-2)	Health Bureau – Health and Medical Research Fund Commissioned Programmes for Influenza Research	01/09/2019	31/08/2026	4,996,960
Jingwan Zhang	Identification and Management of Toxic Metabolites Produced by Proteus mirabilis to Improve Microbiota Dysbiosis in Crohn's Disease	National Natural Science Foundation of China	01/01/2022	31/12/2024	RMB 300,000
	Gut Microbiome in Inflammatory Bowel Disease	Startup Funding	02/11/2023	01/11/2025	1,450,760

Publications

A. Journal Papers

1. Zhan H, Wan Y, Sun Y, Xu Z, Zhang F, Yang K, Zhu W, Cheung CP, Tang W, Ng EK, Wong SK, Yeoh YK, Kl Chan F, Miao Y, Zuo T, Zeng Z, Ng SC. Gut mycobiome alterations in obesity in geographically different regions. *Gut Microbes*. 2024;16(1). doi:10.1080/19490976.2024.2367297.
2. Porcari S, Mullish BH, Asnicar F, Ng SC, Zhao L, Hansen R, O'Toole PW, Raes J, Hold G, Putignani L, Hvas CL, Zeller G, Koren O, Tun H, Valles-Colomer M, Collado MC, Fischer M, Allegretti J, Iqbal T, Chassaing B, Ianiro G, et al. International consensus statement on microbiome testing in clinical practice. *The Lancet Gastroenterology & Hepatology*. 2025;10(2):154-167. doi:10.1016/s2468-1253(24)00311-x. (Review, Epub ahead of print)

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10. Xu W, Zhang Y, Chen D, Huang D, Zhao Y, Hu W, Lin L, Liu Y, Wang S, Zeng J, Xie C, Chan H, Li Q, Chen H, Liu X, Wong SH, Yu J, Chan FKL, Chan MTV, Ng SC, Wu WKK, Zhang L. Elucidating the genotoxicity of *Fusobacterium nucleatum*-secreted mutagens in colorectal cancer carcinogenesis. *Gut Pathogens*. 2024;16(1):1-13. doi:10.1186/s13099-024-00640-w.

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B. Conference Paper

1. Afzali A, Regueiro MD, Yarur AJ, Zabana Y, Ng SC, Menon SS, McDonnell A, Lazin K, Keating M, Bhattacharjee A, Branquinho D, Bananis E, Peyrin-Biroulet L. Su1797 Etrasimod shows low risk of adverse events following concomitant use with opioids or antidepressants in patients with ulcerative colitis. *Gastroenterology*. 2024;166(5):s-818. doi:10.1016/s0016-5085(24)02361-8.

2. DeLeon O, Mocanu M, Cham CM, Tan A, Ceccato H, Sidebottom AM, Colgan JJ, St. George M, Xu Z, Ng SC, Chan FK, Tun HM, Rubin DT, Martinez-Guryn K, Chang EB. 533 Regional microbiota mismatches from fecal microbiota transplants drive persistent, off-target consequences to the host. *Gastroenterology*. 2024;166(5):s-119. doi:10.1016/s0016-5085(24)00766-2.

3. Ho AH, Mak JW, Chan AKW, Dao HV, Sun Y, Kaibullayeva J, Paudel MS, Ahuja V, Limsrivilai J, Wei S-C, Abdullah M, Altuwaijri M, Balderramo D, Banerjee R, Yamamoto-Furusho JK, Hilmi I, Ali RAR, Ng KK, Kotze PG, Kelly P, Iade B, Vui HC, Bernstein CN, Gearry RB, Abreu MT, Rubin DT, Dotan I, Kaplan G, Ng SC. Tu1863 Incidence and phenotype of inflammatory bowel disease in 16 regions across Asia, Africa, Latin America and Middle East from gives-21 consortium. *Gastroenterology*. 2024;166(5):s-1443. doi:10.1016/s0016-5085(24)03764-8.

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19. Zhang L, Wang S, Wong MCS, Mok CK, Ching JY, Mak JW, Chan FK, Ng SC. 1072 Effect of gut microbiome modulation in enhancing immunogenicity after SARS-CoV-2 vaccination in elderly and diabetes patients (impact study). *Gastroenterology*. 2024;166(5):s-252. doi:10.1016/s0016-5085(24)01065-5.

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Article

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Multikingdom and functional gut microbiota markers for autism spectrum disorder

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Check for updates

Qi Su[1,2,9], Oscar W. H. Wong[3,4,9], Wenqi Lu[1,2], Yating Wan[1,2,4], Lin Zhang[1,2], Wenye Xu[1,2], Moses K. T. Li[1], Chengyu Liu[1], Chun Pan Cheung[1,2], Jessica Y. L. Ching[1], Pui Kuan Cheong[1], Ting Fan Leung[4,5], Sandra Chan[3,4], Patrick Leung[4,6], Francis K. L. Chan[1,4,7] & Siew C. Ng[1,2,4,8]

Sensitivity 91%
Specificity 73%

FDA BREAKTHROUGH DEVICE DESIGNATION

July 2024

Siew Ng and her team have discovered disease-specific microbial signatures targeting autism spectrum disorder, and transformed them into clinically applicable non-invasive diagnostic tests. Her technology was granted Breakthrough Device Designation by the U.S. Food and Drug Administration in 2024.

Source: Su Q, Wong OWH, Lu W, Wan Y, Zhang L, Xu W, Li MKT, Liu C, Cheung CP, Ching JYL, Cheong PK, Leung TF, Chan S, Leung P, Chan FKL, Ng SC. Multikingdom and functional gut microbiota markers for autism spectrum disorder. Nature Microbiology. 2024;9(9):2344-2355. doi:10.1038/s41564-024-01739-1.



At a press conference, Siew Ng announced her team's novel non-invasive diagnostic test is a reliable tool to differentiate inflammatory bowel disease (IBD) and other common chronic gut disorders, enabling timely diagnosis and treatment. The findings were published in Nature Medicine.

Source: Press Conference on 4 December 2024



Infectious Diseases, Public Health and Microbiota
傳染病、公共衛生及腸道微生物學

PRINCIPAL INVESTIGATOR | **Renee Chan**

TEAM MEMBERS | Kathy Chan, Kin Pong Tao, Joseph Tsun, Joan Marie Javillo Baguio, Chun Hei Lei, Shuo Wang, Ben Wong, Shaojun Liu, Behzad Nasiri Ahmadabadi, Kwan Hou Tang

Research Progress Summary

The Translational Research using respiratory organoid model for obstructive airway disease from preterm babies to elderly

Chronic obstructive pulmonary disease (COPD) is prevalent in the elderly population and poses a significant burden on those affected, with treatment often proving challenging. This year, the research team led by **Renee Chan** established two industry research contracts to explore therapeutics for COPD. With existing animal models failing to accurately mimic COPD progression in humans, they are addressing a critical gap in this field. Their ongoing research positions them at the forefront of COPD research by demonstrating the utility of organoid models in studying both disease progression and therapeutic responses. By accurately illustrating COPD airway pathology, they are advancing cell models recognised by the FDA as complementary assessment tools. They anticipate that the success of their organoid platform will significantly enhance the development of COPD-specific drugs.

Aiming to contribute significantly to the field, their team, additionally, are elucidating age-specific effects on structural cell responses which could provide valuable insights for targeted interventions. They are also investigating how asthmatic patients respond differently to rhinovirus (RV) infection, shedding light on dysregulated pathways and potential recovery mechanisms.

The Drug Screening Platform: From Cell Lines to Human Organoid

Respiratory viruses continue to be a major contributor to global health challenges, highlighting the urgent need for the development of more effective antivirals. Building on the progression from last year's achievements in using nucleoside analogues as pan-antivirals, their ongoing collaboration with Billy Ng from the School of Pharmacy at the Chinese University of Hong Kong has been pivotal in synthesising innovative antiviral drug candidates. They have successfully developed an advanced influenza virus screening platform that transitions from standard cell lines to more relevant primary human respiratory cell cultures and organoid models, including disease-specific organoids.

Pioneering Paediatric Research and Collaboration in the Greater Bay Area

With the signing of the Memorandum of Understanding for the HOPE Greater Bay Area Expansion, the team has emerged as the leading paediatric research group in collaboration with Shenzhen Baoan Women's and Children's Hospital. They are embarking on a significant project focused on identifying biomarkers for early diagnosis of childhood allergic asthma. This initiative encompasses three longitudinal cohorts involving a total of 1,200 subjects. Ultimately, this research aims to enhance personalised treatment plans for young patients, significantly improving asthma management in children.

Research and Scholarship

Research Awards and Recognitions

Name	Details	
	Award	Organisation
Chun Hei Lei	Best Poster Presentation	Options XII for the Control of Influenza: Virology and Pathogenesis Category
	Peer Reviewer Award	INFECTION 2024, 20th Annual Scientific Meeting, SH Ho Research Centre for Infectious Diseases, The Chinese University of Hong Kong, Hong Kong.

Academic Editorships

Name	Details	
	Role	Journal
Renee Chan	Invited Editor – Special Issue	Journal of Virological Methods
	Associate Editor	Frontiers in Infectious Diseases – Pathogenesis and therapy
	Review Editor	Frontiers for Young Minds – Human Health

Reviewers of Journal / Conference

Name	Details	
	Role	Journal / Conference
Renee Chan	Reviewer	Nature Reviews Microbiology
		Pediatric Pulmonology
		Emerging Microbes & Infections
		npj Viruses
		Viruses
		Frontiers in Medicine
		Microbiology Spectrum
		Frontiers for Young Minds

Grants and Consultancies

Name	Project Title	Funding Source	Start Date (dd/mm/yyyy)	End Date (dd/mm/yyyy)	Amount HK$
Renee Chan	The Translational Potential of Small Extracellular Vesicle (sEV) in Allergic Asthma in Children: The Local and Systemic Protein Profiles	The Hong Kong Institute of Allergy	29/02/2024	28/02/2025	60,000
	The Protein Expression Profile of Small Extracellular Vesicle (sEV) in the Plasma of Children with Allergic Asthma	The Chinese University of Hong Kong Research Committee – Direct Grant	25/06/2024	24/06/2025	32,000
	The Establishment of COPD Organoid Culture to Test for the Therapeutic Effect of the Primary Human Adipose Tissue-derived Mesenchymal Stem Cells	Rohto Advanced Research Hong Kong Ltd.	20/11/2024	31/08/2025	374,969

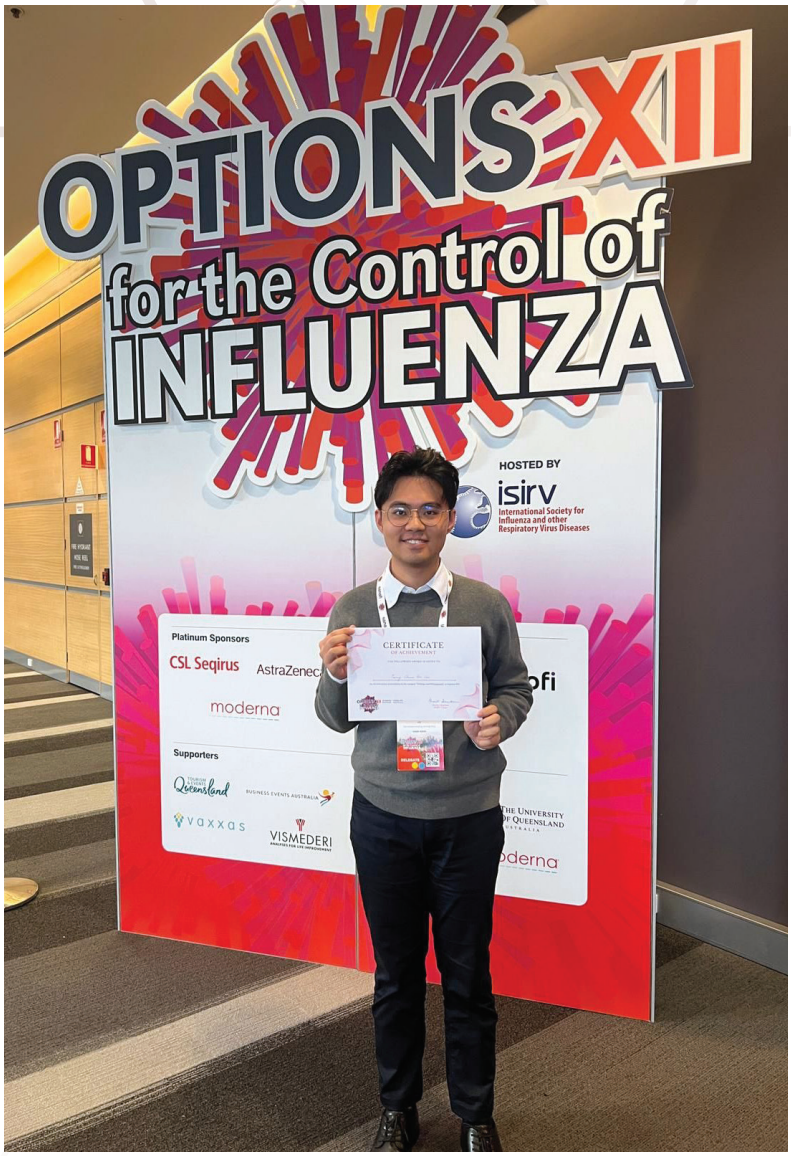
Publications

A. Journal Papers

1. Li Q, Chen Z, Zhang Y, Chan RWY, Chong MKC, Zee BCY, Ling L, Lui G, Chan PKS, Wang MH. Genetic association of COVID-19 severe versus non-severe cases by RNA sequencing in patients hospitalised in Hong Kong. *Hong Kong Medical Journal*. 2024;30(1):25-31. doi:10.12809/hkmj2210178.
2. Chan RWY, Valkenburg SA, Fong HMJ, Cheung MC, Kuok DIT, Islam MA, Peiris J, Nicholls JM, Poon L, Chan MCW. Human lung local immunity to influenza virus-role of lung antibody and resident memory T cells. *Archives of Clinical and Biomedical Research*. 2024;08(01). doi:10.26502/acbr.50170381.
3. Yam SLS, Baguio JMJ, Chan RW. Pediatric respiratory viral infection. *Viruses Basel*. 2024;16:733. doi:10.3390/v16050733.
4. Babicki M, Rzymski P, Chun J, Pun S, Tao KP, Lok S, Yam S, Hon KL, Kay P, Chan S, Li AM, Wan R, Chan Y. Respiratory viral infection patterns in hospitalised children before and after COVID-19 in Hong Kong. *Viruses Basel* 2024, Vol 16, Page 1786. 2024;16(11):1786. doi:10.3390/v16111786.
5. Hui WF, Chan RWY, Hon KL. The cytokine profile of a child with invasive pneumococcal disease-associated acute respiratory distress syndrome treated with extracorporeal cytokine removal. *Therapeutic Apheresis and Dialysis*. 2024;28(6):951-953. doi:10.1111/1744-9987.14191. (Letter)

B. Conference Papers

1. Pun JCS, Tao KP, Hon KL, Chan PKS, Li AM, Chan RWY. Immune debt in children: Impact in different paediatric age groups. The Hong Kong Paediatric Society Hong Kong College of Paediatric Nursing and Hong Kong Paediatric Nurses Association.
2. Hui WF, Chu ATW, Chan RWY, HON KL, Leung TF, Li AM, Ku SW. The impact of ventilators status on the pattern of urinary biomarkers of acute kidney injury among critically ill children. The Hong Kong Paediatric Society Hong Kong College of Paediatric Nursing and Hong Kong Paediatric Nurses Association.
3. Wang S, Wang Y, Tao KP, Ling KKC, Tsun JGS, Lau RWH, Ng CSH, Ko FWS, Chan RWY. Nasal airway organoid model: Recapitulating chronic obstructive pulmonary disease and representing disease severity gradient. *American Journal of Respiratory and Critical Care Medicine*. Published online May2024:A4281-A4281. doi:10.1164/ajrccm-conference.2024.209.1_meetingabstracts.a4281.
4. Chan RWY, Pun JCS, Liu S, Tao KP, Sze RKH, Tsoi LLY, Tsun JGS, Chong KKL, Chan KCC, Leung ASY, Chan PKS, Li AM. Dynamic changes in rhinovirus diversity from 2015 to 2023: The impact of public health measurements and its implication to "Immune debt" in children. *American Journal of Respiratory and Critical Care Medicine*. Published online May2024:A4996-A4996. doi:10.1164/ajrccm-conference.2024.209.1_meetingabstracts.a4996.



Student Chun Hei Lei, winner of the 'Best Poster Presentation' award during the Options XII conference in the Control of Influenza: Virology and Pathogenesis category.

Source: Renee Chan



The Hong Kong Hub of Paediatric Excellence (HOPE) of the Chinese University of Hong Kong embarked on a collaboration with the Shenzhen Boa'An District Health Bureau and the Bao'An Maternal and Child Health Care Hospital, to establish the HOPE – Obstetric and Paediatric Centre. Renee and her team are pleased to start their first prospective cohort study with Bao'An's team in enhancing multidisciplinary research that can improve the health and welfare of children.

Source: Renee Chan



Infectious Diseases, Public Health and Microbiota
傳染病、公共衛生及腸道微生物學

PRINCIPAL INVESTIGATOR | **Peter Cheung**

TEAM MEMBERS | Wing Ying Au, Cheuk Wang Fung, Xinzhou Xu, Buyu Zhang, Ka Man Tse, Yiqiong Zhang, Liuli Dong, Lin Yang, Zhitong Zhu, Zhibin Liang, Sirui Li, Ka Kwan Mak, Zhuoran Gao

Research Progress Summary

Peter Cheung's research interests are diverse and multidimensional. He focuses on various areas including structural biology and computational biology, statistics on large clinical datasets, molecular mechanisms of RNA virus replication and transcription, analysing the evolution and antigenic properties of influenza and coronaviruses, and the impact of polymerase fidelity on viral evolution and host adaptation.

Peter has published a significant number of research articles and creative works. He has a total of 43 publications. Some notable publications include studies on the transcription and replication pathways of SARS-CoV-2 RNA polymerase, rapid microfluidics prototyping for multiplex diagnostics, predicting the antigenic evolution of SARS-CoV-2 using deep learning, and the effectiveness of heterologous and homologous COVID-19 vaccine regimens. He has published as a corresponding author in reputable journals such as the *British Medical Journal, The Lancet Microbe, Nature Catalysis, Nature Communications* and *Nucleic Acids Research*.

In terms of knowledge transfer activities, Peter has been actively engaged in sharing his research findings. He has participated in academic conferences, such as the Options for the Control of Influenza and public forums to present his work and exchange knowledge with fellow researchers and the wider scientific community. His research collaborations

have also been instrumental in advancing his work. He has collaborated with researchers from different institutions, both locally and internationally, to enhance the scope and impact of his research.

Overall, Peter has made significant contributions to the field of biomedical research, particularly in the areas of virology, molecular biology, and computational biology. His dedication to multidimensional academic pursuits and his collaborations with other researchers have been instrumental in advancing scientific knowledge and understanding. This includes Oxford University, Wuhan Institute of Virology, and Cornell University through many of his successful grants from the Research Grants Council (RGC) as the leader including the Collaborative Research Fund, National Natural Science Foundation of China/RGC Joint Research Scheme, among others.

Research and Scholarship

Fellowships

Name	Details	
	Fellowship	Organisation
Cheuk Wang Fung	Postdoctoral Fellowship	Research Grants Council

Academic Editorships

Name	Details	
	Role	Journal
Peter Cheung	Editor	Frontiers in Microbiology

Reviewers of Journal / Conference

Name	Details	
	Role	Journal / Conference
Peter Cheung	External Reviewer	Open Health
		British Medical Journal

Grants and Consultancies

Name	Project Title	Funding Source	Start Date (dd/mm/yyyy)	End Date (dd/mm/yyyy)	Amount (HK$)
Peter Cheung	From Structural to Genomic Biology: A Multi-scale Approach Tightly Integrating Structural Biology and Novel Genomics Platform to Quantitatively Analyze the Transcription and its Regulation of SARS-CoV-2 Viral RNA Polymerase	Research Grants Council – Collaborative Research Fund	30/06/2022	29/06/2025	8,000,000

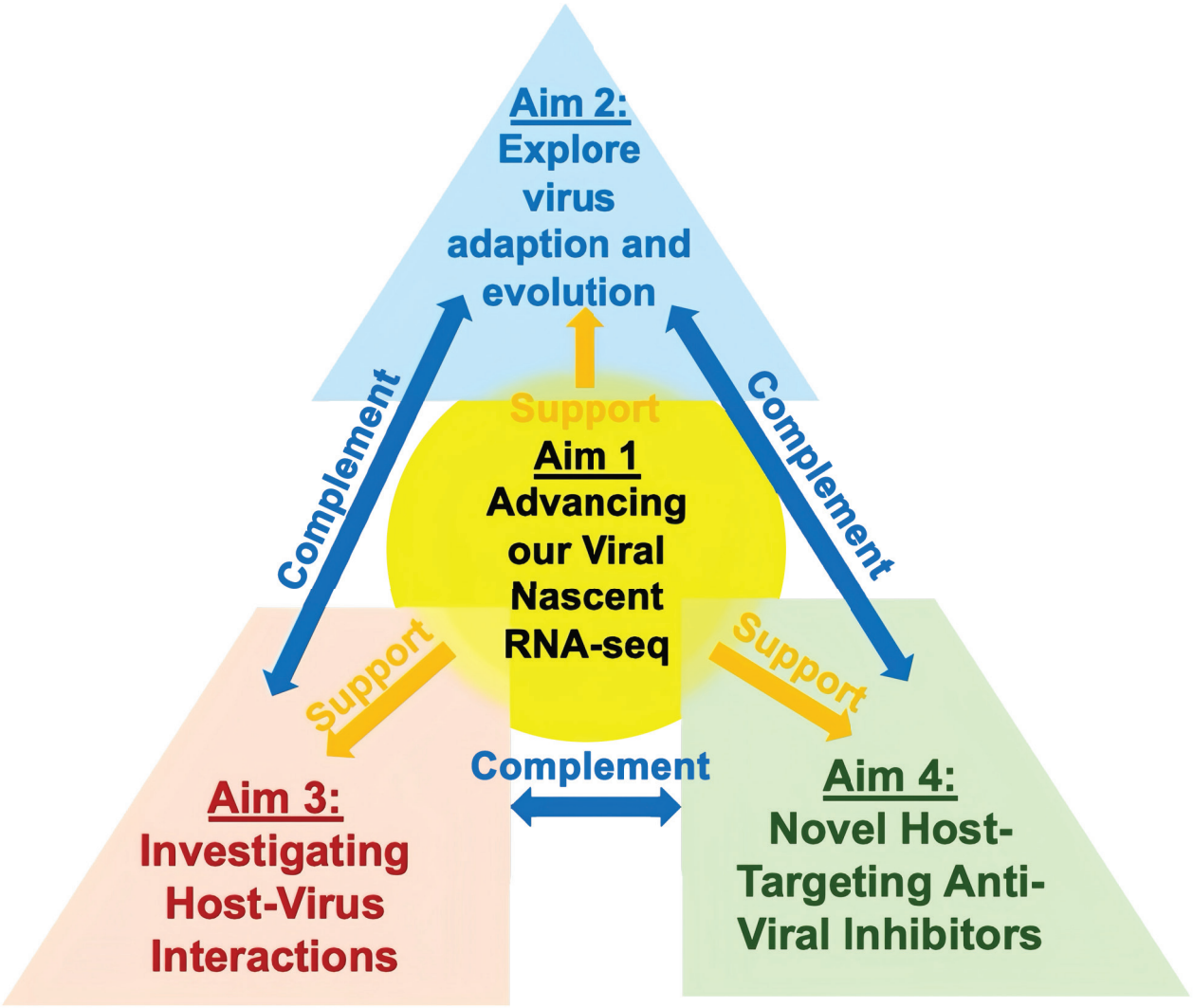
Grants and Consultancies

Name	Project Title	Funding Source	Start Date (dd/mm/yyyy)	End Date (dd/mm/yyyy)	Amount (HK$)
Peter Cheung	Investigation on the Molecular Mechanisms by which RNA Viruses Control Replication Accuracy with Application to Antiviral Drug Sensitivity Assessment through a Tightly Integrative Approach	National Natural Science Foundation of China/Research Grants Council Joint Research Scheme	01/01/2024	31/12/2027	1,250,000
	Real-Time Enzymatic Analysis of Viral Polymerases Using Novel Fluorescently Labeled Capped RNA Probes	Research Grants Council – Early Career Scheme	28/09/2024	27/09/2027	781,567

Publications

A. Journal Papers

1. Chow NKN, Tsang CYW, Chan YH, Telaga SA, Ng LYA, Chung CM, Yip YM, Cheung PPH. The effect of pre-COVID and post-COVID vaccination on long COVID: A systematic review and meta-analysis. *Journal of Infection*. 2024;89(6):106358. doi:10.1016/j.jinf.2024.106358. (Review)



Peter Cheung and his team develop innovative nascent RNA sequencing technologies to identify novel gene regulatory sites involved in the replication and evolution of viruses of public health concern. Additionally, they employ multi-omics approaches to uncover host and viral factors that directly influence viral polymerase activity, enabling the discovery of new viral targets, which they then evaluate using preclinical models.

Source: Peter Cheung



Infectious Diseases, Public Health and Microbiota

System Microbiology, Microbiome & Antimicrobial Resistance

傳染病、公共衛生及腸道微生物學

PRINCIPAL INVESTIGATOR | **Hein Min Tun**

TEAM MEMBERS | Ye Peng, Suisha Liang, Chendi Sam Zhu, Subhankar Mukhopadhyay, Shilin Zhao, Juelei Yu, Guanwen Huang, Xueqi Wu, Yuzhou Chen, Gailin Yang, Hang Li, Liu Xin, Brian Ho, Jie Zhu, Jacky Chau, Shawn Kam, Magi Zheng

Research Progress Summary

The research initiatives led by **Hein Min Tun** and his team at the System Microbiology and Antimicrobial Resistance (SMART) Lab have made significant strides in understanding the complex interplays between gut microbiota and various health outcomes. Notably, the development of the Gut Microbiome Health Index for Infants (GM-HIFI) aims to establish a benchmark for assessing gut health in early life, which is crucial for preventing future health issues. Recently, Hein Min's team has developed the Metagenome-Assembled Genome Inventory for Children (MAGIC), a pioneering global database that enhances the understanding of gut microbiome dynamics in early life. Hein Min's team MAGIC database lays a solid foundation for and opens prospects towards studying early-life microbiome research globally given the complex interactions of microbiomes with human health since the inception of life. The findings have been published in the international journal (*Cell Host & Microbe*, IF: 20.6). Additionally, the construction of a bacteriophage

bank targeting antibiotic-resistant bacteria represents a proactive approach to combating rising antimicrobial resistance, a critical public health concern.

In exploring the gut-brain axis, the team is investigating the relationship between gut microbiota and mental health conditions, such as depression and autism spectrum disorder (ASD). They have recently reported the alternations of fecal virome and bacteriome in children with autism spectrum disorder (*Cell Reports Medicine*, IF: 11.7) and the potential therapeutic application of probiotics in major depressive disorder (*Nutrition Reviews*, IF: 5.9). A newly funded study by Research Grants Council (RGC)/General Research Fund (GRF) is also examining the impact of prenatal exposure to tobacco smoke on the epigenetic modifications and gut microbiome assembly in offspring, highlighting the importance of maternal health on child development.

Hein Min's team has also secured substantial funding through various grants, including the Fleming Fund Fellowship, which aims to build antimicrobial resistance related capacity of government staffs in Bangladesh and Sri Lanka. Hein Min is leading the Fleming Fellowship Programme as the programme director at the Chinese University of Hong Kong as the host institution.

Knowledge Transfer Activities

Hein Min's commitment to knowledge transfer is evident through various initiatives aimed at disseminating research findings to broader audiences. Hein Min's team has filed patents related to symbiotic formula for alleviating symptoms in patients with autism spectrum disorder (ASD) and enhancing COVID-19 vaccine efficacy, demonstrating a focus on translating research into practical applications. Engagement with the community and stakeholders has also been a priority, as evidenced by the orientation workshops for the Fleming Fellowship Phase II in Sri Lanka and Bangladesh, which brought together government officials and health practitioners to discuss antimicrobial resistance and public health strategies.

Academic Conferences and Public Forums

Hein Min has actively participated in numerous academic conferences, delivering keynote lectures and presentations that address critical issues such as antimicrobial resistance, the gut microbiome's role in infectious diseases, and the implications of early-life microbiome development on health outcomes. Notable presentations include discussions at the International Youth Forum on Public Health organised by Nanjing Medical University and the 10th Global Network Forum on Infection and Immunity organised by Chiba University, where he has shared insights on the immunological interactions of the gut microbiome and its potential for therapeutic interventions.

Research Collaborations

Hein Min's team collaborative efforts extend internationally, with partnerships established across various institutions. Collaborations with universities in Canada, Indonesia, Singapore, and the United States focus on topics ranging from antimicrobial resistance in poultry workers to the role of gut microbiota in mediating health interventions for diseases like Parkinson's. These partnerships enhance the research scope and facilitate the exchange of knowledge and resources, ultimately contributing to a more comprehensive understanding of microbiome-related health issues.

In summary, the ongoing research and collaborative efforts at the SMART Lab reflect a robust commitment to advancing the field of microbiome science, with a clear focus on translating findings into meaningful health interventions and public health strategies.

Research and Scholarship

Research Awards and Recognitions

Name	Details	
	Award	Organisation
Hein Min Tun	World's Top 2% Scientists	A database created by Stanford University
	Top Scholar (0.5% of all scholars worldwide) in the fields of Human Gastrointestinal Microbiota (#135) and Microbiota (#455)	ScholarGPS
Ye Peng	Best Highlight Talk	28th Microbiome Virtual International Forum
	微生態醫學新銳獎	Lion Lake International Microbiome Conference 2024
Sam Chendi Zhu	Conference Travel Award	8th World One Health Congress

Fellowship

Name	Details	
	Fellowship	Organisation
Sam Chendi Zhu	Faculty Postdoctoral Fellowship Scheme 2023/24	Faculty of Medicine, The Chinese University of Hong Kong

Academic Editorships

Name	Details	
	Role	Journal
Hein Min Tun	Associate Editor	Frontiers in Microbiology
	Editorial Board Member	Cellular and Molecular Life Sciences
	Early Career Editorial Board Member	Sustainable Horizons
	Guest Editor	Toxics
		Nutrients
	JournalScan Contributor	Gut

Reviewers of Journal / Conference

Name	Details	
	Role	Journal / Conference
Hein Min Tun	Abstract Reviewer and Organizing Committee Member	Microbiome Summit 2025
	Organizing Committee Member	The 11th Global Network Forum on Infection and Immunity
	Reviewer	Nature Reviews in Gastroenterology and Hepatology
		Nature

Reviewers of Journal / Conference

Name	Details	
	Role	Journal / Conference
Hein Min Tun	Reviewer	Cellular and Molecular Life Sciences
		Lancet Microbe
		JAMA Network Open
		Environment International
		Cell Reports Medicine
		Nature Communications
		eBioMedicine
		Cell Host & Microbe
		Gut Microbes
		Gut

Grants and Consultancies

Name	Project Title	Funding Source	Start Date (dd/mm/yyyy)	End Date (dd/mm/yyyy)	Amount (HK$)
Hein Min Tun	The Fleming Fund Fellowship Scheme – Phase II (Bangladesh and Sri Lanka)	The United Kingdom Department of Health and Social Care – Fleming Fund	01/02/2024	31/12/2025	GBP 1,309,011
	Enhancing Psychological Wellbeing and the Patient-caregiver Relationship Through Dyadic Mindfulness: A Randomized Controlled Trial in People with Parkinson's Disease and Their Caregivers	Research Grants Council – General Research Fund	01/07/2024	30/06/2027	927,800
	Phage-based Innovative Pharmabiotics for Pathogens and Pathobionts (PIP2P)	The Chinese University of Hong Kong Research Committee – Research Assistant Professorship Scheme	16/08/2024	14/08/2028	2,000,000

Grants and Consultancies

Name	Project Title	Funding Source	Start Date (dd/mm/yyyy)	End Date (dd/mm/yyyy)	Amount (HK$)
Hein Min Tun	Investigating the Anti-inflammatory Role of Human Milk Exosomal microRNA Enriched by COVID-19 mRNA Vaccination	The Chinese University of Hong Kong Research Committee – Direct Grant	27/06/2024	26/06/2025	150,000
	The Impact of Prenatal Exposure to Tobacco Smoke on Epigenetic, Modifications, Gut Microbiome Assembly and Metabolic Consequences in Offspring	Research Grants Council – General Research Fund	01/01/2024	31/12/2026	1,384,000
	Combining Sepsis Phenotype with Disease Syndrome for the Clinical Evaluation by Integrated Traditional Chinese and Western Medicine	Guangdong Special Support Plan – Provincial Health Commission (Health Talents)	01/01/2024	31/12/2026	RMB 1,000,000
	Developing a Next-Generation Synbiotic for the Treatment of Metabolic Dysfunction Associated Fatty Liver Disease	Innovation and Technology Commission – Midstream Research Programme for Universities	01/09/2023	28/02/2026	3,284,239
	Translating Microbiome, Multi-omics and Dietary Innovations to Enhance Inflammatory Bowel Disease Diagnosis and Outcome	Research Grants Council – Research Impact Fund	29/06/2023	28/06/2026	7,750,000
	Discovery and Construction of a Bacteriophage Isolate Collection to Target Antibiotic-resistant Bacteria	The Chinese University of Hong Kong Research Committee – Direct Grant	19/06/2023	18/06/2024	150,000

Grants and Consultancies

Name	Project Title	Funding Source	Start Date (dd/mm/yyyy)	End Date (dd/mm/yyyy)	Amount (HK$)
Hein Min Tun	Investigating the Gut Microbiota Associated Depression and its Modifiable Effect	Research Grants Council – Early Career Scheme	01/01/2023	31/12/2025	1,170,550
	Evolution and Determinants of Population Mental Health during the Myanmar Conflict: A Nationwide Longitudinal Study from 2021 to 2025	Research Grants Council – General Research Fund	01/01/2023	31/12/2025	882,925
	Gut Microbiota in Adults with Chronic Widespread Pain	The Chinese University of Hong Kong Peter Hung Pain Research Institute	01/12/2022	30/11/2024	602,810
	Characterization of Heteroresistance in Commensal *Escherichia coli* Isolates in Relation to Therapeutic Use of Antibiotics	Health Bureau – Health and Medical Research Fund	01/11/2022	31/10/2025	1,105,092
	Assess Antibiotic Resistome Flows from Pollution Hotspots to Environments and Explore the Control Strategies	Research Grants Council – Theme-based Research Scheme	01/01/2021	31/12/2025	18,905,000
	Characterisation of a Novel Heart-liver-gut Axis in Congenital Heart Disease: From Clinical Phenome to Gut Microbiome	Health Bureau – Commissioned Paediatric Research at Hong Kong Children's Hospital	01/09/2021	31/08/2024	893,380.00
	Understanding Aspects of Common, Complex Chronic Diseases in Urban Households: FAMILY Cohort	Health Bureau – Commissioned Research to Support Local Cohorts and Follow-up Studies	10/09/2019	31/12/2024	9,996,232

Publications

A. Journal Papers

1. Peng Y, Zhu J, Wang S, Liu Y, Liu X, DeLeon O, Zhu W, Xu Z, Zhang X, Zhao S, Liang S, Li H, Ho B, Ching JYL, Cheung CP, Leung TF, Tam WH, Leung TY, Chang EB, Chan FKL, Zhang L, Ng SC, Tun HM. A metagenome-assembled genome inventory for children reveals early-life gut bacteriome and virome dynamics. *Cell Host and Microbe*. 2024;32(12):2212-2230.e8. doi:10.1016/j.chom.2024.10.017.
2. Chui SLC, Lai SW, Huang PY, Pang CCC, Tsui CKA, Tun HM, Chan SKO, Wu P. Knowledge, perception, and behaviours related to antibiotic use and antimicrobial resistance in community-dwelling individuals in Hong Kong. *Journal of Infection and Chemotherapy*. 2025;31(3):102583. doi:10.1016/j.jiac.2024.12.012. (Epub ahead of print).
3. Bashar S, Tun HM, Ting JY, Hicks M, Mandhane PJ, Moraes TJ, Simons E, Turvey SE, Subbarao P, Scott JA, Kozyrskyj AL. Impact of postpartum hospital length of stay on infant gut microbiota: A comprehensive analysis of vaginal and caesarean birth. *Journal of Hospital Infection*. 2025;156:50-60. doi:10.1016/j.jhin.2024.10.012. (Epub ahead of print).
4. Tsui Y, Wu X, Zhang X, Peng Y, Mok CKP, Chan FKL, Ng SC, Tun HM. Short-chain fatty acids in viral infection: The underlying mechanisms, opportunities, and challenges. *Trends in Microbiology*. Published online November5, 2024. doi:10.1016/j.tim.2024.10.001. (Review, Epub ahead of print)
5. Wan Y, Wong OWH, Tun HM, Su Q, Xu Z, Tang W, Ma SL, Chan S, Chan FKL, Ng SC. Fecal microbial marker panel for aiding diagnosis of autism spectrum disorders. *Gut Microbes*. 2024;16(1):2418984. doi:10.1080/19490976.2024.2418984.
6. Zhao S, Tao J, Liang S, Tun HM. Reply to: Toward enhanced methodological rigour: Addressing limitations in the comparative analysis of probiotics and antidepressants for major depressive disorder management. *Nutrition Reviews*. doi:10.1093/nutrit/nuae139. (Letter)
7. Wang S, Liu Y, Tam WH, Ching JYL, Xu W, Yan S, Qin B, Lin L, Peng Y, Zhu J, Cheung CP, Ip KL, Wong YM, Cheong PK, Yeung YL, Kan WHB, Leung TF, Leung TY, Chang EB, Rubin DT, Claud EC, Wu WKK, Tun HM, Chan FKL, Ng SC, Zhang L. Maternal gestational diabetes mellitus associates with altered gut microbiome composition and head circumference abnormalities in male offspring. *Cell Host and Microbe*. 2024;32(7):1192-1206.e5. doi:10.1016/j.chom.2024.06.005.
8. Chui ZSW, Chan LML, Zhang EWH, Liang S, Choi EPH, Lok KYW, Tun HM, Kwok JYY. Effects of microbiome-based interventions on neurodegenerative diseases: A systematic review and meta-analysis. *Scientific Reports*. 2024;14(1). doi:10.1038/s41598-024-59250-w.
9. Fan X, Ning K, Ma TS, Aung Y, Tun HM, Zaw PPT, Flores FP, Chow MS, Leung CM, Lun P, Chang WC, Leung GM, Ni MY. Post-traumatic stress, depression, and anxiety during the 2021 Myanmar conflict: A nationwide population-based survey. *The Lancet Regional Health - Southeast Asia*. 2024;26. doi:10.1016/j.lansea.2024.100396.
10. Zhang S, Chau HT, Tun HM, Huang FY, Wong DKH, Mak LY, Yuen MF, Seto WK. Virological response to nucleos(t)ide analogues treatment in chronic hepatitis B patients is associated with Bacteroides-dominant gut microbiome. *eBioMedicine*. 2024;103. doi:10.1016/j.ebiom.2024.105101.
11. Peng Y, Tun HM, Ng SC, Wai HKF, Zhang X, Parks J, Field CJ, Mandhane P, Moraes TJ, Simons E, Turvey SE, Subbarao P, Brook JR, Takaro TK, Scott JA, Chan FKL, Kozyrskyj AL. Maternal smoking during pregnancy increases the risk of gut microbiome-associated childhood overweight and obesity. *Gut Microbes*. 2024;16(1). doi:10.1080/19490976.2024.2323234.
12. Wan Y, Zhang L, Xu Z, Su Q, Leung TF, Chan D, Wong OWH, Chan S, Chan FKL, Tun HM, Ng SC. Alterations in fecal virome and bacteriome virome interplay in children with autism spectrum disorder. *Cell Reports Medicine*. 2024;5(2). doi:10.1016/j.xcrm.2024.101409.

13. Zhao S, Liang S, Tao J, Peng Y, Chen S, Wai HKF, Chung FY, Sin ZY, Wong MKL, Haqq AM, Chang WC, Ni MY, Chan FKL, Ng SC, Tun HM. Probiotics for adults with major depressive disorder compared with antidepressants: A systematic review and network meta-analysis. *Nutrition Reviews*. doi:10.1093/nutrit/nuad171. (Review, Epub ahead of print)

14. Tun HM, Peng Y, Massimino L, Sin ZY, Parigi TL, Facoetti A, Rahman S, Danese S, Ungaro F. Gut virome in inflammatory bowel disease and beyond. *Gut*. 2023;73(2):350-360. doi:10.1136/gutjnl-2023-330001.

15. Lau RI, Su Q, Lau ISF, Ching JYL, Wong MCS, Lau LHS, Tun HM, Mok CKP, Chau SWH, Tse YK, Cheung CP, Li MKT, Yeung GTY, Cheong PK, Chan FKL, Ng SC. A synbiotic preparation (SIM01) for post-acute COVID-19 syndrome in Hong Kong (RECOERY): A randomised, double-blind, placebo-controlled trial. *The Lancet Infectious Diseases*. 2024;24(3):256-265. doi:10.1016/s1473-3099(23)00685-0.



Featured are research team members: (from left) Zhang Lin, Assistant Professor of the Department of Anaesthesia and Intensive Care and the Lead Scientist in the Microbiota I-Center (MagIC); Siew Ng, Croucher Professor in Medical Sciences, Director of MagIC and New Cornerstone Investigator; Hein Min Tun, Associate Professor of the Jockey Club School of Public Health and Primary Care at CU Medicine and Associate Director of MagIC; as well as Peng Ye, the lead author of the study and Postdoctoral Fellow of the Jockey Club School of Public Health and Primary Care at CU Medicine.

Source: Press release on 30 December 2024, https://www.med.cuhk.edu.hk/press-releases/cu-medicine-develops-the-metagenome-assembled-genome-inventory-for-children-magic-to-promote-early-life-microbiome-research



Participants of the orientation workshop - HE British High Commissioner Andrew Patrick (Back row: 7th from left), Director Generals from Ministry of Health and Ministry of Agriculture of the Government of Sri Lanka, Hein Min Tun (Front row: 5th from left), Alumni Fellows and New Fellows at Hilton Colombo, Sri Lanka.

Source: Photo was taken at the Fleming Fellowship Phase II Orientation Workshop, Colombo, Sri Lanka



Infectious Diseases, Public Health and Microbiota
傳染病、公共衛生及腸道微生物學

PRINCIPAL INVESTIGATOR | **Chris Mok**

TEAM MEMBERS | Yun Sang Tang, Chen Chunke, Yuanxin Sun, Siu Lok Fung, Qihong Gao, Jianxun Li

Research Progress Summary

In 2024, **Chris Mok** and his research team's research advanced the fields of infectious diseases and immunology, focusing on SARS-CoV-2, influenza viruses, and microbiota interventions. These studies produced impactful findings, as detailed below:

SARS-CoV-2 Research

1) Broad Neutralising Antibodies: Their work published in *Cell Reports* identified a highly conserved cryptic epitope within the receptor-binding domain (RBD) of SARS-CoV-2 and other sarbecoviruses. This discovery supports the potential development of universal vaccines targeting conserved viral structures, laying the groundwork for better pandemic preparedness against future coronaviruses.

2) Therapeutics for COVID-19: A study published in *The Lancet Infectious Diseases* demonstrated that nirmatrelvir-ritonavir therapy significantly reduced post-acute sequelae and mortality in SARS-CoV-2 patients. This underscores the dual benefits of antivirals in acute treatment and long-term health outcomes.

3) Booster Vaccination Efficacy: Findings from the *International Journal of Infectious Diseases* revealed that bivalent mRNA vaccines elicited strong cross-neutralising antibodies against the XBB lineage, providing critical insights into vaccine strategies against emerging Omicron subvariants.

Influenza Research

1) Antigenic Imprinting and Vaccine Responses: The team study in *Journal of Virology* investigated the distinct antigenic imprinting effects on hemagglutinin (HA) and neuraminidase (NA) of influenza H1N1. These results elucidate how prior immune exposures shape vaccine responses and susceptibility to influenza variants.

2) Evolutionary Dynamics of Influenza: Work in *Nature Communications* analysed how mutations influence viral antigenicity and fitness. This modelling provides tools for predicting evolutionary trajectories, improving vaccine strain selection, and understanding virus-host interactions.

Microbiota and Long-COVID

Post-COVID-19 Interventions: A randomised controlled trial published in *The Lancet Infectious Diseases* showed that the synbiotic SIM01 reduced long-COVID symptoms and promoted gut microbiota restoration. This highlights the critical role of microbiota-targeted therapies in managing post-viral syndromes.

These projects emphasised interdisciplinary collaboration, integrating virology, computational modelling, immunology, and microbiota research. By addressing global public health challenges, they contributed to advancing vaccine development, therapeutic interventions, and understanding of pathogen-host interactions. This work aligns with the University's mission to lead high-impact biomedical research at national and international levels.

Research and Scholarship

Research Awards and Recognitions

Name	Details	
	Award	Organisation
Chris Mok	The World's Top 2% Most-cited Scientists 2024	Stanford University

Fellowships

Name	Details	
	Fellowship	Organisation
Chris Mok	Visiting Scientist	National University of Singapore
		Lee Kong Chian School of Medicine, Nanyang Technological University
	Honorary Assistant Professor	Pasteur Research Pole, School of Public Health, Li Ka Shing Faculty of Medicine, The University of Hong Kong

Academic Editorships

Name	Details	
	Role	Journal
Chris Mok	Associate Editor	Virology Journal
		Frontier of Immunology
	Guest Editor	PLOS Pathogens

Reviewers of Journal / Conference

Name	Details	
	Role	Journal / Conference
Chris Mok	Reviewer	Archives of Virology
		Cell Reports Medicine
		eBiomedicine
		International Journal of Infectious Diseases
		Influenza and Other Respiratory Viruses
		Journal of Medical Virology
		Journal of Infection
		Lancet Regional Health-Western Pacific
		Lancet Infectious Diseases
		The Signal Transduction and Targeted Therapy

Grants and Consultancies

Name	Project Title	Funding Source	Start Date (dd/mm/yyyy)	End Date (dd/mm/yyyy)	Amount (HK$)
Chris Mok	Commissioned Research on the Novel Coronavirus Disease (Covid-19) – Long-term Longitudinal Comparisons of Health Status and Immune Response in Convalescent COVID-19 and Vaccinated Cohorts in Hong Kong	Health Bureau – Commissioned Studies	01/04/2021	31/03/2025	24,000,000

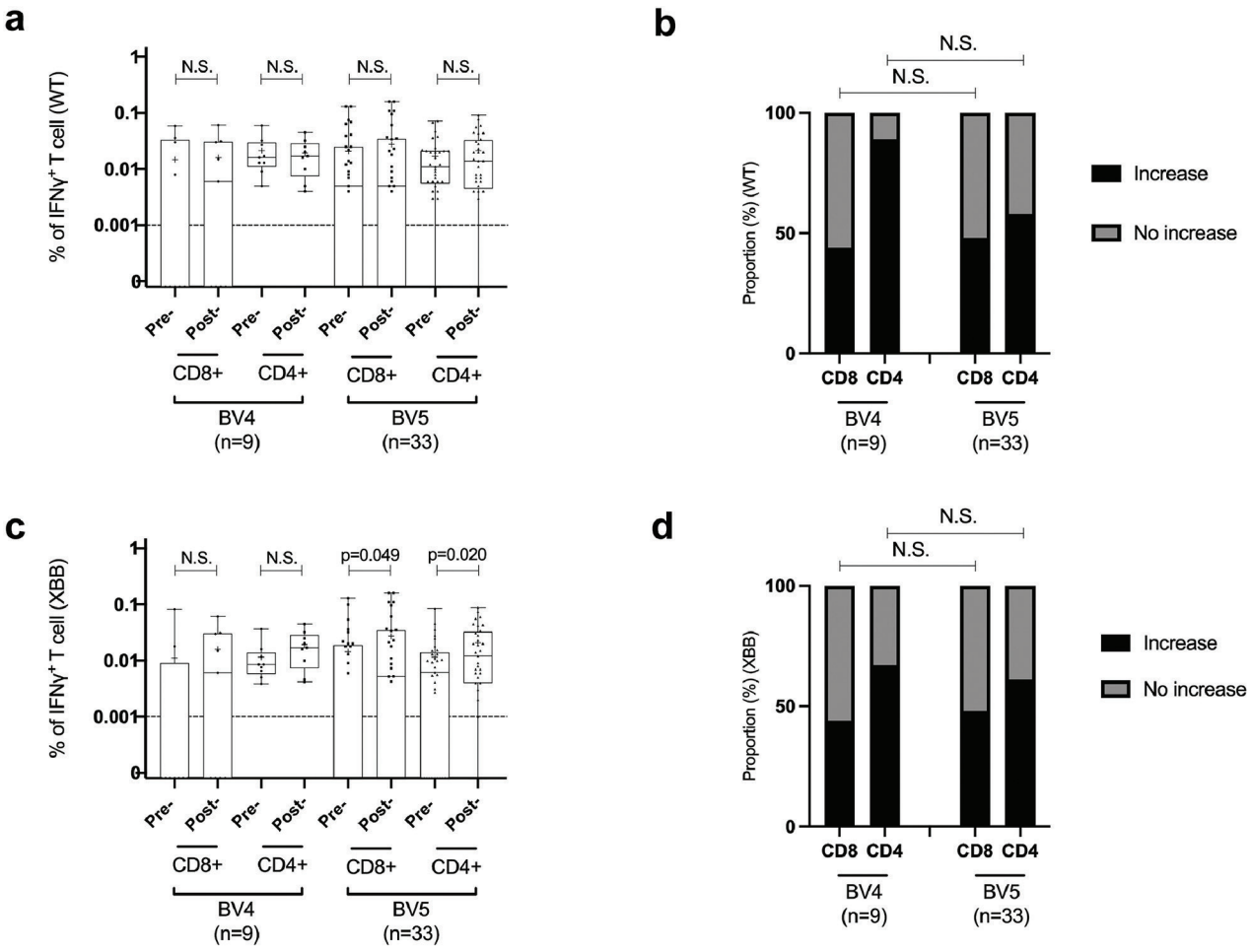
Grants and Consultancies

Name	Project Title	Funding Source	Start Date (dd/mm/yyyy)	End Date (dd/mm/yyyy)	Amount HK$
Chris Mok	From Structural to Genomic Biology: A Multi-scale Approach Tightly Integrating Structural Biology and Novel Genomics Platform to Quantitatively Analyze the Transcription and its Regulation of SARS-CoV-2 Viral RNA Polymerase	Research Grants Committee – Collaborative Research Fund	30/06/2022	29/06/2025	8,000,000
	Establishment of a Joint Laboratory Between CUHK and The Guangzhou National Laboratory	The Chinese University of Hong Kong Resource Allocation Committee	28/09/2022	27/09/2025	7,316,000
	Identification of Monoclonal Antibodies Targeting to the Spike Protein for the Therapeutic Treatment of Omicron BA.1 and BA.2 Infections	Health Bureau – Health and Medical Research Fund	01/09/2023	31/08/2025	1,500,000
	Development of Simeprevir Analogues as Anti-coronavirus Drugs	Health Bureau – Health and Medical Research Fund	01/09/2023	31/08/2025	1,500,000
	Investigating Cardiotoxicity Induced by Antiviral Therapeutics using *in vitro* hiPSC-Cardiomyocyte and *in vivo* Mouse Model	Health Bureau – Health and Medical Research Fund	01/07/2023	30/06/2025	1,499,004

Publications

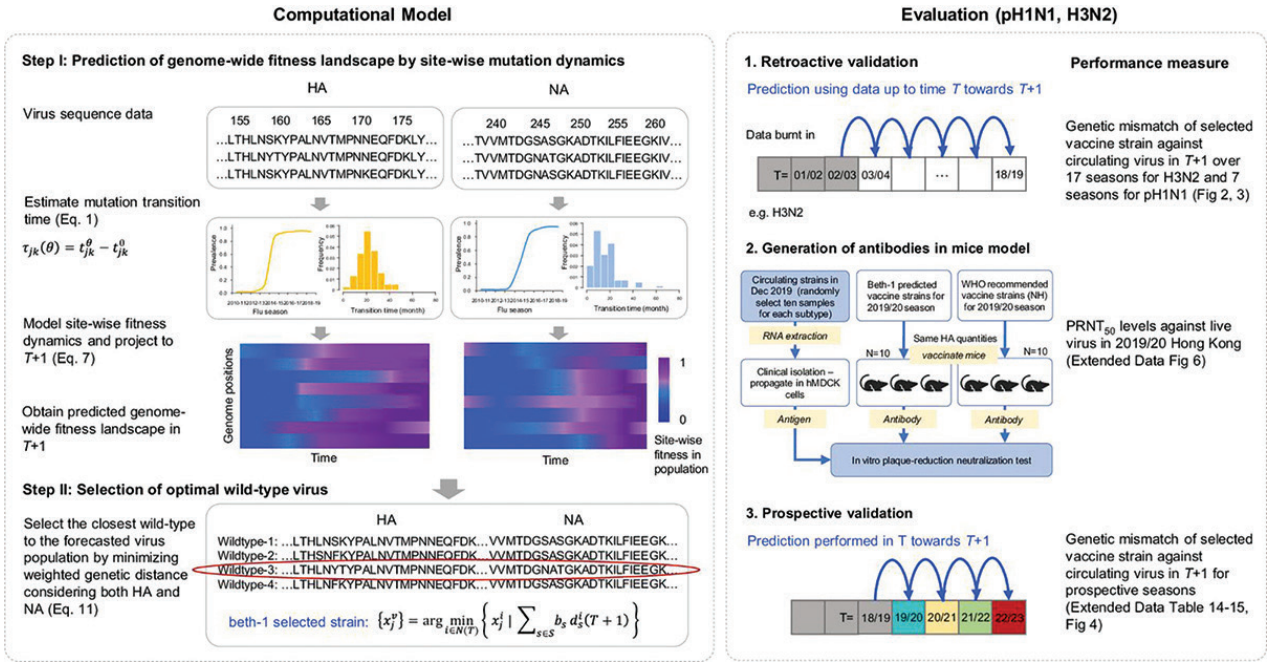
A. Journal Papers

1. Wang Y, Zhang Z, Yang M, Xiong X, Yan Q, Cao L, Wei P, Zhang Y, Zhang L, Lv K, Chen J, Liu X, Zhao X, Xiao J, Zhang S, Zhu A, Gan M, Zhang J, Cai R, Zhuo J, Zhang Y, Rao H, Qu B, Zhang Y, Chen L, Dai J, Cheng L, Hu Q, Chen Y, Lv H, So RTY, Peiris M, Zhao J, Liu X, Mok CKP, Wang X, Zhao J. Identification of a broad sarbecovirus neutralising antibody targeting a conserved epitope on the receptor-binding domain. *Cell Reports*. 2024;43(1):113653. doi:10.1016/j.celrep.2023.113653.
2. Lau RI, Su Q, Lau ISF, Ching JYL, Wong MCS, Lau LHS, Tun HM, Mok CKP, Chau SWH, Tse YK, Cheung CP, Li MKT, Yeung GTY, Cheong PK, Chan FKL, Ng SC. A synbiotic preparation (SIM01) for post-acute COVID-19 syndrome in Hong Kong (RECOVERY): A randomised, double-blind, placebo-controlled trial. *The Lancet Infectious Diseases*. 2024;24(3):256-265. doi:10.1016/s1473-3099(23)00685-0.
3. Lou J, Liang W, Cao L, Hu I, Zhao S, Chen Z, Chan RWY, Cheung PPH, Zheng H, Liu C, Li Q, Chong MKC, Zhang Y, Yeoh EK, Chan PKS, Zee BCY, Mok CKP, Wang MH. Predictive evolutionary modelling for influenza virus by site-based dynamics of mutations. *Nature Communications*. 2024 151. 2024;15(1):1-11. doi:10.1038/s41467-024-46918-0.
4. Lei R, Liang W, Ouyang WO, Hernandez Garcia A, Kikuchi C, Wang S, McBride R, Tan TJC, Sun Y, Chen C, Graham CS, Rodriguez LA, Shen IR, Choi D, Bruzzone R, Paulson JC, Nair SK, Mok CKP, Wu NC. Epistasis mediates the evolution of the receptor binding mode in recent human H3N2 hemagglutinin. *Nature Communications*. 2024 151. 2024;15(1):1-12. doi:10.1038/s41467-024-49487-4.
5. Wang H, Wei Y, Hung CT, Lin G, Jiang X, Li C, Jia KM, Yam CHK, Chow TY, Ho JYE, Wang Y, Zhao S, Guo Z, Li K, Yang A, Mok CKP, Hui DSC, Yeoh EK, Chong KC. Association of nirmatrelvir–ritonavir with post-acute sequelae and mortality in patients admitted to hospital with COVID-19: A retrospective cohort study. *Lancet Infectious Diseases*. 2024;24(10):1130-1140. doi:10.1016/s1473-3099(24)00217-2.
6. Wang H, Wei Y, Lin G, Boyer C, Jia KM, Hung CT, Jiang X, Li C, Yam CHK, Chow TY, Wang Y, Zhao S, Guo Z, Li K, Yang A, Mok CKP, Hui DSC, Chong KC, Yeoh EK. COVID-19 vaccination modified the effect of nirmatrelvir–ritonavir on post-acute mortality and rehospitalization: a retrospective cohort study. *Emerging Microbes & Infections*. 2024;13(1):2421397. doi:10.1080/22221751.2024.2421397.
7. Cheng SMS, Mok CKP, Li JKC, Chan KKP, Luk KS, Lee BHW, Gu H, Chan KCK, Tsang LCH, Yiu KYS, Ling KKC, Tang YS, Luk LLH, Yu JKM, Pekosz A, Webby RJ, Cowling BJ, Hui DSC, Peiris M. Cross-neutralising antibody against emerging Omicron subvariants of SARS-CoV-2 in infection-naïve individuals with homologous BNT162b2 or BNT162b2(WT + BA.4/5) bivalent booster vaccination. *Virology Journal*. 2024;21(1):1-7. doi:10.1186/s12985-024-02335-9.
8. Tsui Y, Wu X, Zhang X, Peng Y, Mok CKP, Chan FKL, Ng SC, Tun HM. Short-chain fatty acids in viral infection: The underlying mechanisms, opportunities, and challenges. *Trends in Microbiology*. Published online 2024. doi:10.1016/j.tim.2024.10.001. (Review)
9. Zhao S, Mok CKP, Tang YS, Chen C, Sun Y, Chong KC, Hui DSC. Inferring incidence of unreported SARS-CoV-2 infections using seroprevalence of open reading frame 8 antigen, Hong Kong. *Emerging Infectious Diseases*. 2024;30(2):325-328. doi:10.3201/eid3002.231332.
10. Lv H, Teo QW, Lee CCD, Liang W, Choi D, Mao KJ, Ardagh MR, Gopal AB, Mehta A, Szlembarski M, Bruzzone R, Wilson IA, Wu NC, Mok CKP. Differential antigenic imprinting effects between influenza H1N1 hemagglutinin and neuraminidase in a mouse model. ThomasPG, ed. *Journal of Virology*. 2025;99(1). doi:10.1128/jvi.01695-24. (Epub ahead of print)
11. Tang YS, Tan CW, Chong KC, Chen C, Sun Y, Yiu K, Ling KC, Chan KKP, Peiris M, Mok CKP, Hui DS. Determination of T cell response against XBB variants in adults who received either monovalent wild-type inactivated whole virus or mRNA vaccine or bivalent WT/BA.4-5 COVID-19 mRNA vaccine as the additional booster. *International Journal of Infectious Diseases*. 2024;149. doi:10.1016/j.ijid.2024.107271.
12. Lin G, Wei Y, Wang H, Boyer C, Jia KM, Hung CT, Jiang X, Li C, Yam CHK, Chow TY, Wang Y, Zhao S, Guo Z, Li K, Yang A, Mok CKP, Hui DSC, Chong KC, Yeoh EK. Association of nirmatrelvir-ritonavir with post-acute sequelae and mortality among patients who are immunocompromised with COVID-19 in Hong Kong: A retrospective cohort study. *Lancet Rheumatology*. 2025;7(2). doi:10.1016/s2665-9913(24)00224-8. (Epub ahead of print)



T cell responses against SARS-CoV-2 in adults who received bivalent vaccine as the fourth or fifth dose. PBMCs from before or 1 month after booster of bivalent vaccine were stimulated with pooled spike or structural (S/M/N/E) peptides. The percentage of IFNγ+CD8+ and IFNγ+CD4+ T cell against WT (a) or XBB (c) were measured by flow cytometry. Dotted lines represent the limit of detection following background (DMSO) subtraction. (b and d) The proportion of positive participants that showed increase in IFNγ+CD8+ and IFNγ+CD4+ T cell after receiving the booster dose. In panels (a and c), data was presented as box and whiskers while the error bars represent the minimum and maximum. Data within the same vaccine group was compared by pairwise Wilcoxon rank sum test. Mann–Whitney U test was used to test between different subgroups. N.S. represented P > 0.05 and was defined as statistically nonsignificant. P was generated by multiple linear regression model adjusting by age, gender, and other confounders.

Source: From Tang YS, Tan CW, Chong KC, Chen C, Sun Y, Yiu K, Ling KC, Chan KKP, Peiris M, Mok CKP, Hui DS. Determination of T cell response against XBB variants in adults who received either monovalent wild-type inactivated whole virus or mRNA vaccine or bivalent WT/BA.4-5 COVID-19 mRNA vaccine as the additional booster. International Journal of Infectious Diseases 2024 Dec;149:107271. (Co-corresponding author)



Overview of the computational model and study design. Site-wise fitness dynamics are modelled and projected to the next season (T + 1). Based on the predicted genome-wide fitness landscape of future virus population, an optimal wild-type virus can be selected integrating evolutionary information of both hemagglutinin and neuraminidase genes. The prediction is validated by genetic mismatch against observed circulating viruses in the Northern Hemisphere retroactively and prospectively for pH1N1 and H3N2. In addition, mouse model is used to evaluate the antibodies elicited by predicted vaccine strain in neutralising the clinical isolates in 2019/20 season.

Source: Lou J, Liang W, Cao L, Hu I, Zhao S, Chen Z, Chan RWY, Cheung PPH, Zheng H, Liu C, Li Q, Chong MKC, Zhang Y, Yeoh EK, Chan PK, Zee BCY, Mok CKP, Wang MH. Predictive evolutionary modelling for influenza virus by site-based dynamics of mutations. Nature Communications. 2024 Mar 21;15(1):2546. (Co-corresponding author)



Infectious Diseases, Public Health and Microbiota

Respiratory Medicine

傳染病、公共衛生及腸道微生物學

PRINCIPAL INVESTIGATOR | **Ken Chan**

TEAM MEMBERS | Karen Yiu, Wai Chi Yung, Natalie Wong, Cynthia Ho, Fanny Chan, Ken Ling, Timothy Ng, Angela Leung, Crystal Tso, Tiffany Chan, Alice Chan, Sharon Yim

Research Progress Summary

Ken Chan's research group has made significant advancements in three primary areas.

First, in collaboration with the Department of Chemical Pathology, the research team has developed a new liquid biopsy assay utilising pleural fluid. This assay employs whole genome sequencing technology coupled with advanced bioinformatic analysis. Preliminary data indicate that this assay provides superior diagnostic performance compared to conventional polymerase chain reaction (PCR) techniques or culture-based methods. This novel technique promises to enhance the diagnostic pathway for tuberculous pleuritis, reducing the need for repeated invasive investigations and

facilitating early initiation of anti-tuberculosis treatment. Additionally, they are developing molecular-based techniques for the rapid identification of non-tuberculous bacteria in pleural infections. Traditional culture-based methods often lack the sensitivity needed to detect the causative microorganisms. Currently, no PCR panel dedicated to pleural infections is commercially available. Their development aims to shorten the time to diagnosis and guide appropriate antibiotic usage.

Second, the team's research involves big data analysis using a territory-wide healthcare database to evaluate the burden of various respiratory viral infections (e.g. influenza, respiratory syncytial virus, COVID-19) and their impact on patients with chronic respiratory diseases. The data generated will illuminate the disease burden in Hong Kong and inform vaccination strategies for vulnerable patient groups.

Lastly, the research group has conducted prospective follow-up studies on patients who have recovered from COVID-19, comparing their clinical and functional outcomes with those of SARS survivors. Additionally, they are evaluating the spectrum of long COVID symptoms in COVID-19 survivors and exploring the cellular mechanisms associated with these symptoms.

Research and Scholarship

Research Awards and Recognitions

Name	Details	
	Award	Organisation
Ken Chan	Outstanding Author	Journal of Thoracic Disease

Academic Editorships

Name	Details	
	Role	Journal
Ken Chan	Editorial Board Member	Respirology

Reviewers of Journal / Conference

Name	Details	
	Role	Journal / Conference
Ken Chan	Reviewer	Respiratory Investigation
		Annals of Translational Medicine
		Medicina
		Thorax
	Abstract reviewer	Respiratory Infection (non-tuberculous) Assembly, Asian Pacific Society of Respirology Congress 2024

Grants and Consultancies

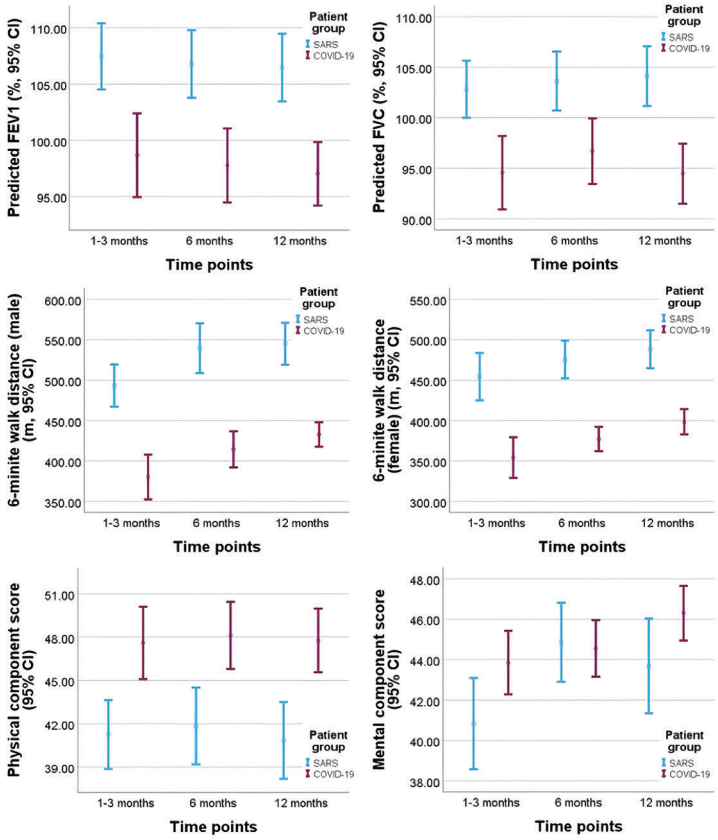
Name	Project Title	Funding Source	Start Date (dd/mm/yyyy)	End Date (dd/mm/yyyy)	Amount (HK$)
Ken Chan	A Pilot Study Comparing the Clinical Efficacy and Bleeding Risk between Low Dose and Standard Dose Intrapleural Tissue Plasminogen Activator for Pleural Infection	Health Bureau – Health and Medical Research Fund	01/07/2024	30/06/2026	470,000
	Levels of *Mycobacterium tuberculosis* Cell-free DNA (MTB cfDNA) in Tuberculous and Non-tuberculous Pleural Effusion	Hong Kong Tuberculosis, Chest and Heart Diseases Association	01/10/2022	30/09/2024	320,000
	A Survey on the Practice and Interpretation of Various Diagnostic Tests for Tuberculous Pleuritis among Respiratory Physicians	Asian Pacific Society of Respirology	01/06/2024	28/02/2025	USD 19,385
	Epidemiology and Clinical Outcomes in Adult Non-traumatic Pleural Diseases: A Territory-wide Retrospective Cohort Study in Hong Kong	Hong Kong Lung Foundation	01/04/2024	30/09/2025	225,000
	Improving Diagnosis and Theragnosis (Treatment Selection) in Mesothelioma by Multiplex Immunostaining and Digital Image Analysis	Pneumoconiosis Compensation Fund Board	01/11/2023	31/10/2025	1,065,418

Publications

A. Journal Papers

1. Chan KKP, Wong JSH, Yip WH. Superimposed pleural infection in cirrhotic chylothorax. *Respirology Case Reports*. 2024;12(11). doi:10.1002/rcr2.70065.
2. Rowntree LC, Audsley J, Allen LF, McQuilten HA, Hagen RR, Chaurasia P, Petersen J, Littler DR, Tan HX, Murdiyarso L, Habel JR, Foo IJH, Zhang W, Ten Berge ERV, Ganesh H, Kaewpreedee P, Lee KWK, Cheng SMS, Kwok JSY, Jayasinghe D, Gras S, Juno JA, Wheatley AK, Kent SJ, Rossjohn J, Cheng AC, Kotsimbos TC, Trubiano JA, Holmes NE, Chan KKP, Hui DSC, Peiris M, Poon LLM, Lewin SR, Doherty PC, Thevarajan I, Valkenburg SA, Kedzierska K, Nguyen THO. SARS-CoV-2-specific $CD8^+$ T cells from people with long COVID establish and maintain effector phenotype and key TCR signatures over 2 years. *Proceedings of the National Academy of Sciences of the United States of America*. 2024;121(39). doi:10.1073/pnas.2411428121.
3. Chan C, Chan KKP. Pleural fluid biomarkers: A narrative review. *Journal of Thoracic Disease*. 2024;16(7):4764-4771. doi:10.21037/jtd-24-467. (Review)
4. Li JJX, Ng JKM, Chan C, Lau CHY, Ng JKC, Lo RLP, Yip WH, Ngai JCL, Chan KP. Digital image comparison of cellular yield in bronchial brushing: Pre- and post-biopsy lavage cytology. *Acta Cytologica*. 2024;68(4):368-373. doi:10.1159/000539567.

Figure 1. Serial changes in various parameters over 12 months for COVID-19 and SARS survivors



Serial changes in physiological and function parameters over 12 months for COVID-19 and SARS survivors.

Source: Ken Chan



Infectious Diseases, Public Health and Microbiota

Early Life Microbiome

傳染病、公共衛生及腸道微生物學

PRINCIPAL INVESTIGATOR | **Lin Zhang**

TEAM MEMBERS | Yingzhi Liu, Wenye Xu, Shilan Wang, Judeng Zeng, Xinbo Xu, Xinyi Zhang, Shuai Yan, Tong Yu

Research Progress Summary

In 2024, **Lin Zhang** and her team reinforced the role of Faculty of Medicine, The Chinese University of Hong Kong in the study of early-life microbiome. Lin together with collaborators from Icahn School of Medicine at Mount Sinai and Center for Molecular Prediction of Inflammatory Bowel Disease (PREDICT) from Denmark presented a comprehensive summary of the interplay between early-life factors and microbiome perturbations, and their association with risk of childhood inflammatory bowel disease (IBD). In addition, they provided an overview of host and external factors in early life that are known to impact gut microbiome maturation and exposures implicated in IBD risk. Considering

the emerging concept of IBD prevention, they proposed strategies to minimise maternal and offspring exposure to potentially harmful variables and recommend protective measures during pregnancy and the postpartum period (*Gut*, 2024).

As gestational diabetes mellitus (GDM) is one of the leading pregnancy complications globally, Lin and her team accessed the fecal microbiome of 264 mother-baby pairs, employing metagenomic sequencing to analyse 1,566 stool samples. For the first time, they unveiled the impact of GDM on mother-infant gut microbiomes and the subsequent sexual dimorphism in infant neurodevelopment. Findings have been published in an international journal - *Cell Host & Microbe*. A public press release launched about "CU Medicine's large-scale mother-baby study finds altered gut microbiome in pregnant mothers with gestational diabetes mellitus affects infants' head circumference, which is the earliest validated marker for neurodevelopment."

Besides the early-life microbiome, Lin has a solid track record in the study of host-microbe interactions. She recently discovered that the genotoxicity of *Fusobacterium nucleatum* in colorectal carcinogenesis was mediated through its secreted mutagens (*Gut Pathogens,* 2024). Moreover, she and her team reported the role of m6A modification in the protection against *Helicobacter pylori* infection (*Nature Communications*, 2024).

Research and Scholarship

Research Awards and Recognitions

Name	Details	
	Award	Organisation
Lin Zhang	The Most Downloaded During its 12 Months of Publication in Journal of Gastroenterology and Hepatology (2024)	Journal of Gastroenterology and Hepatology

Fellowships

Name	Details	
	Fellowship	Organisation
Yingzhi Liu	Postdoctoral Fellowship Scheme	Research Grants Council
Wenye Xu	Faculty Postdoctoral Fellowship	Faculty of Medicine, The Chinese University of Hong Kong
Shilan Wang		
Xinbo Xu		
Judeng Zeng		

Academic Editorships

Name	Details	
	Role	Journal
Lin Zhang	Editorial Board	iMeta

Reviewers of Journal / Conference

Name	Details	
	Role	Journal / Conference
Lin Zhang	Reviewer	Signal Transduction and Targeted Therapy
		Annals of Internal Medicine
		Gastroenterology
		Gut
		Gut Microbes
		Oncogene
		Alimentary Pharmacology & Therapeutics
		Journal of Pathology
		International Inflammopharmacology
		Journal of Molecular Sciences
		Pediatric Allergy and Immunology
		Scientific Report
		Current Medicinal Medicine
		iMeta
Yingzhi Liu	Reviewer	iMeta

Grants and Consultancies

Name	Project Title	Funding Source	Start Date (dd/mm/yyyy)	End Date (dd/mm/yyyy)	Amount (HK$)
Lin Zhang	Augmenting the cGAS-STING Pathway for Eliminating *Helicobacter pylori* Infection	Research Grants Council – General Research Fund	01/01/2024	31/12/2026	1,577,000
	Deciphering How Host Defense Peptide Gene Variation Influences the Early Life Gut Microbiota Composition	The Chinese University of Hong Kong Research Committee – Direct Grant	30/06/2024	29/06/2025	50,000
	Gut Microbiota Activates the Impaired Lysosome Acidification against SARS-CoV-2 Non-structural Protein 6 Triggered NLRP3-dependent Pyrolosis	The Chinese University of Hong Kong Research Committee – Direct Grant	30/06/2023	29/06/2024	75,000

Grants and Consultancies

Name	Project Title	Funding Source	Start Date (dd/mm/yyyy)	End Date (dd/mm/yyyy)	Amount (HK$)
Lin Zhang	Faculty Postdoctoral Fellowship Scheme	Faculty of Medicine, The Chinese University of Hong Kong	09/2024	09/2025	250,000
	Translating Microbiome, Multi-omics and Dietary Innovations to Enhance Inflammatory Bowel Disease Diagnosis and Outcome	Research Grants Council – Research Impact Fund	29/06/2023	28/06/2026	7,878,339
	Translating Microbiome, Multi-omics and Dietary Innovations to Enhance Inflammatory Bowel Disease Diagnosis and Outcome	The Chinese University of Hong Kong – Matching for Research Impact Fund	29/06/2023	28/06/2026	3,376,431
	Gut Microbiota in Adults with Chronic Widespread Pain: A Pilot Case-control Study	The Chinese University of Hong Kong Peter Hung Pain Research Institute – Peter Hung Pain Research Institute Research Fund	01/12/2022	30/11/2024	602,810
	Novel Strategies to Facilitate Early Detection, Prevention and Intervention for Long-term Health Problems related to COVID-19 (NovITor-COVID Study)	Health Bureau – Health and Medical Research Fund Commissioned Research on the Novel Coronavirus Disease (COVID-19)	01/04/2021	31/03/2026	45,991,725
	Optimisation of Clinical Treatment of Severe Influenza to Reduce Morbidity and Mortality	Health Bureau – Health and Medical Research Fund Commissioned Programmes for Influenza Research	01/09/2019	31/08/2026	4,996,960

Publications

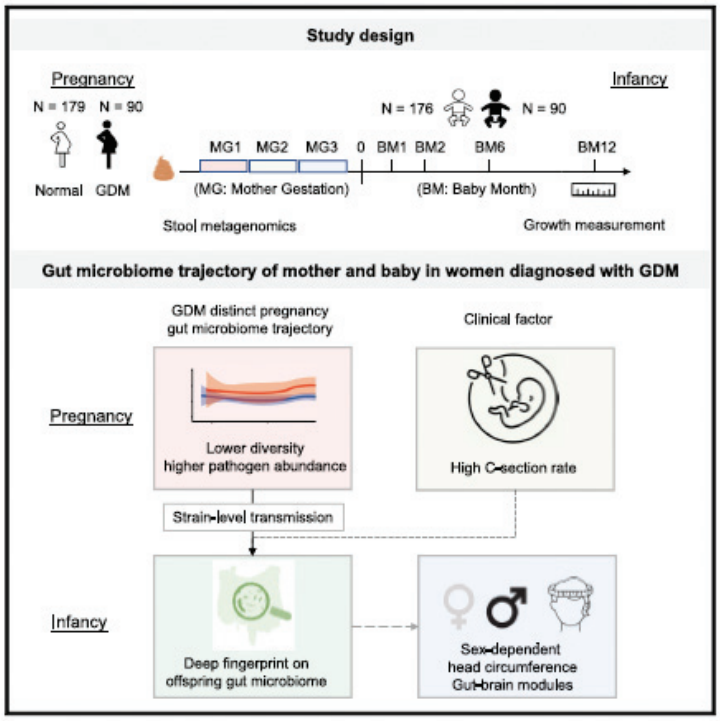
A. Journal Papers

1. Xu W, Zhang Y, Chen D, Huang D, Zhao Y, Hu W, Lin L, Liu Y, Wang S, Zeng J, Xie C, Chan H, Li Q, Chen H, Liu X, Wong SH, Yu J, Chan FKL, Chan MTV, Ng SC, Wu WKK, Zhang L. Elucidating the genotoxicity of *Fusobacterium nucleatum*-secreted mutagens in colorectal cancer carcinogenesis. *Gut Pathogens*. 2024;16(1). doi:10.1186/s13099-024-00640-w.
2. Zeng J, Xie C, Huang Z, Cho CH, Chan H, Li Q, Ashktorab H, Smoot DT, Wong SH, Yu J, Gong W, Liang C, Xu H, Chen H, Liu X, Wu JCY, Ip M, Gin T, Zhang L, Chan MTV, Hu W, Wu WKK. LOX-1 acts as an N^6-methyladenosine-regulated receptor for *Helicobacter pylori* by binding to the bacterial catalase. *Nature Communications*. 2024;15(1). doi:10.1038/s41467-024-44860-9.
3. He Y, Zhang L, Chen Z, Chan PKS, Leung TF, Tam WH. The associations of pre-pregnancy BMI and gestational weight gain with maternal gut microbiota. *Beneficial Microbes*. 2024;15(4):397-410. doi:10.1163/18762891-bja00018.
4. Jiang S, Cai M, Li D, Chen X, Chen X, Huang Q, Zhong C, Zheng X, Zhou D, Chen Z, Zhang L, Ching JYL, Chen A, Lu S, Zhang L, Hu L, Liao Y, Li Y, He Z, Wu J, Huo H, Liang Y, Li W, Zou Y, Luo W, Ng SC, Chan FKL, Chen X, Deng Y. Association of breast milk-derived arachidonic acid-induced infant gut dysbiosis with the onset of atopic dermatitis. *Gut*. Published online December 10, 2024. doi:10.1136/gutjnl-2024-332407. (Epub ahead of print)
5. Chen H, Liu W, Coker OO, Qin N, Chen H, Wang Y, Liu X, Zhang L, Choi GYS, Wong WT, Leung CCH, Ling L, Hui M, Gin T, Wong SH, Chan MTV, Wu WKK. Blood microbial signatures associated with mortality in patients with sepsis: A pilot study. *Heliyon*. 2024;10(8). doi:10.1016/j.heliyon.2024.e29572.
6. Zhang L, Agrawal M, Ng SC, Jess T. Early-life exposures and the microbiome: Implications for IBD prevention. *Gut*. 2023;73(3):541-549. doi:10.1136/gutjnl-2023-330002.

Cell Host & Microbe

Maternal gestational diabetes mellitus associates with altered gut microbiome composition and head circumference abnormalities in male offspring

Graphical abstract



Authors

Shilan Wang, Yingzhi Liu, Wing Hung Tam, ..., Francis K.L. Chan, Siew C. Ng, Lin Zhang

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In brief

Gestational diabetes mellitus (GDM), defined as hyperglycemia during pregnancy, is the leading gestational complication worldwide. Assessing the fecal microbiome in 264 mother-baby pairs, Wang et al. demonstrate that GDM affects both maternal and infant gut microbiome composition and gut-brain modules, which are associated with infant head growth in sexual dimorphism.

Gestational diabetes mellitus (GDM), defined as hyperglycemia during pregnancy, is the leading gestational complication worldwide. Assessing the fecal microbiome in 264 mother-baby pairs, the team demonstrates that GDM affects both maternal and infant gut microbiome composition and gut-brain modules, which are associated with infant head growth in sexual dimorphism.

Source: Wang S, Liu Y, Tam WH, Ching JYL, Xu W, Yan S, Qin B, Lin L, Peng Y, Zhu J, Cheung CP, Ip KL, Wong YM, Cheong PK, Yeung YL, Kan WHB, Leung TF, Leung TY, Chang EB, Rubin DT, Claud EC, Wu WKK, Tun HM, Chan FKL, Ng SC, Zhang L. Maternal gestational diabetes mellitus associates with altered gut microbiome composition and head circumference abnormalities in male offspring. Cell Host and Microbe. 2024;32(7):1192-1206.e5. doi:10.1016/j.chom.2024.06.005.



Infectious Diseases, Public Health and Microbiota

Virology

傳染病、公共衛生及腸道微生物學

PRINCIPAL INVESTIGATOR | **Mingyuan Li**

TEAM MEMBERS | Xinzhou Xu, Zhuoran Gao, Zhitong Zhu, Deng Kao

Research Progress Summary

Pathogenic RNA viruses like flaviviruses, coronaviruses, and influenza viruses frequently cause worldwide epidemics and pandemics due to the lack of effective vaccines or antiviral medications. RNA viruses exhibit a higher mutation rate compared to DNA viruses, resulting in accelerated evolution and the development of drug resistance. Consequently, traditional antiviral strategies that target viral proteases/polymerases, aiming to inhibit viral protein functions, encounter difficulties. Antiviral medications that target host dependency factors present a promising alternative, potentially combating a wide range of pathogenic viruses. However, achieving specificity while minimising side effects remains a significant challenge. Unfortunately, limited knowledge on the underlying mechanisms of host-

pathogen interactions impedes the development of innovative antiviral approaches. Therefore, the overarching goal of **Mingyuan Li**'s research focuses on the screen and identification of pan antiviral host targets for further therapeutic treatment replying on the platform for proteome and interactome. Some of her key responsibilities and achievements are listed below:

1. Utilising mass spectrometry and CRISPR-Cas9 technology, a serial of host factors involved in intracellular vesicle transport have been screened and identified as being manipulated by pathogenic RNA viruses, such as Dengue virus, Zika virus, Influenza virus and SARS-CoV-2. Several viral dependent host factors present promising potential as antiviral targets with broad spectrum efficacy. (Li et al., *Nature Microbiology*, In press)
2. Her team characterised the host ARFs II members upon Zika virus infection *in vivo* by construction of gene knockout mice. Their previous research demonstrated that Class II ARFs, which recruit coat components and package cargo for transport to post-Golgi compartments, are involved in the secretion of Dengue virus, a member of flaviviruses. Additionally, ARF4 alone was identified in their current studies to be essential to Zika virus, another member of flaviviruses. Therefore, to investigate their specific role in *in vivo* infection and pathogenesis, they conducted CRISPR-Cas9 mediated knockout in C57BL/6JGpt mice to established heterogenous ARF4 partial knockout mice ($ARF4^{-/+}$) and homogeneous ARF5 completed knockout mice ($ARF5^{-/-}$). They also generated ARF4/5 double knockout mice by the mating between $ARF4^{-/+}$ and ARF5-/- mice ($ARF4^{-/+}$/ $ARF5^{-/-}$). ZIKV challenges were performed using above achieved mice. Results indicated that viral infection in $ARF4^{-/+}$ mice, but not in $ARF5^{-/-}$ developed attenuated pathological changes in the brain and testis compared with the wild-type mice. This study together with their previous data gained from in vitro investigation drew a conclusion that ARF4 rather than ARF5 is essential for ZIKV infection. This study also provided animal models for studying the roles of ARF4 and ARF5 in flaviviruses infection and developing antivirals. (Deng et al., *Chinese Journal of Biotechnology*, 2024)
3. By utilising advanced DIA proteome and interactome analysis platform, plenty of exosome related host proteins has been identified to be regulated by virus. Therefore, it may uncover novel biomarkers for viral diagnosis, as well as additional key vulnerabilities in ZIKV infection for further antiviral pharmaceutical development. The team also defined a novel exosome packed release of progeny virions by TEM and immunofluorescent imaging analysis which is associated with biochemistry confirmation. Further investigation has confirmed the role of cellular exosome in evading circulating antibody and affecting tissue tropism. Related paper is being prepared.

Research and Scholarship

Fellowships

Name	Details	
	Fellowship	Organisation
Xinzhou Xu	Postdoctoral Fellowship Scheme	University Grants Committee

Reviewers of Journal / Conference

Name	Details	
	Role	Journal / Conference
Mingyuan Li	Reviewer	Frontiers in Microbiology

Grants and Consultancies

Name	Project Title	Funding Source	Start Date (dd/mm/yyyy)	End Date (dd/mm/yyyy)	Amount (HK$)
Mingyuan Li	Studies on the Underlying Mechanism ARF4 Regulated Zika Exosomes Mediated Egress	National Natural Science Foundation of China	01/01/2022	31/12/2025	RMB 540,000
	Studies on the Common Mechanisms in Coronavirus Infection and Pan Anti-Viral Targets Characterization	National Key Project on Scientific and Technological Innovation	01/12/2022	30/11/2025	RMB 22,000,000

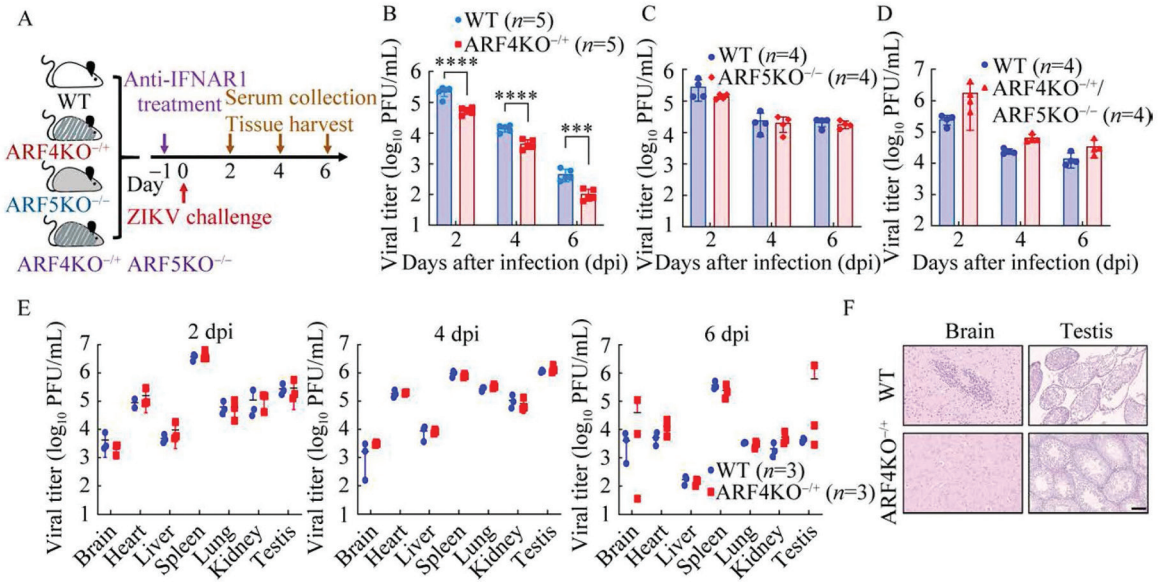
Publications

A. Journal Papers

1. Deng K, Li MY, Zhang HY, Deng YQ, Qin Y, Qin CF. Characterization of host factors ARF4 and ARF5 upon Zika virus infection *in vivo* by construction of gene knockout mice. *Chinese Journal of Biotechnology*. 2024; 40(12):4605-4615. doi:10.13345/j.cjb.240307.

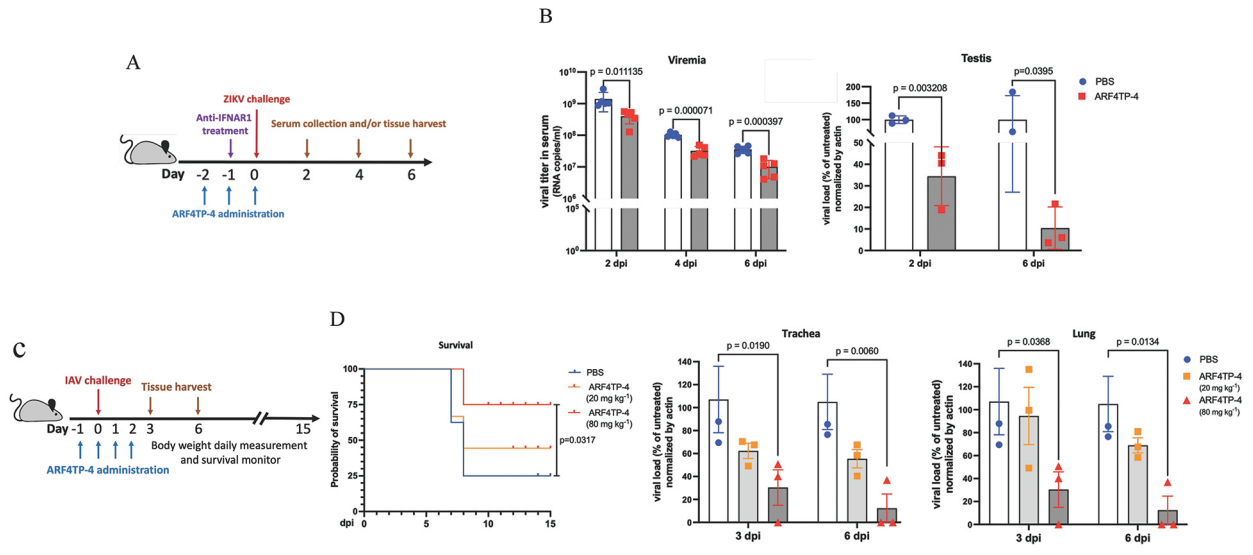
B. Conference Papers

1. Targeting ARF4 mediated intracellular transport as broad-spectrum antivirals against pathogenic RNA viruses including influenza A virus and SARS-CoV-2.
2. Targeting ARF4-mediated intracellular transport as a broad-spectrum antiviral strategy. doi: 10.21203/rs.3.rs-4017169/v1.



ARF4 deficiency decrease the Zika virus infection and induced pathogenic changes *in vivo*. A) Schematic diagram of the experimental design. B–D) Detection of viremia of WT and KO mice at 2, 4, and 6 dpi by quantitative RT-PCR. E) Detection of viral load in various tissue of WT and ARF4KO–/+ mice at 2, 4, and 6 dpi by quantitative RT-PCR. F) HE staining of ZIKV infected brain and testis collected from WT and ARF4KO–/+ mice at 6 dpi. Scale bar=100 μm. All data were expressed as x ± s , two-way ANOVA was performed to analyse the significance. **: P<0.05; **: P<0.01; ***: P<0.001; ****: P<0.0001*

Source: Deng K, Li MY, Zhang HY, Deng YQ, Qin Y, Qin CF. Characterization of host factors ARF4 and ARF5 upon Zika virus infection in vivo by construction of gene knockout mice. Chinese Journal of Biotechnology. 2024; 40(12):4605-4615. doi: 10.13345/j.cjb.240307.



ARF4 targeting peptide-ARF4TP-4 is protective against virus challenge in mice. A) Schematic diagram of ARFTP-4 treatment in ZIKV-infected mice. B) Viremia and viral load in testis were tested respectively. C) Schematic of ARF4TP-4 treatment in IAV infection *in vivo*. D) Survival curve (n=8 mice/group), viral load in trachea and lung were tested respectively.

Source: Mingyuan Li



Infectious Diseases, Public Health and Microbiota

Systems Immunology in Health and Disease, T Cell Biology

傳染病、公共衛生及腸道微生物學

PRINCIPAL INVESTIGATOR | Likai Tan

TEAM MEMBERS | Zemin Chen, Zeyu Shi

Research Progress Summary

Harnessing High-dimensional Immune Profiling for Enhanced Early Sepsis Detection in the Intensive Care Unit Settings

Sepsis is a life-threatening inflammatory syndrome against infections that kills over 7 million people annually. The pathogenesis of sepsis is complex, resulting from a profoundly dysregulated host immune response to infections.

Significant clinical challenges for sepsis range from timely and accurate diagnosis to treatment and prognosis, which may be addressed by investigating the underlying mechanisms for dysregulated immune responses in sepsis.

The aim of this study is to develop new biomarkers to diagnose sepsis, by identifying key immune cell populations that can reflect the occurrence and development of sepsis from a systemic clinical cohort. **Likai Tan**'s team is recruiting a multi-center cohort from Hong Kong and Chengdu, collecting peripheral blood mononuclear cells (PBMCs) on the day of hospital admission. Leveraging spectral flow cytometry and single-cell sequencing, the team will comprehensively map cellular phenotypes and transcriptional states.

The team has designed a 36-immune marker panel capable of detailed characterisation of immune cell phenotypes in PBMCs. In their preliminary experiments, they identified 43 distinct immune cell sub-populations among lymphocytes and myeloid cells. Notably, monocytes from patients admitted to the hospital within 24 hours exhibited the greatest differences between sepsis and non-sepsis groups. By analysing eight subsets of monocytes, characterised mainly by PD-L1, HLA-DR, and CD319 expression, they can effectively distinguish sepsis patients from controls.

This project is collaborated with Manli Li at West China University (Chengdu, China) and Immo Prinz at University Medical Center Hamburg Eppendorf (Hamburg, Germany).

Research and Scholarship

Fellowships

Name	Details	
	Fellowship	Organisation
Likai Tan	Youth Committee	Chinese Association of Rehabilitation Medicine

Academic Editorships

Name	Details	
	Role	Journal
Likai Tan	Review Editor	Frontiers in Immunology
	Editor	Microbes & Immunity

Reviewers of Journal / Conference

Name	Details	
	Role	Journal / Conference
Likai Tan	Peer Review	Journal of Leukocyte Biology
		BMC Medicine
		Frontiers In Immunology
		Experimental Cell Research

Grants and Consultancies

Name	Project Title	Funding Source	Start Date (dd/mm/yyyy)	End Date (dd/mm/yyyy)	Amount (HK$)
Likai Tan	Spectral Flow Cytometry-based Immune Profiling for Improved Sepsis Diagnosis: A Multi-Center, International Study	Research Grants Council – Germany/ Hong Kong Joint Research Scheme	01/12/2023	30/11/2025	89,000
	Shingles and PHN: Decoding the Pain with Immune Clues and AI	The Chinese University of Hong Kong Peter Hung Pain Research Institute – Peter Hung Pain Research Institute Research Fund	01/09/2024	30/08/2026	3,384,000

Publications

A. Journal Papers

1. Jiang Y, Huang Z, Sun W, Huang J, Xu Y, Liao Y, Jin T, Li Q, Ho IHT, Zou Y, Zhu W, Li Q, Qin F, Zhang X, Shi S, Zhang N, Yang S, Xie W, Wu S, Tan L, Zhang L, Chen H, Gin T, Chan MTV, Wu WKK, Xiao L, Liu X. *Roseburia intestinalis*-derived butyrate alleviates neuropathic pain. *Cell Host and Microbe*. 2025;33(1):104-118.e7. doi:10.1016/j.chom.2024.11.013. (Epub ahead of print)

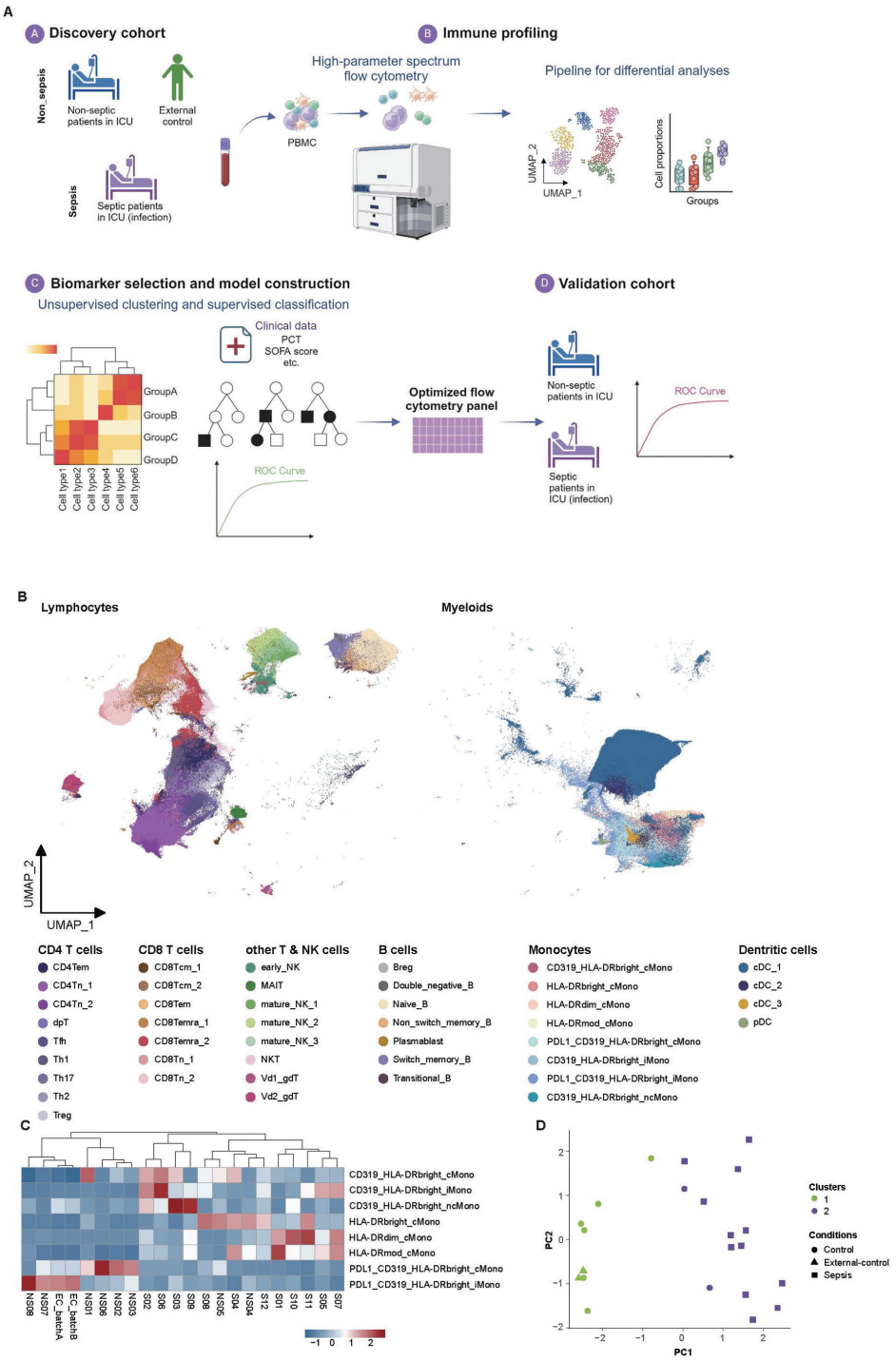


Figure 1. Systemic profiling of immune cells uncovers dysregulated monocytes in sepsis. **(A)**Workflow.**(B)** High-dimensional analysis of spectral flow cytometry data on PBMC from sepsis patients. **(C)** Monocyte subsets are differentially abundant in sepsis versus control patients. **(D)** Sepsis patients were discriminated from control using the monocyte composition.

Systemic profiling of immune cells uncovers dysregulated monocytes in sepsis.

Source: Poster, Hong Kong Flow-cytometry Annual Meeting



Infectious Diseases, Public Health and Microbiota

Exposomics, Exposure Biology, Environmental Health, Environmental Health Data Science, Machine Learning, Metabolomics

傳染病、公共衛生及腸道微生物學

PRINCIPAL INVESTIGATOR | **Jake Chung**

TEAM MEMBERS | Yujing Chen, Qianyi Huang, Yeli Lin, Wencong Wu

Research Progress Summary

Following the landmark Catalytic Workshop Series on the Exposome in 2022, which was sponsored by the National Institute of Environmental Health Sciences (NIEHS), an international exposomics consortium was formed. A series of papers summarising the discussion were published and **Jake Chung** was one of the leading authors for a publication focusing on data science methodologies and implications of exposome-wide association studies (ExWASs) in health and medicine.

Using national administrative claims with 19 million SARS-CoV-2 test records, Jake was able to estimate the paediatric and young adult household secondary attack rates of SARS-CoV-2 in the initial waves of outbreaks in the U.S.

Jake's team collaborated with researchers from the School of Public Health, Sun Yat-Sen University, to study the exposure to air-born fine particulate matter and its influence on maternal glucose metabolism and allergic rhinitis in children. The studies concluded that reduction in ambient fine particulate could improve glucose metabolism and allergic rhinitis symptoms in early childhood.

In collaboration with NIEHS, the team explored the Personalised Environment and Genes Study (PEGS) and investigated the impacts of the totality of environmental factors on asthma. They systematically assessed ninety-three occupational chemical agents and evaluated the combined risk of polyexposure for adult asthma and identified potential novel asthmagens that warrant further investigation and targeted prevention strategies. In addition, they examined the association between residential environmental hazards and adult asthma risk, highlighting the role of air pollutants, such as organic matter in PM2.5. Socially vulnerable neighbourhoods also showed increased risks of mixture exposure and asthma.

Jake was also invited to give a talk on exposome and health at the joint conference of the 1st International Conference on Health, Environment, Education and Research 2024 and the 10th International Conference on Water Resource and Environment at The Education University of Hong Kong. He also chaired an oral session on environmental sustainability.

Research and Scholarship

Research Awards and Recognitions

Name	Details	
	Award	Organisation
Jake Chung	Silver Medal	Silicon Valley International Invention Festival
	Silver Medal	International Invention Innovation Competition in Canada
	Special Award	

Academic Editorships

Name	Details	
	Role	Journal
Jake Chung	Editorial Board Member	Exposome

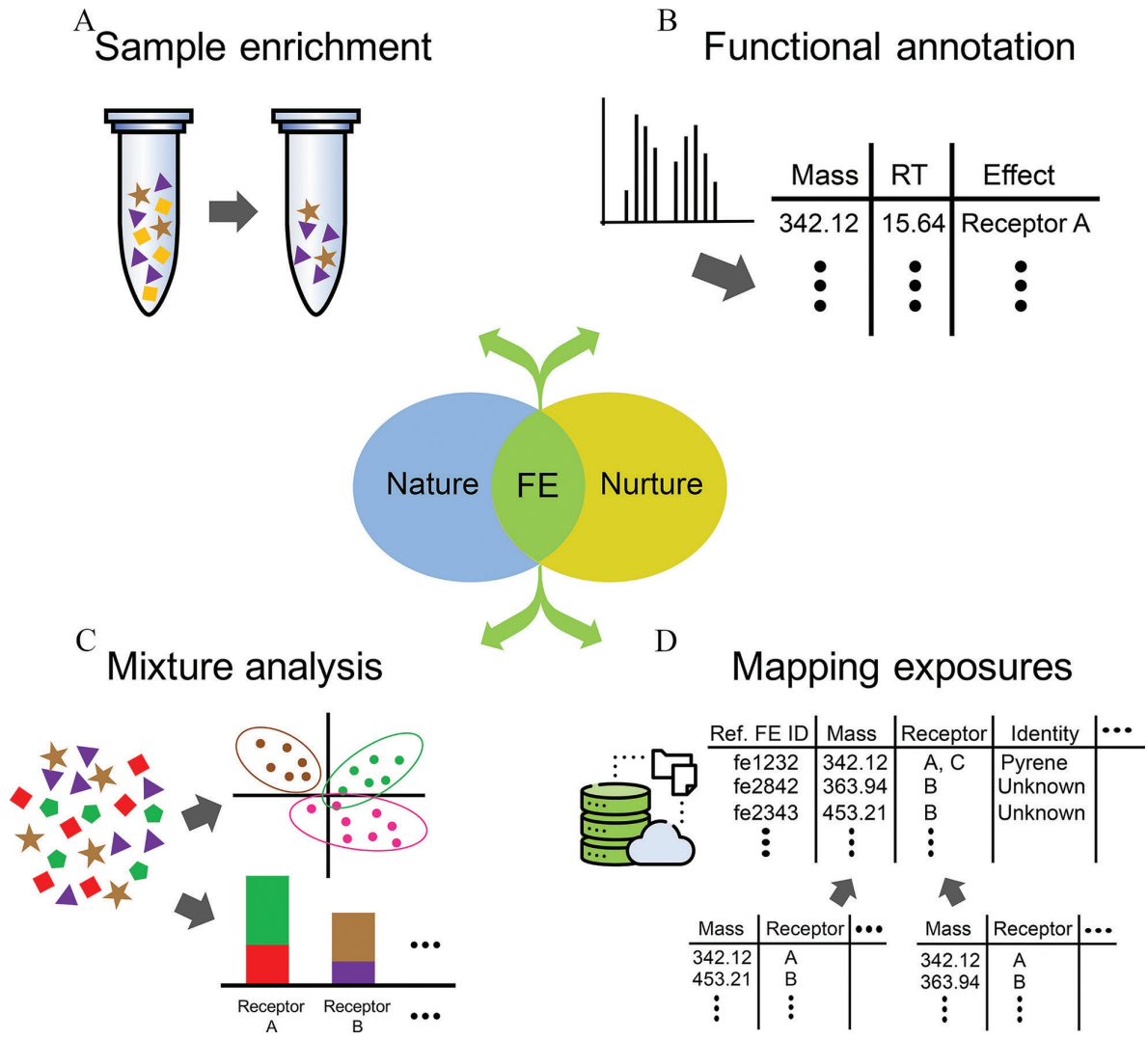
Reviewers of Journal / Conference

Name	Details	
	Role	Journal / Conference
Jake Chung	Reviewer	Communications Medicine
		Environment International
		Exposome
		BMC Public Health
		Environmental Health Perspectives

Publications

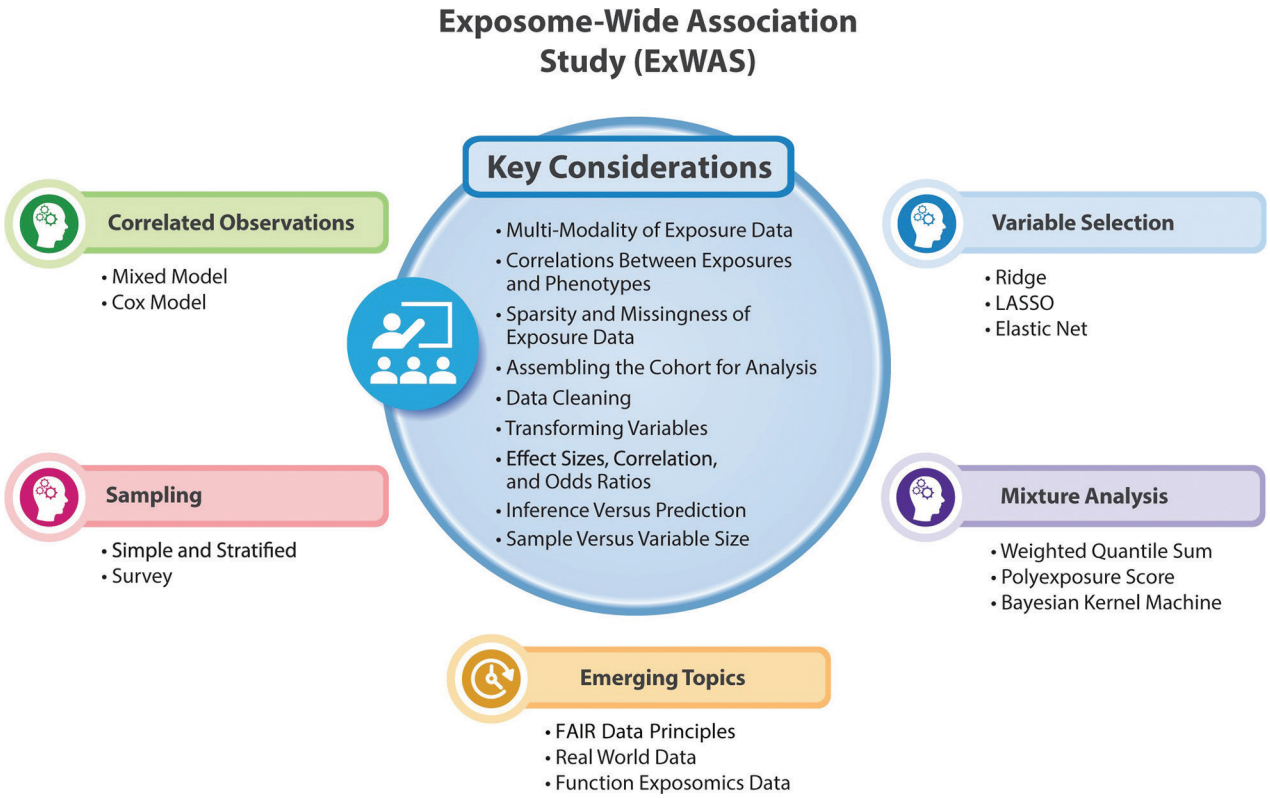
A. Journal Papers

1. Chen Y, Wang Y, Chen Q, Chung MK, Liu Y, Lan M, Wei Y, Lin L, Cai L. Gestational and postpartum exposure to PM2.5 components and glucose metabolism in Chinese women: A prospective cohort study. *Environmental Science and Technology*. 2024;58(20):8675-8684. doi:10.1021/acs.est.4c03087.
2. Chen Y, Guo C, Chung MK, Yi Q, Wang X, Wang Y, Jiang B, Liu Y, Lan M, Lin L, Cai L. The associations of prenatal exposure to fine particulate matter and its chemical components with allergic rhinitis in children and the modification effect of polyunsaturated fatty acids: A birth cohort study. *Environmental Health Perspectives*. 2024;132(4). doi:10.1289/ehp13524.



Functional exposomics.

Source: Chung MK, Rappaport SM, Wheelock CE, Nguyen VK, van derMeer TP, Miller GW, Vermeulen R, Patel CJ. Utilizing a biology-driven approach to map the exposome in health and disease: An essential investment to drive the next generation of environmental discovery. Environmental Health Perspectives. 2021;129(8). doi:10.1289/ehp8327.



ExWAS and environmental health data science.

Source: Chung MK, House JS, Akhtari FS, Makris KC, Langston MA, Islam KT, Holmes P, Chadeau-Hyam M, Smirnov AI, Du X, Thessen AE, Cui Y, Zhang K, Manrai AK, Motsinger-Reif A, Patel CJ. Decoding the exposome: Data science methodologies and implications in exposome-wide association studies (ExWASs). Exposome. 2024;4(1). doi:10.1093/exposome/osae001.



Cancers
癌症研究

PRINCIPAL INVESTIGATOR | **Jessie Liang**

TEAM MEMBERS | Yao Zeng, Effie Lau, Silin Ye, Jiawei Lu, Yuting Sun

Research Progress Summary

With the support of an Innovation and Technology Commission (ITC) project, **Jessie Liang** and her research team developed a microbiome-based method for the non-invasive diagnosis of colorectal cancer and adenoma. The newly identified microbial markers are currently being assessed for their diagnostic value through targeted quantification. An invention patent for the diagnostic model has been filed, and a utility model derived from this project has been granted.

Probiotics can exert beneficial effects on gut microbiota and help maintain homeostasis. Probiotics that efficiently decrease the abundance of pathogenic bacteria associated with colorectal cancer (CRC) are expected to reduce the microbial risk for developing CRC. Therefore, they develop new probiotic formulas for modulating gut microbiota, particularly aimed at reducing pathogenic bacteria, which may ultimately be beneficial for CRC prevention. Patents have been filed and licensed to a biotech company, and the relevant probiotic product has been launched on the market. Building on this finding, they are now investigating the roles of new probiotic species in antagonising pathogenic bacteria and suppressing cancer development. The team has demonstrated that *Faecalibacterium prausnitzii* suppresses colorectal tumorigenesis by producing hypoxanthine and inhibiting *Fusobacterium nucleatum*, which was presented at DDW 2024.

Fusobacterium nucleatum is a well-known bacterium contributing to colorectal tumorigenesis, but its functional mechanism remains to be fully elucidated. They have recently discovered a new role for *F. nucleatum* in inducing cholesterol production in host cells and the effectiveness of butyrate in inhibiting this process. The detailed mechanism has been elucidated, and paper submission is currently underway.

The team previously identified a faecal bacterial gene marker '*m3*' from an unclassified bacterium that is significantly increased in patients with colorectal cancer and adenoma (Liang et al. *Gut* 2020). They have recently isolated and characterised this *m3*-carrying bacterium and investigated its role in colorectal tumorigenesis. This work was presented at DDW 2024.

Research and Scholarship

Research Awards and Recognitions

Name	Details	
	Award	Organisation
Jessie Liang	Distinguished Lecturer	Macao Society of Gastroenterology and Hepatology

Fellowships

Name	Details	
	Fellowship	Organisation
Jiawei Lu	Hong Kong PhD Fellowship Scheme	The Research Grants Council of Hong Kong

Academic Editorships

Name	Details	
	Role	Journal
Jessie Liang	Guest Editor	International Journal of Molecular Sciences
	Editorial Board Member	Molecular Medicine Reports
		International Journal of Translational Research
		Journal of Gastroenterology, Liver & Pancreatic Diseases

Reviewers of Journal / Conference

Name	Details	
	Role	Journal / Conference
Jessie Liang	Reviewer	Advanced Science
		Alimentary Pharmacology & Therapeutics
		Gut
		Journal of Hepatology
		Lancet Microbe
		Journal of Medical Virology

Reviewers of Journal / Conference

Name	Details	
	Role	Journal / Conference
Jessie Liang	Organising Committee	Hong Kong Society for Immunology Forum 2024
	Grant reviewer	National Nature Science Foundation of China
		Population Health Research Grant, National Medical Research Council, Singapore

Grants and Consultancies

Name	Project Title	Funding Source	Start Date (dd/mm/yyyy)	End Date (dd/mm/yyyy)	Amount (HK$)
Jessie Liang	A Microbiome-based Noninvasive Diagnostic Test for Early Colorectal Cancers	Innovation and Technology Commission – Midstream Research Programme	01/04/2021	31/03/2024	4,600,000
	Organoid-based Investigations of COVID-19: Assess Infectivity of Mutant Viruses, Evaluate Vaccine Efficacy and Explore Disease Pathogenesis	Research Grants Council – Collaborative Research Fund (2nd round one-Off CRF COVID-19 Research Exercise)	08/04/2022	07/05/2025	Amount not to be disclosed
	Function and Mechanism of Bacterium Fx in Suppressing Colorectal Tumorigenesis via Inhibiting Fusobacterium Nucleatum	Research Grants Council – Research Grant Direct Allocation	01/12/2023	30/11/2026	20,000
	Further Optimizing M3CRC Test and Evaluating its Performance in Diagnosing Colorectal Adenoma and Cancer	GenieBiome	01/08/2022	24/08/2024	300,000
	Function and Mechanism of Bacterium Fx in Suppressing Colorectal Tumorigenesis via Inhibiting Fusobacterium Nucleatum	Research Grants Council – General Research Fund	01/01/2024	31/12/2026	1,400,000

Grants and Consultancies

Name	Project Title	Funding Source	Start Date (dd/mm/yyyy)	End Date (dd/mm/yyyy)	Amount (HK$)
Jessie Liang	The Role and Functional Mechanism of a New Lachnoclostridium Species in Colorectal Cancer	National Nature and Science Foundation of China	01/01/2024	31/12/2027	570,000

Publications

A. Journal Papers

1. Sun Y, Zhou T, Ye S, Lau EYT, Zeng Y, Liang JQ. Exploration of different quantitative polymerase chain reaction-based genotyping methods to distinguish $Apc^{min/+}$ mice from wildtype mice. *PLOS one*. 2025;20(2). doi:10.1371/journal.pone.0317038. (Epub ahead of print)
2. Zeng Y, Liang JQ. Advances in non-invasive screening tests for colorectal cancer and adenoma. *Chinese Science Bulletin*. Published online June 12, 2024. doi:10.1360/tb-2023-1359.

B. Conference Papers

1. Liang JQ, Huang Y, Zeng Y, Ye S, Sun Y, Lau EYT, Chan FK. A new enterocloster species promotes colorectal tumorigenesis by producing carcinogenic metabolites. *Gastroenterology*. 2024;166(5):S-139. doi:10.1016/s0016-5085(24)00809-6.
2. Sun Y, Zeng Y, Ye S, Lau EYT, Chan FK, Liang JQ. *Faecalibacterium prausnitzii* suppresses colorectal tumorigenesis by producing hypoxanthine and inhibiting *Fusobacterium nucleatum*. *Gastroenterology*. 2024;166(5):S-139. doi:10.1016/s0016-5085(24)00811-4.

C. Patents

1. **Hong Kong Patent:**

   Title: Faecal Bacterial Markers for Colorectal Cancer
   Inventors: Yu J, Sung JJ, Liang Q
   Registration No.: HK1252142
   Patent Grant Date: 2 February 2024

   Title: MiRNA Markers for Colorectal Cancer
   Inventors: Yu J, Sung JJ, Liang Q
   Registration No.: HK40036194
   Patent Grant Date: 18 October 2024

Title: Assessing Risk for Colorectal Adenoma Recurrence by Noninvasive Means
Inventors: Ng SC, Chan FK, Liang Q
Registration No.: 40102473 A
Filing Date: 15 March 2024
Publication Date: 7 June 2024

Title: Assessing Risk for Colorectal Adenoma Recurrence by Noninvasive Means
Inventors: Ng SC, Chan FK, Liang Q
Application No.: 62024089379.7
Filing Date: 27 March 2024

2. **China Patent**

Title: MiRNA Markers for Colorectal Cancer
Inventors: Yu J, Sung JJ, Liang Q
Patent No.: ZL 2020 8 0002435.3
Patent Grant Date: 26 June 2024

Title: A Synbiotic Composition for Immunity 用於提高免疫力的組合物
Inventors: Ng SC, Chan FK, Tang W, Xu Z, Liang Q
Patent No.: ZL 2021 1 0223880.9
Patent Grant Date: 8 March 2024

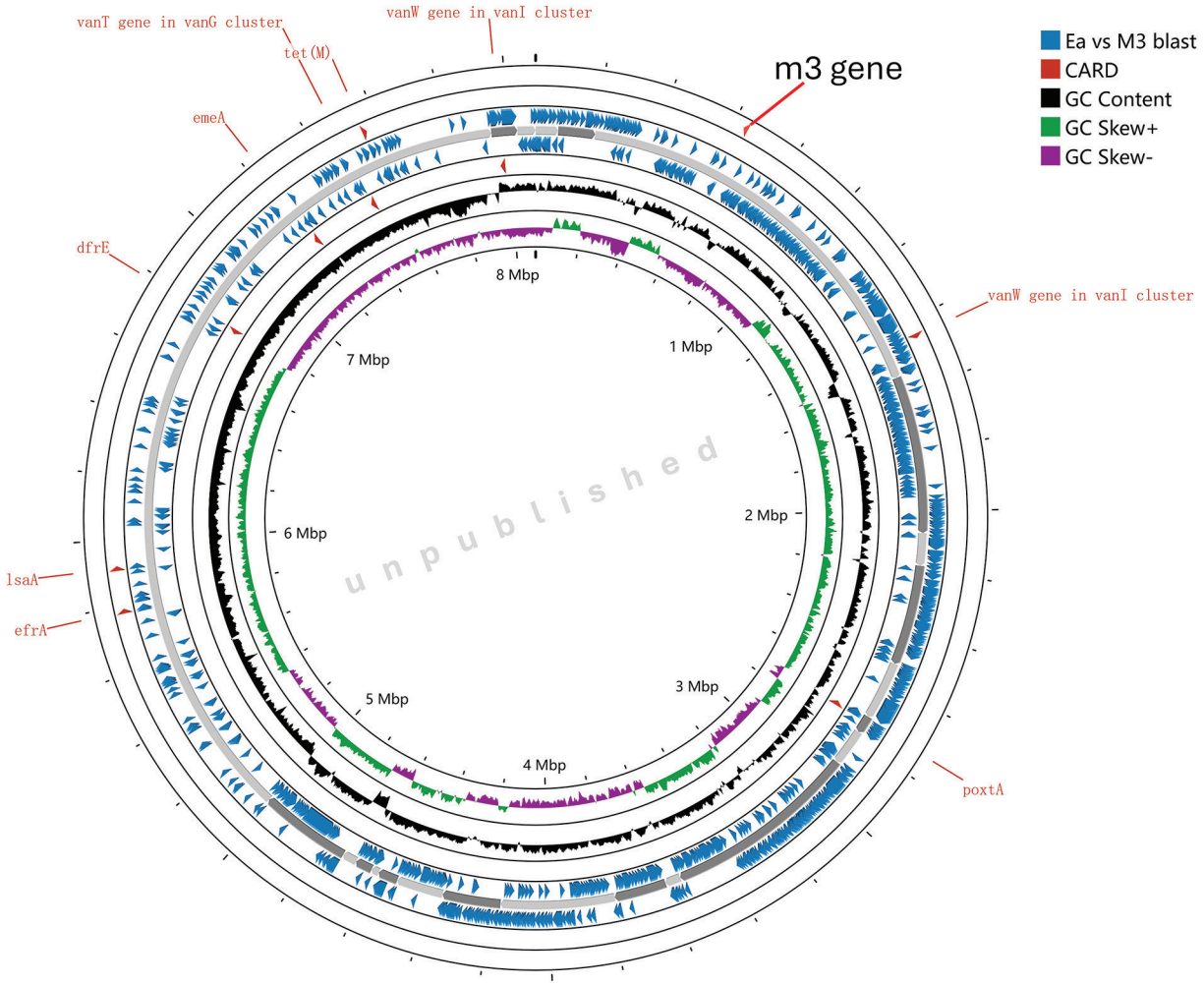
Title: 一種糞便採樣裝置
Inventors: Liang Q, Ng SC, Chan FK, Ye Silin
Patent No.: ZL 2023 2 2110274.3
Patent Grant Date: 19 March 2024

Title: A microbiome function-based method for non-invasive diagnosis of colorectal cancer and adenoma, and nutrient supplementation for disease prevention
Inventors: Liang Q, Ye Silin
Application No.: 202410656357.9
Filing Date: 24 March 2024

3. **The United States Patent**

Title: Assessing Risk for Colorectal Adenoma Recurrence by Noninvasive Means
Inventors: Ng SC, Chan FK, Liang Q
Publication No.: US-2024-0301510-A 1
Publication Date: 12 September 2024

Title: A beneficial bacterium for colorectal cancer prevention and inhibition of pathogenic bacteria
Inventors: Liang Q, Sun Y
Application No.: 63/644,899
Filing Date: 9 May 2024



Circos illustration of the M3 genome in comparison to Ea

Source: Jessie Liang - Unpublished data



Cancers
癌症研究

PRINCIPAL INVESTIGATOR | **Andreas Möller**

TEAM MEMBERS | Luize Goncalves Lima, Su-Ho Park, Sunyoung Ham, Keko'olani Visan, Yue Su, Xuanxuan Li

Research Progress Summary

With international collaborations spanning across multiple continents, **Andreas Möller** and his team have identified key elements in the blood that not only contribute to cancer progression, but also act as biomarkers for early cancer detection and prognostication. Extracellular vesicles (EVs) are nanosized (30-200 nm), cell-derived particles that envelop an abundance of genetic materials such as proteins, DNA and RNA. Their lipid-bound composition enables stability in various bodily fluids, hence their collection is non-invasive, easily accessible, highly efficient, and repeatable in nature. Therefore, EVs are great alternatives to traditional cancer diagnostic and prognostic methods, to act as liquid biopsy biomarkers.

Many early-stage cancer patients undergo intensive treatments to no avail, as they develop therapy-resistant and metastatic tumours. This demonstrates the futility of current prognostication methods. With this, Möller and his team have identified four prognostic EV proteins, capable of predicting the response of lung (non-small cell lung cancer) cancer patients to therapy. This finding, published recently, has the capacity to determine the most successful treatment/s for an individual, providing a personalised cancer therapy approach.

Conference presentations

- "Transitioning EV isolation from the bench to the bedside"
  3rd Asia Pacific Societies of Extracellular Vesicles Meeting, Guangzhou, China, November 2024, Invited Plenary Speaker

- "Transitioning EV isolation from the bench to the bedside"
  International Forum of Extracellular Vesicles Technology and Novel Therapeutics, November 2024, Taiwan, Invited Keynote Speaker

- "Transitioning EV isolation from the bench to the bedside"
  International Forum of Extracellular Vesicles Technology and Novel Therapeutics, November 2024, Taiwan, Invited Keynote Speaker

- "Transitioning EV isolation from the bench to the bedside"
  ISEV Blood EV workshop, Seoul, Korea, September 2024, Invited Speaker

- "Cancer Biomarkers based on Extracellular Vesicles"
  Inaugural Guangdong EV Society conference, Guangzhou, July 2024, Invited Keynote Speaker

- "Cancer Biomarkers based on Extracellular Vesicles"
  Asia-Pacific Symposium on Extracellular Vesicles, SunYatsen University, Guangzhou, July 2024, Invited Keynote Speaker

- "Regulation of immune cell responses through cytokines and extracellular vesicles"
  6th International Conference on Cytokines in Cancer, Greece, June 2024, Invited Speaker

Research Collaborations

- Biostability of exosomes, The Chinese University of Hong Kong, Hong Kong
- Cancer biology and exosomes, Tsinghua University, China
- Lung cancer exosomes, QIMR Berghofer MRI, Australia
- Clinical studies of lung exosomes, Royal Brisbane and Women's Hospital, Australia
- Prognostic biomarker in lung cancer, University of Applied Sciences Geneva HES-SO, Switzerland
- Exosomes in nanotech, University of Queensland, Australia
- Exosome biomarker, University of Queensland, Australia
- Exosomes in NSCLC prospective trial, Peter MacCallum Cancer Centre, Australia
- Timeline of NSCLC and exosomes as biomarker, Peter MacCallum Cancer Centre, Australia
- NSCLC samples for exosomes biomarker, Prince Charles Hospital Brisbane, Australia
- Blood and saliva exosomes in Head and neck cancer, Griffith University QLD, Australia
- Exosome tracking in cells, National Taiwan University, Taiwan
- Exosomes in NK cells, Cha University Korea, Korea
- Mitochondria detection of NK and T cells, Cha University Korea, Korea
- Exosome isolation and analysis in cancer, Thomas Jefferson University Philadelphia, United States of America
- CD155 and exosomes in melanoma, University of Bonn, Germany
- Exosomal miRNA in cancer detection, Tokyo Medical University, Japan
- Exosomes and secretome in Melanoma, Monash University, Australia
- Exosomes as biomarker in gastric cancer, Monash University, Australia

Research and Scholarship

Research Awards and Recognitions

Name	Details	
	Award	Organisation
Andreas Möller	Global STEM Scholar	Hong Kong SAR Government
	Global STEM Professorship Scheme	

Fellowships

Name	Details	
	Fellowship	Organisation
Luize Goncalves Lima	Research Assistant Professorship	The Chinese University of Hong Kong

Reviewers of Journal / Conference

Name	Details	
	Role	Journal / Conference
Andreas Möller	Reviewer	Nature Communications
		Journal of Extracellular Vesicles
		Nature Immunology
		Nature Communications
		Journal of Extracellular Biology
		Proceedings of the National Academy of Sciences of the United States of America
		Nature Cancer

Grants and Consultancies

Name	Project Title	Funding Source	Start Date (dd/mm/yyyy)	End Date (dd/mm/yyyy)	Amount (HK$)
Andreas Möller	An Early Diagnostic and Prognostic Blood-based Biomarker for Head-and-neck Cancer	The Chinese University of Hong Kong – IdeaBooster Fund	30/06/2023	30/06/2025	100,000
	JC STEM Lab of Personalised Cancer Medicine	Hong Kong Jockey Club Charities Trust	01/02/2023	31/01/2028	9,900,000

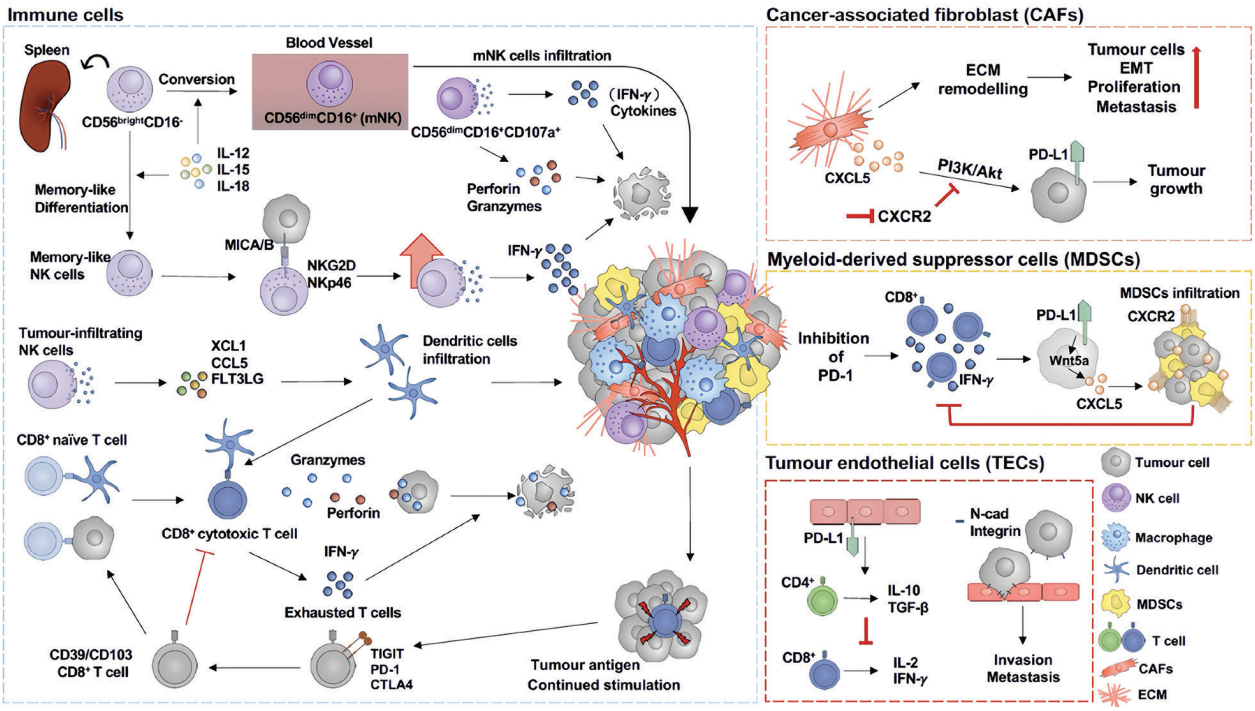
Grants and Consultancies

Name	Project Title	Funding Source	Start Date (dd/mm/yyyy)	End Date (dd/mm/yyyy)	Amount (HK$)
Andreas Möller	4 Research Talent Hub Funding to Support Research Staff Cost in Association with Global STEM Professorship and Directorship for the JC STEM Lab of Personalised Cancer Medicine	Innovation and Technology Commission – Innovation and Technology Fund Research Talent Hub	01/02/2023	31/01/2028	5,000,000

Publications

A. Journal Papers

1. Zhou Q, Niu X, Zhang Z, O'Byrne K, Kulasinghe A, Fielding D, Möller A, Wuethrich A, Lobb RJ, Trau M. Glycan profiling in small extracellular vesicles with a SERS microfluidic biosensor identifies early malignant development in lung cancer. *Advanced Science.* 2024;2401818:1-12. doi:10.1002/advs.202401818.
2. Wu LY, Park SH, Jakobsson H, Shackleton M, Möller A. Immune regulation and immune therapy in melanoma: Review with emphasis on CD155 signalling. *Cancers.* 2024;16(11). doi:10.3390/cancers16111950. (Review)



Immunoregulation in tumour microenvironment of melanoma.

Source: Wu LY, Park SH, Jakobsson H, Shackleton M, Möller A. Immune regulation and immune therapy in melanoma: Review with emphasis on CD155 signalling. Cancers. 2024;16(11). doi:10.3390/cancers16111950. (Review)



Cancers
Dermatology
癌症研究

PRINCIPAL INVESTIGATOR | **Chester Lai**

TEAM MEMBERS | Christina Cheung, Agnes Chan

Research Progress Summary

Chester Lai joined The Chinese University of Hong Kong (CUHK) during this year. Prior to coming to The Chinese University of Hong Kong, Chester was based at the University of Southampton, UK, where he was funded by the Medical Research Council to undertake translational research to investigate mechanisms of dysfunctional anti-tumour immunity and identify immunotherapeutic targets in skin cancer.

Skin cancer is the most common cancer in many countries, and is the eighth most common type of cancer in Hong Kong. Treatments for advanced or metastatic skin cancers (including melanoma and cutaneous squamous cell carcinoma) are limited and current immunotherapies lead to complete responses in only a minority of patients. The Prince of Wales Hospital is the site of Hong Kong's only combined cutaneous oncology clinic, a tertiary specialist clinic with dermatologists, plastic surgeons and oncologists which receives referrals for skin cancer from all of Hong Kong. Since joining CUHK, Chester has availed of this opportunity to continue his research in skin cancer, and establish ex vivo tumour tissue slice culture models for investigating tumoral immunity and for preclinical testing of immunostimulatory antibodies for skin cancer immunotherapy performed in collaboration with the University of Southampton.

Within CUHK, he has formed links with investigators in the Departments of Medicine and Therapeutics, and Anatomical and Cellular Pathology, as well as with the Single Cell and Spatial Omics Core at the School of Biomedical Sciences. In addition, Chester has continued to collaborate with the UK Keratinocyte Cancer Collaborative, which includes researchers in Queen Mary University of London, University of Glasgow, and elsewhere, in studies to investigate prognostic biomarkers for cutaneous squamous cell carcinoma, and with the Wellcome Sanger Institute to examine genetic changes in skin caused by ultraviolet radiation. Furthermore, Chester has been involved together with Christina Cheung and Agnes Chan from the Dermatology team at Prince of Wales Hospital, to establish and continue data collection for inflammatory skin disease registries.

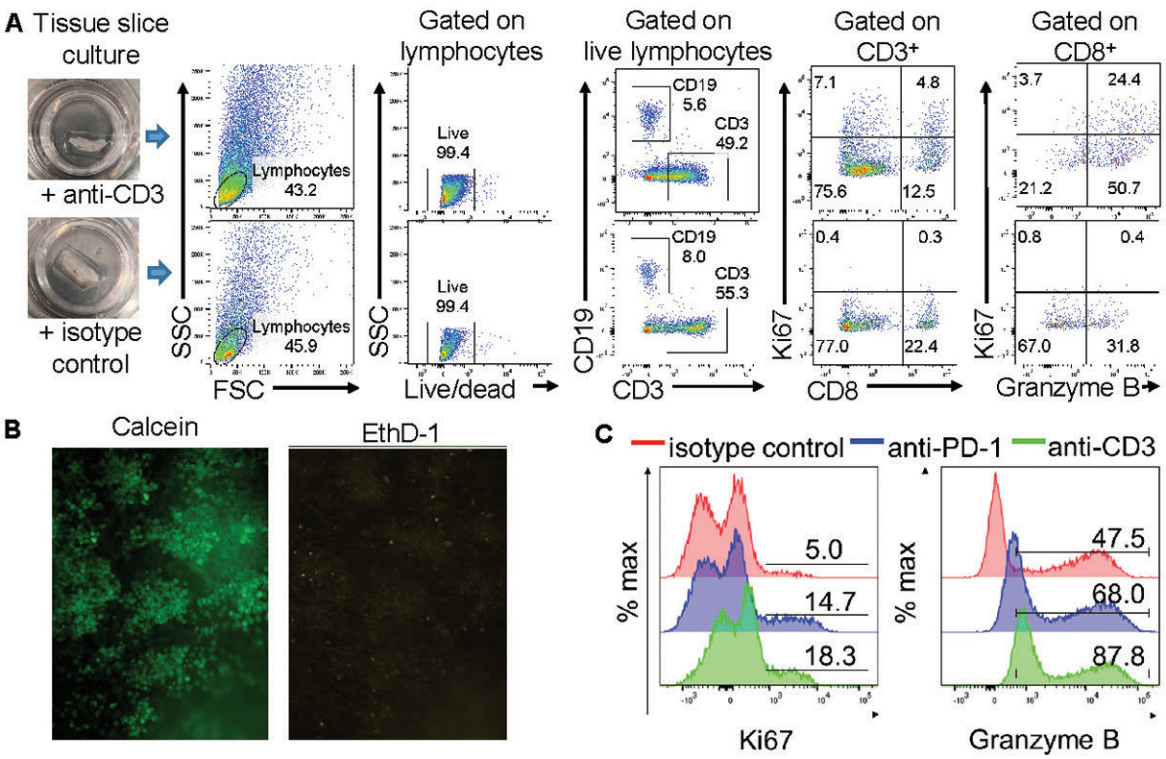
Research and Scholarship

Reviewers of Journal / Conference

Name	Details	
	Role	Journal / Conference
Chester Lai	Conference organiser	British Society for Investigative Dermatology
	Grants Advisory Committee member	British Skin Foundation
	Reviewer	British Journal of Dermatology
		Scientific Reports

Grants and Consultancies

Name	Project Title	Funding Source	Start Date (dd/mm/yyyy)	End Date (dd/mm/yyyy)	Amount (HK$)
Chester Lai	Development of T-cell Costimulatory Antibodies for Skin Cancer Immunotherapy	Medical Research Council (United Kingdom)	01/08/2022	31/07/2025	GBP 283,196
	Inflammatory Skin Disease Registry	Novartis	02/12/2024	01/12/2025	12,000
	Eczema and Prurigo Nodularis Registry	Sanofi	27/08/2024	26/08/2025	178,200
	Improvement on Competitive in Hiring New Faculties	The Chinese University of Hong Kong – Research Startup Fund	29/04/2024	28/04/2027	1,199,392



Ex vivo skin cancer tumour tissue slice culture system. (A) Example of cutaneous squamous cell carcinoma (cSCC) tissue slice cultures (left), with flow cytometry plots showing increased Ki67 expression on $CD3^+$ T-cells and increased Granzyme B expression on $CD8^+$ T cells in tumour tissue slices cultured with anti-CD3 compared with those from culture with isotype control. (B) cSCC tissue slice culture stained with calcein (demonstrating cell viability) and EthD-1 (demonstrating cell death). (C) Flow cytometry histograms of $CD3^+$ T cells from skin cancer tissue slices cultured for 3 days with isotype control antibody (red), anti-PD-1 (blue) and anti-CD3 (green).

Source: Chester Lai – Unpublished data



Cancers
Urology
癌症研究

PRINCIPAL INVESTIGATOR | **Jeremy Teoh**

TEAM MEMBERS | Hongda Zhao, Kang Liu, Vincy Ho, Xuan Chen, Hongwei Wu, Qiaoxiu Wang

Research Progress Summary

For 2024, **Jeremy Teoh** and his team have been actively involved in prestigious international conferences including the annual European Association of Urology (EAU) Congress and American Urological Association (AUA) Congress. These conferences provide unique opportunities for their team members to present their research findings, communicate with leading experts in their field as well as stay updated on cutting-edge technologies in urology. Apart from participating in international conferences, they also had the privilege of hosting the Urology Symposium organised by the Division of Urology, Department of Surgery, The Chinese University of Hong Kong. This event brought together renowned urologists from Hong Kong and overseas, sharing their expertise through didactic lectures and video presentations. The symposium provides a platform for knowledge exchange, collaboration and discussions on cutting-edge research and clinical practices.

Beyond conferences and symposiums, the team has also established collaboration with overseas institutions, such as the Medical University of Vienna. Through this partnership they have exchanged knowledge and expertise on primary and organoid cultures, furthermore, they are working towards establishing a collaborative cohort to share genomic data, allowing effective collaborations between teams and fostering collaborations with research groups globally, with a more varied dataset of bladder cancer patients.

Research-wise, the research team is actively expanding their bladder cancer organoid biobank, which is an important resource for studying bladder cancer. They are focusing on developing cisplatin-resistant organoid models to better understand the mechanisms behind drug resistance. In addition, they are screening potential compounds that show effectiveness against cisplatin-resistant organoids, aiming to identify new therapeutic options. Other than cisplatin resistance, the team also plans to investigate resistance to other drugs using organoids as their model system. These efforts will provide valuable insights into drug resistance in bladder cancer and pave the way for the development of more effective treatment strategies.

As one of the first few groups in Asia to establish a bladder cancer organoid biobank, Jeremy and his team are proud to contribute to advancing research in the field. Leveraging on their existing knowledge of organoid technology, they have made fair progress in dissecting bladder cancer heterogeneity. Their work has resulted in a manuscript that is currently under review in *Advanced Science*, highlighting their findings and the potential impact of organoid models on translational cancer research. This milestone reflects their commitment to pushing the boundaries of urological cancer research and contributing to the scientific community.

Research and Scholarship

Research Awards and Recognitions

Name	Details	
	Award	Organisation
Jeremy Teoh	Gold Medal Winner of the Prize for Best Original Research by Young Fellows	Hong Kong Academy of Medicine
	WCUS Rising Star Award 2024	World Chinese Urological Society

Fellowships

Name	Details	
	Fellowship	Organisation
Jeremy Teoh	Adjunct Professor	Medical University of Vienna

Academic Editorships

Name	Details	
	Role	Journal
Jeremy Teoh	Associate Editor	European Urology Oncology
		Andrologia
		BMC Urology
		Frontiers in Surgery
		Surgical Practice
	Consulting Editor	European Urology
	Social Media Editor	The Sociéte Internationale d'Urologie Journal
	Editor	Hong Kong Medical Journal

Reviewers of Journal / Conference

Name	Details	
	Role	Journal / Conference
Jeremy Teoh	Reviewer	Asia-Pacific Journal of Clinical Oncology
		British Journal of Urology International Knowledge
		International Journal of Cardiology
		International Urology and Nephrology
		Hong Kong Medical Journal
		Surgical Practice
		Therapeutic Advances in Urology
		Pathogens
		Molecules
		Australasian Medical Journal
		Surgical Endoscopy
		Cancers
		Asian Journal of Urology
		World Journal of Surgical Oncology
		European Urology Focus
		World Journal of Urology
		Andrologia
		BJU International
		BMC Urology
		Basic and Clinical Andrology
		BMC Cancer
		Scandinavian Journal of Urology
		Cochrane Urology
		Journal of International Medical Research
		Investigative and Clinical Urology
		International Journal of Electrical and Computer Engineering
		Turkish Journal of Urology
		Translational Andrology and Urology
		Journal for ImmunoTherapy of Cancer
		European Urology
		BMJ Open

Reviewers of Journal / Conference

Name	Details	
	Role	Journal / Conference
Jeremy Teoh	Reviewer	Annals, Academy of Medicine, Singapore
		International Journal of Management Science and Engineering
		Transactions on Engineering Management
		Expert Opinion on Pharmacotherapy
		International Journal of Clinical Practice
		European Association of Urology Guidelines on Non-muscle-invasive Bladder Cancer
		American Journal of Alzheimer's Disease & Other Dementias
		Future Oncology
		Cancer Investigation
		International Journal of Urology
		Scientific Progress
		ANZ Journal of Surgery
		European Urology Oncology
		European Urology Open Science
		Journal of Urology
		The Sociéte Internationale d'Urologie Journal
		British Journal of Surgery

Grants and Consultancies

Name	Project Title	Funding Source	Start Date (dd/mm/yyyy)	End Date (dd/mm/yyyy)	Amount (HK$)
Jeremy Teoh	Institute of Medical Intelligence and XR	Research Grants Council – Theme-based research Scheme	01/01/2023	31/12/2027	50,607,000
	The Global En Bloc Resection of Bladder Tumour Registry	Research Grants Council – General Research Fund and Early Career Scheme	01/01/2022	31/12/2024	1,136,432

Grants and Consultancies

Name	Project Title	Funding Source	Start Date (dd/mm/yyyy)	End Date (dd/mm/yyyy)	Amount (HK$)
Jeremy Teoh	A Randomized Controlled Trial Comparing Magnetic Resonance Imaging (MRI)-Targeted Biopsy and Extended Transperineal Systematic Biopsy for Detection of Clinically Significant Prostate Cancer	Research Grants Council – General Research Fund and Early Career Scheme	01/01/2022	31/12/2024	1,162,247
	Virtual/Augmented Reality Based Planning and Intraoperative Guidance for Precise Laparoscopic Cystectomy via Advanced Human-in-the-loop Image Segmentation, Visualization, and Registration Techniques	Research Grants Council – General Research Fund and Early Career Scheme	01/01/2022	31/12/2024	838,393

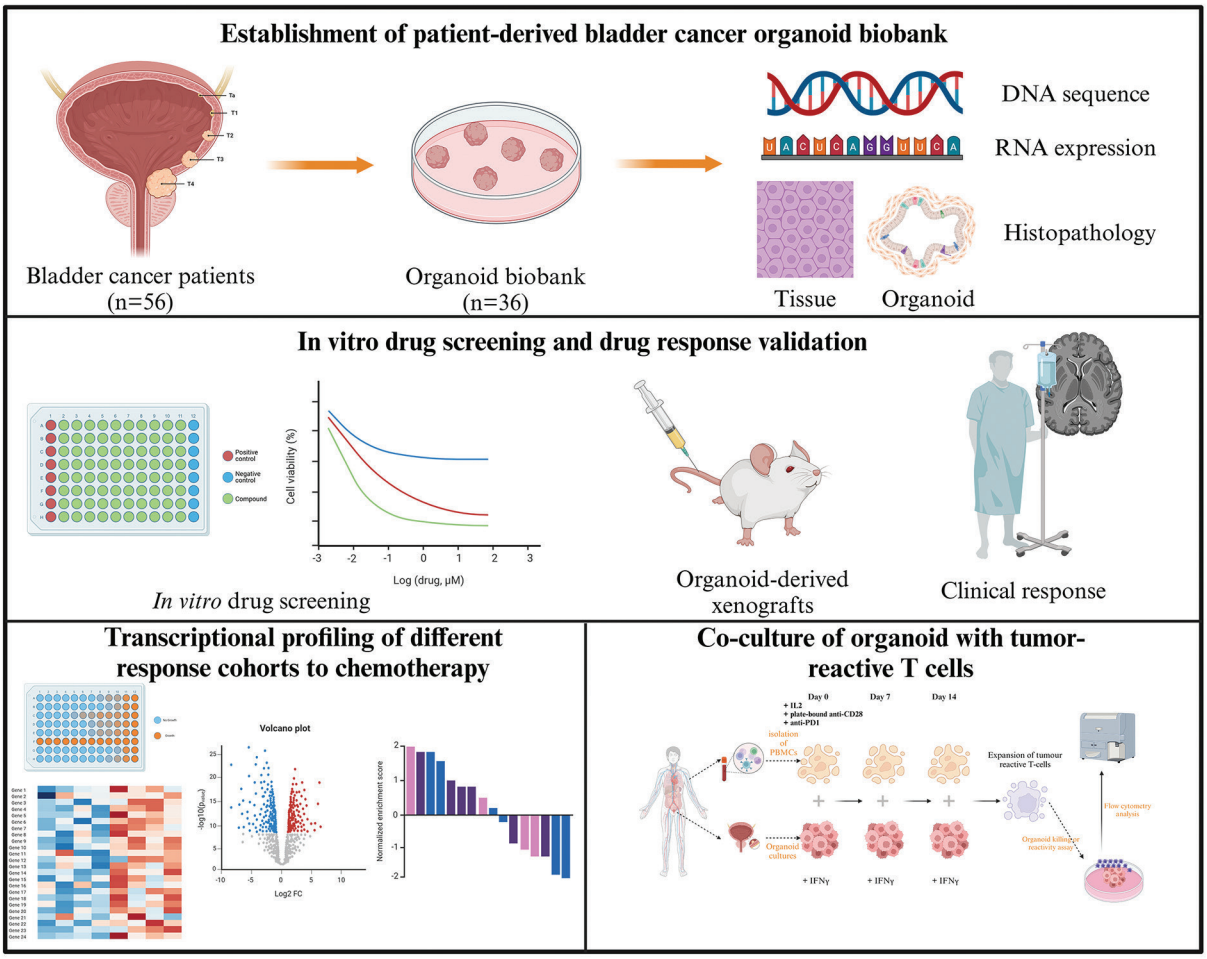
Publications

A. Journal Papers

1. Liu AQ, Choy EKH, Chiu PKF, Yee CH, Ng CF, Teoh JYC. High levels of incidental COVID-19 infection in emergency urology admissions: A propensity score-matched real world data analysis across surgical specialties. *Viruses*. 2024;16(9):1402. doi:10.3390/v16091402.
2. Wong CHM, Ko ICH, Leung DKW, Siu B, Cheng CKK, Lim YYJ, Mok HT, Kwok CFB, Tang CY, Leung SCH, Chiu PKF, Teoh JYC, Ng CF. Deep PSA response and extended time-to-nadir as robust predictors of survival in Asian patients with de novo metastatic hormone-sensitive prostate cancer receiving upfront intensified treatment. *The Prostate*. 2025;85(1):30-39. doi:10.1002/pros.24797. (Epub ahead of print)
3. Wong CHM, Ko ICH, Tang ESF, Yuen SKK, Leung DKW, Kong AWY, Chiu PKF, Teoh JYC, Ng CF. Risk factors of hematoma after SWL for renal calculi: Analysis from RCTs and a literature review. *International Urology and Nephrology*. 2024;57(2):323-332. doi:10.1007/S11255-024-04205-3. (Epub ahead of print)
4. Leung DK, Ko IC, Siu BW, Wong CH, Yuen SK, Ng CF, Teoh JY. The role of surgery in metastatic renal cell carcinoma in 2024. *Clinical Medicine Insights: Oncology*. 2024;18. doi.org/10.1177/11795549241272447.

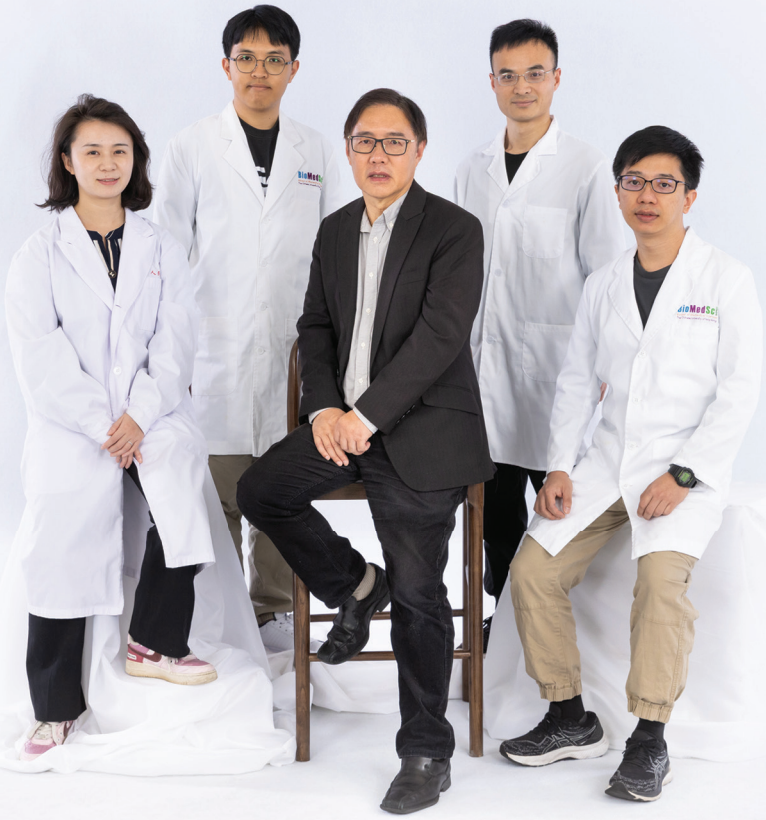
5. Wong CHM, Ko ICH, Leung DKW, Kang SH, Kitamura K, Horie S, Muto S, Ohyama C, Hatakeyama S, Patel M, Yang CK, Kijvikai K, Lee JY, Chen HG, Zhang RY, Lin TX, Lee LS, Teoh JYC, Chan E. Pre-op hydronephrosis predicts outcomes in patients receiving robot-assisted radical cystectomy. *Cancers*. 2024;16(16):2826. doi:10.3390/cancers16162826.

6. Wong CHM, Ko ICH, Leung DKW, Liu K, Zhao H, Alvarez-Maestro M, Pes M del PL, de la Rosette J, Teoh JYC. Impact of pre-operative ureteroscopy on bladder recurrence following nephroureterectomy for UTUC. *Cancers*. 2024;16(15):2683. doi:10.3390/cancers16152683.



Study Summary – Jeremy Teoh and his team's study established the first Asian-based bladder cancer patient-derived organoids (PDOs) biobank, demonstrating their accuracy in mirroring parental tumours' properties. Drug screening revealed diverse sensitivities to chemotherapies and targeted therapies, validated by PDO xenografts and patient outcomes. Genetic profiling identified key genes associated with response to standard chemotherapies. The co-culture model highlighted the potential of PDOs in exploring the tumour microenvironment.

Source: Hongda Zhao - Unpublished data



Cardiovascular Medicine

Vascular Medicine - Basic Research

心血管疾病研究

PRINCIPAL INVESTIGATOR | **Xiaoqiang Yao**

TEAM MEMBERS | Xiao Li, Jun Zhang, Duan Zhuo, Zhenchuan Lei, Wentao Peng, Shizhang Yang, Chun-Yin Lo

Research Progress Summary

Xiaoqiang Yao and his research team have been working on Ca^{2+}-permeable ion channels in the cardiovascular system and cancer. Recently, they have uncovered a novel function of endothelial cell Orai1 channels in vascular contraction and blood pressure control. They have also identified novel functional roles of Orai1 channels and Orai3 channels in breast cancer, ovarian cancer and colorectal cancer. They have been in the process of developing and/or repurposing Orai1-related drugs for cancer therapy. The research is supported by Hong Kong Innovation and Technology Fund and Hong Kong Research Grants Council (RGC) – Collaborative Research Fund. One patent has already been filed on the topic of repurposing Orai1-related drugs for cancer therapy.

Research and Scholarship

Academic Editorships

Name	Details	
	Role	Journal
Xiaoqiang Yao	Associate Editor	Frontiers in Pharmacology
	Guest Editor	Cells

Reviewers of Journal / Conference

Name	Details	
	Role	Journal / Conference
Xiaoqiang Yao	Reviewer	Circulation Research
		Science Advances
		Advanced Science

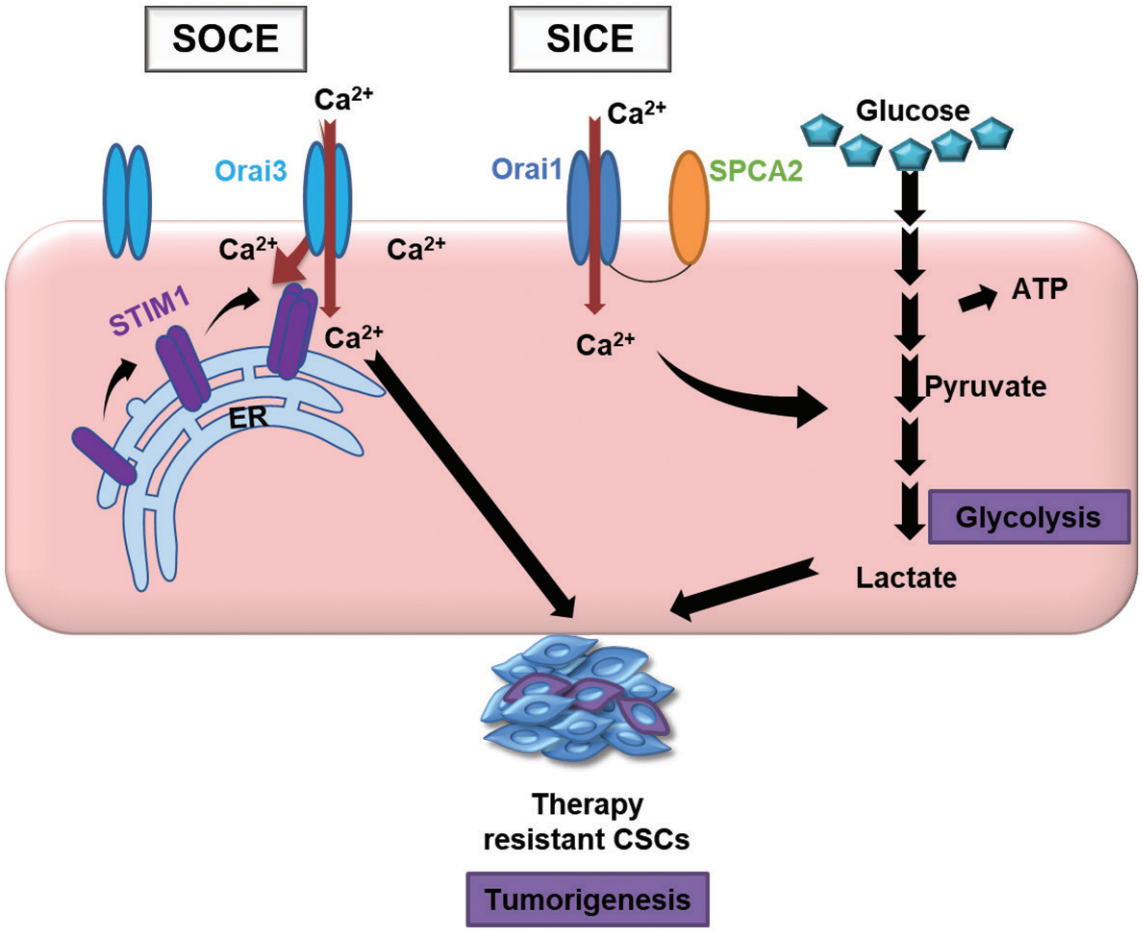
Grants and Consultancies

Name	Project Title	Funding Source	Start Date (dd/mm/yyyy)	End Date (dd/mm/yyyy)	Amount (HK$)
Xiaoqiang Yao	Orai1 Inhibitors as Potential Therapeutic Drugs against Colorectal Cancer Stem Cells	Innovation and Technology Commission – Innovation and Technology Fund	01/12/2022	31/05/2024	1,100,000
	Plant Bioreactor for Pharmaceutical Proteins	Research Grants Council – Research Impact Fund	01/06/2019	31/12/2024	5,000,000
	The Roles of Mechanically Heterogeneous Local Niches within Primary Tumors in Metastatic Organotropism	Research Grants Council – Collaborative Research Fund	01/06/2024	31/05/2027	5,985,252
	LETM-domain Containing Protein 1 as a New Player in Adipose Thermogenesis	Research Grants Council – General Research Fund	01/01/2023	31/12/2025	1,178,251

Publications

A. Journal Papers

1. Zhuo D, Lei Z, Dong L, Chan AML, Lin J, Jiang L, Qiu B, Jiang X, Tan Y, Yao X. Orai1 and Orai3 act through distinct signalling axes to promote stemness and tumorigenicity of breast cancer stem cells. *Stem Cell Research and Therapy*. 2024;15(1). doi:10.1186/s13287-024-03875-1.
2. Li X, Lei ZC, Lo CY, Jan TY, Lau CW, Yao X. Endothelial cell Orai1 is essential for endothelium-dependent contraction of mouse carotid arteries in normotensive and hypertensive mice. *Acta Pharmacologica Sinica*. 2024;45(5):975-987. doi:10.1038/s41401-024-01227-6.



Schematic illustration of Orai1-SPCA2 and Orai3-STIM1 regulation on the stemness and tumorigenicity of BCSCs. Orai1 interacts with SPCA2 to mediate SICE, which activates glycolytic pathway to promote stemness and tumorigenic ability of BCSCs. On the other hand, Orai3 and STIM1 mediate SOCE, which promotes stemness and tumorigenic ability of breast cancer cells via a glycolysis-independent mechanism.

Source: Zhuo D, Lei Z, Dong L, Chan AML, Lin J, Jiang L, Qiu B, Jiang X, Tan Y, Yao X. Orai1 and Orai3 act through distinct signalling axes to promote stemness and tumorigenicity of breast cancer stem cells. Stem Cell Research and Therapy. 2024;15(1). doi:10.1186/s13287-024-03875-1.



Cardiovascular Medicine

Heart Diseases – Cardiac Imaging and Intervention

心血管疾病研究

PRINCIPAL INVESTIGATOR | **Alex Lee**

TEAM MEMBERS | Victor Sim, Guangming Tan, Kent So, Tsz Kin Tam, Kevin Kam, Andrew Li, Leo Lai, Geri Wong, Katie Fan, Scott Dougherty, Xue Ting Wang, Tiffany Chung, Crystal Tao, Alexandersson, Anja, Leah Yin, Lily Zhao, Sophia Leung, Stella Luk, Kitty Leung, Tao Geng, Rubi Kuok, Raymond Chan, Robert Chan, Andy Lai, Xinghua Shan, Fei Yu, Lavender Yeung

Research Progress Summary

The year of 2024 marked significant advancements in **Alex Lee** and his team's research efforts in the field of heart disease imaging and intervention. This research progress report highlights the key achievements and collaborations that have contributed to the advancement of their knowledge and the development of innovative solutions.

1. Clinical Trials and Research:

- As Co-PI, Alex received 3 important grants to support AI applications, including WUN, TEA-NET(NRDI), and CRF, focusing on AI in AR, AI in heart failure, and more.
- Collaborating with various academic institutions in the UK, Hungary, and others on research related to AI-assisted minimally invasive interventions and machine learning, including:

    - Magnetically-controlled tentacle robots for transcatheter structural heart intervention
    - TIDAL-RV: Translational investigation of volume overload-induced right ventricular dysfunction: From bench to machine learning-based clinical decision support
    - Next-generation AI-XR empowered surgical planning and intraoperative guidance system via effective fusion of empirical knowledge, human interaction, and machine inference
    - Artificial intelligence in aortic regurgitation: A multicenter randomised controlled trial
- Collaboration and consultancy with AI industry leaders, including US2.Ai and Echonous Kosmos, in applying AI to echo image acquisition, measurement, and reporting
- Establishment of the Asian-Pacific 3D Echo Biobank for atrioventricular valve regurgitation and transcatheter repair, in collaboration with researchers from South Korea, Singapore, Taiwan, mainland China, and India
- National leadership in two major multicenter clinical trials:
    - A multicenter, randomised, double-blind, parallel-group, placebo-controlled study
        - To evaluate the efficacy and safety of finerenone on morbidity and mortality in participants with heart failure (NYHA II-IV) and left ventricular ejection fraction ≥ 40% (FINEARTS-HF)
    - A pivotal phase 3 randomised, placebo-controlled clinical study
        - As a national leader, to evaluate the efficacy and safety of the sGC stimulator vericiguat in adults with chronic heart failure with reduced ejection fraction (VICTOR)
- Collaboration and consultancy with device companies, Huihe Healthcare, Dawneo Healthcare, and Shenqi Healthcare, for the development of transcatheter tricuspid annuloplasty and TEER devices, undergoing clinical trials in mainland China and Europe
- Consultancy and research agreement with major imaging device companies, Philips Healthcare and Abbott Healthcare, to develop and validate a novel 3D echo software and intracardiac echo technology
- Collaboration research of 3D physical replica for cardiac structure with USA and mainland China
- Collaboration research of degenerative mitral regurgitation outcomes in Asian compared with European-American institutions, mitral regurgitation international database
- Investigator-initiated drug clinical trials, such as the VALENTINO study investigating the effect of Vericiguat on cardiac remodelling in patients with heart failure and reduced ejection fraction (HFrEF): A prospective study using novel echocardiographic imaging techniques (VALENTINO)
- Asian fabry cardiomyopathy high-risk screening program - valve disease
- Patient and family educational training and diagnostic programme on fabry disease
- Natural history in fabry disease with IVS4+919G>A mutations: a longitudinal study (FABULOUS).
- Educational grant for patient and family educational training on fabry disease
- AI echo right heart project
- Conducting a cost-effectiveness analysis of COVID-19 vaccines among the older adult population with pre-disposed comorbidities in Hong Kong

2. Publications:

- Publication of original and review articles in esteemed journals, including *The New England Journal of Medicine, European Journal of Preventive Cardiology, Clinical Rheumatology* and *Immunology, JACC Cardiovascular Intervention* and so on. (Details please kindly refer to Part VI)
- Patent publication titled "3D physical replica of a cardiac structure and a method for manufacturing the same" in the USA and mainland China.

3. Academic Conferences and Public Forums:

- Engagement in Cardiac Imaging Innovations: Presentations on imaging guidance in TTVR using the LuX-Valve Plus system, highlighting advancements in minimally invasive interventions.
- Exploration of Machine Learning Applications: Focusing on automating echocardiographic examinations through machine learning, demonstrating innovative approaches in cardiac diagnostics.
- Participation in International Conferences: Involvement in major events such as the ACC and AAAI conferences, showcasing research on functional tricuspid regurgitation and volumetric medical image segmentation.
- Expert Contributions to Clinical Discussions: Panellist and speaker roles addressing complex cases in mitral valve disease and palliative care, emphasizing collaborative efforts in the field of structural heart disease.
- Promotion of Educational Initiatives: Successful organisation of 3 educational events, enhancing knowledge in cardiac imaging.

Research and Scholarship

Research Awards and Recognitions

Name	Details	
	Award	Organisation
Alex Lee	HB Calleja Professorial Lecturer	Philippine Heart Association

Fellowships

Name	Details	
	Fellowship	Organisation
Alex Lee	Fellow	Society for Cardiovascular Angiography & Interventions

Academic Editorships

Name	Details	
	Role	Journal
Alex Lee	Associate Editor	Elsevier's Heart Failure Clinics
	Editorial Board Member	Exploration of Cardiology
		Journal of Cardiovascular Imaging

Reviewers of Journal / Conference

Name	Details	
	Role	Journal / Conference
Alex Lee	Reviewer	Circulation: Cardiovascular Imaging
		BMJ Journal: Heart
		Journal of the American Society of Echocardiography
		Heart
		JACC: Asia
		JACC: Case Reports

Grants and Consultancies

Name	Project Title	Funding Source	Start Date (dd/mm/yyyy)	End Date (dd/mm/yyyy)	Amount (HK$)
Alex Lee	Real-World Characteristics and Treatment Patterns of Patients with Transthyretin Amyloid Cardiomyopathy (ATTR-CM): A Multi-country, Non-interventional, Disease Registry	Pfizer Contract Research Organization IQVIA	11/09/2024	11/05/2026	415,0000
	Educational Grant for Patient and Family Educational Training on Fabry Disease	Takeda Pharmaceuticals (Hong Kong) Limited	04/03/2024	03/03/2025	300,000
	Effect of Vericiguat on Cardiac Remodeling in Patients with Heart failure and Reduced Ejection Fraction (HFrEF): A Prospective Study Using Novel Echocardiographic Imaging Techniques (VALENTINO)	Bayer HealthCare Limited	19/10/2023	31/12/2025	600,000
	Patient and Family Educational Training and Diagnostic Programme on Fabry Disease	Takeda Pharmaceuticals (Hong Kong) Limited	01/02/2023	31/01/2024	400,000
	Cost Effectiveness Analysis of COVID-19 Vaccines Amongst Older Adult Population with Pre-disposed Comorbidities in Hong Kong	Fosun Industrial Co., Ltd.	01/01/2023	30/06/2025	500,000
	Periprocedural Decision-making in Left Atrial Appendage Closure by Reinforcement Learning and 3D Modelling	National Nature Science Foundation of China	01/01/2023	31/12/2025	320,496

Grants and Consultancies

Name	Project Title	Funding Source	Start Date (dd/mm/yyyy)	End Date (dd/mm/yyyy)	Amount (HK$)
Alex Lee	多模態影像融合指導瓣膜疾病診療的應用研究	廣東省科學技術廳	01/01/2023	31/12/2024	320,496
	Asian Fabry Cardiomyopathy High-risk Screening Program - Valve Disease	Sanofi Hong Kong Ltd.	13/12/2022	12/12/2025	955,118
	AI Echo right heart project	Johnson & Johnson (HK) Ltd.	01/09/2022	31/08/2024	99,595
	Natural History in Fabry Disease with IVS4+919G>A Mutations: A Longitudinal Study (FABULOUS)	Sanofi Hong Kong Ltd.	01/04/2022	31/08/2026	2,664,033
	A Pivotal Phase 3 Randomised, Placebo-controlled Clinical Study to Evaluate the Efficacy and Safety of the sGC Stimulator Vericiguat/MK-1242 in Adults with Chronic Heart Failure with Reduced Ejection Fraction (MK-1242-035)	Merck Sharp & Dohme (Asia) Ltd.	17/02/2022	01/04/2025	2,045,131.35
	Vascular Effects of Achieving Low Disease Activity in Axial Spondyloarthritis - A 2 Year Prospective Cohort Study, Food and Health Bureau (FHB) - Health and Medical Research	Health Bureau – Health and Medical Research Fund	01/09/2021	28/02/2025	1,505,615

Grants and Consultancies

Name	Project Title	Funding Source	Start Date (dd/mm/yyyy)	End Date (dd/mm/yyyy)	Amount (HK$)
Alex Lee	Clinical Trial of Atrial Fibrillation Patients Comparing Left Atrial Appendage Occlusion Therapy to Non-vitamin K Antagonist Oral Anticoagulants (CATALYST Trial)	Abbott Cardiovascular Systems Inc.	01/07/2021	31/12/2028	442,000
	Speeding Up Examination of Heart Diseases Through the Use of 3D Echocardiography and Machine Learning, Innovation & Technology Commission	Innovation and Technology Commission – Midstream Research Programme for Universities	01/04/2021	31/03/2024	1,251,200
	A Multicenter, Randomised, Double-blind, Parallel-group, Placebo-controlled Study to Evaluate the Efficacy and Safety of Finerenone on Morbidity and Mortality in Participants with Heart Failure (NYHA II-IV) and Left Ventricular Ejection Fraction≥ 40%	Bayer HealthCare Limited	01/12/2020	30/11/2026	1,999,080

Publications

A. Journal Papers

1. Solomon SD, McMurray JJV, Vaduganathan M, Claggett B, Jhund PS, Desai AS, Henderson AD, Lam CSP, Pitt B, Senni M, Shah SJ, Voors AA, Zannad F, Abidin IZ, Alcocer-Gamba MA, Atherton JJ, Bauersachs J, Chang-Sheng M, Chiang C-E, Chioncel O, Viswanathan P, Lee APW, et al. Finerenone in heart failure with mildly reduced or preserved ejection fraction. *New England Journal of Medicine*. Published online October 24, 2024. doi:10.1056/nejmoa2407107.
2. Xu H, Chen M, Wang Z, Huo J, Li J, He F, Husanova F, Li H, Zhou D, Zhang X, Liu X, Song G, Li J, Luo J, Guo Y, Mou Y, Yuan S, Tao T, Wu S, Teng P, Ni Y, Ma L, Pan X, Ge J, Lee APW, Li W. Mid-term outcomes of K-Clip transcatheter tricuspid annuloplasty system in patients with severe functional tricuspid regurgitation. *JACC: Cardiovascular Interventions*. 2024;17(23):2796-2807. doi:10.1016/j.jcin.2024.10.007.
3. Dougherty S, Yu F, Zhao C, Wong M, Wong G, So K, Kam K, Fan Y, Lee APW. Unveiling the invisible: The impact of 3D intracardiac echocardiography on mitral transcatheter edge-to-edge repair. *JACC: Cardiovascular Interventions*. 2025;18(4):534-535. doi:10.1016/j.jcin.2024.11.044.

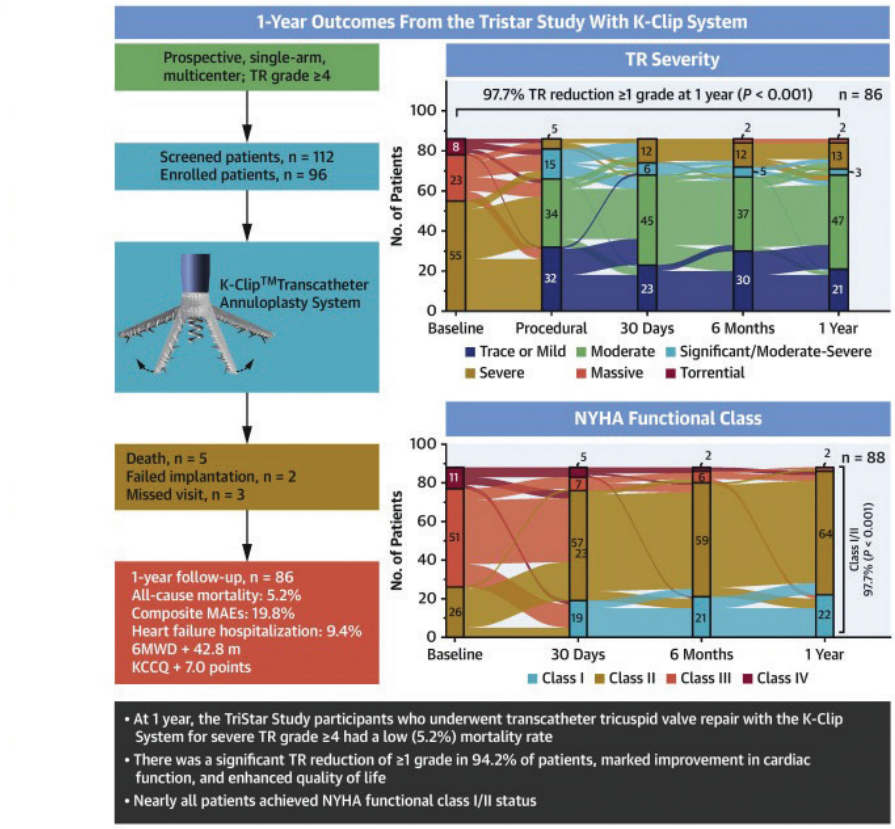
4. Gao X, Luo W, Qu L, Yang M, Chen S, Lei L, Yan S, Liang H, Zhang X, Xiao M, Liao Y, Lee APW, Zhou Z, Chen J, Zhang Q, Wang Y, Xiu J. Genetic association of lipid-lowering drugs with aortic aneurysms: A Mendelian randomisation study. *European Journal of Preventive Cardiology*. 2024;31(9):1132-1140. doi:10.1093/eurjpc/zwae044.

5. Leung SPY, Dougherty S, Zhang XY, Kam KKH, Chi WK, Chan JYS, Fung E, Wong JKT, Choi PCL, Chan DKH, Sheng B, Lee APW. The asian fabry cardiomyopathy high-risk screening study 2 (ASIAN-FAME-2): Prevalence of fabry disease in patients with left ventricular hypertrophy. *Journal of Clinical Medicine*. 2024;13(13). doi:10.3390/jcm13133896.

6. Hamid N, Bursi F, Benfari G, Vanoverschelde JL, Tribouilloy C, Biagini E, Avierinos JF, Barbieri A, Fan Y, Guerra F, Leng CY, Essayagh B, Pasquet A, Szymansky C, Théron A, Michelena HI, Nkomo VT, Vancraeynest D, Rusinaru D, Grigioni F, Enriquez-Sarano ML, Pin DZ, Lee APW. Degenerative mitral regurgitation outcomes in Asian compared with European-American institutions. *JACC: Asia*. 2024;4(6):468-480. doi:10.1016/j.jacasi.2024.03.003.

7. Lee APW. Navigating the dual challenge: Insights from the China-VHD study on mitral and tricuspid regurgitation. *JACC: Asia*. Published online 2025. doi:10.1016/j.jacasi.2024.10.007. (Editorial)

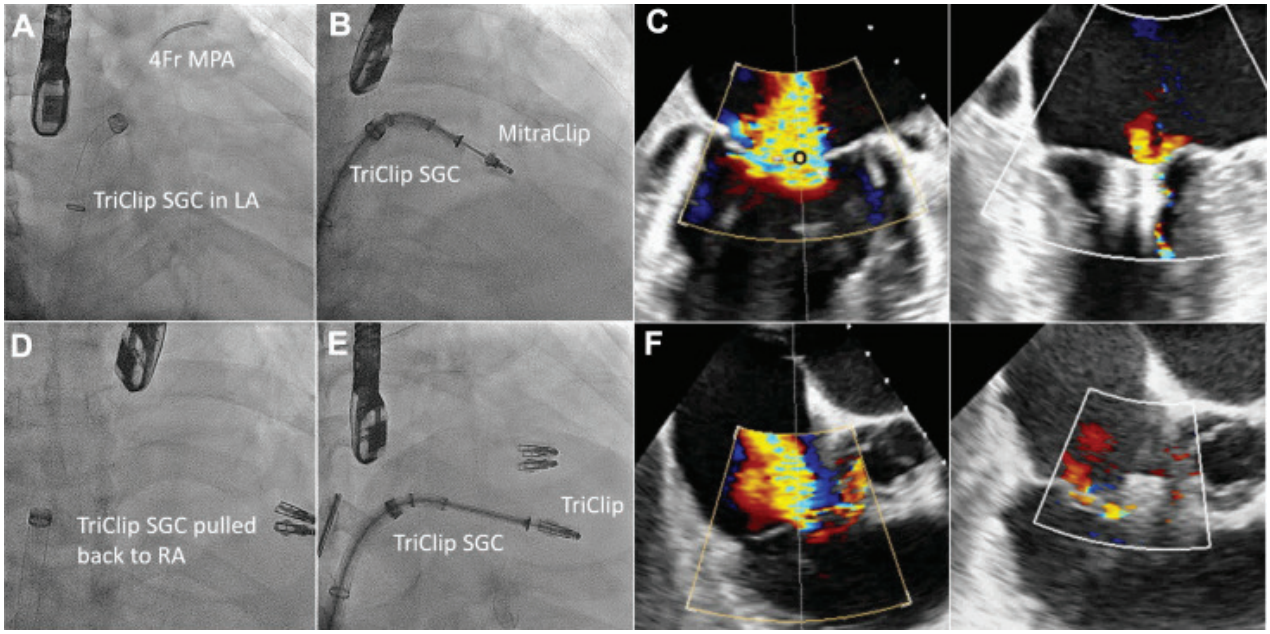
CENTRAL ILLUSTRATION: TriStar Study Design Outcomes



Xu H, et al. JACC Cardiovasc Interv. 2024;17(23):2796-2807.

At 1 year, the TriStar (Confirmatory Clinical Study of Treating Tricuspid Regurgitation With K-Clip™ Transcatheter Annuloplasty System) study participants who underwent transcatheter tricuspid valve repair with the K-Clip system for severe tricuspid regurgitation (TR) (grade ≥ 4) had a low mortality rate (5.2%). There were significant TR reductions of ≥1 grade in 94.2% of patients, marked improvement in cardiac function, and enhanced quality of life. Nearly all patients achieved NYHA functional class I or II status. 6MWD = 6-minute walk distance; KCCQ = Kansas City Cardiomyopathy Questionnaire; MAE = major adverse event(s).

Source: Xu H, Chen M, Wang Z, Huo J, Li J, He F, Husanova F, Li H, Zhou D, Zhang X, Liu X, Song G, Li J, Luo J, Guo Y, Mou Y, Yuan S, Tao T, Wu S, Teng P, Ni Y, Ma L, Pan X, Ge J, Lee APW, Li W. Mid-term outcomes of K-Clip transcatheter tricuspid annuloplasty system in patients with severe functional tricuspid regurgitation. JACC: Cardiovascular Interventions. 2024;17(23):2796-2807. doi:10.1016/j.jcin.2024.10.007.



Procedure Highlight of a Combined Mitra Clip and TriClip Using the TriClip SGC. (A) The TriClip steerable guide catheter (SGC) was inserted into the leftatrium (LA), with a 4-F multipurpose catheter (MPA) in the LA to maintain LA access for a subsequent appendage occlusion. (B) The MitraClip clip delivery system (CDS) was inserted into the TriClip SGC for mitral transcatheter edge-to-edge repair(M-TEER). (C) Severity of mitral regurgitation at baseline (severe) and after M-TEER (mild). (D) After the completion of M-TEER, the TriClip SGC was pulled back to right atrium (RA). (E) TriClip TEER was performed. (F) Severity of tricuspid regurgitation at baseline (severe) and after tricuspid TEER (mild).

Source: So KC, Kam KK, Tang GHL, Lee APW. Feasibility of using triclip guide for combined mitraclip and triclip transcatheter edge-to-edge repair: First-in-human experience. JACC: Cardiovascular Interventions. 2024;17(8):1071-1072. doi:10.1016/j.jcin.2024.02.024. (Letter)



Diabetes and Obesity
糖尿病與肥胖症研究

PRINCIPAL INVESTIGATOR

Juliana Chan

TEAM MEMBERS

Ronald Ma, Alice Kong, Andrea Luk, Elaine Chow, Hongjiang Wu, Aimin Yang, Juliana Lui, Edith Chow, Tony Chun-Kwan O, Wing Yee So, Risa Ozaki, Cadmon Lim, Stephanie Cheung, Baoqi Fan, Phyllis Kwong, Eric Lau, Heung Man Lee, Mei Shi, Claudia Tam, Natural Chu, Chuiguo Huang, James Ling, Noel Ng, Jiazhou Yu, Donna Chen, Alex Ng, Emily Poon, Abby Li, Hester Lee, Sheila Wong, Chris Hui, Atta Tsang, Yingnan Fan, Tsz Fung Tsoi, Xinge Zhang, Zhengli Bai, Yanrong Du, Yidan Hao, Yintang Huang, Huaning Li, Huishu Lin, Henry Tam, Yingcong Xue, Gechang Yu, Tianjiao Yuan, Minglu Zhang, Yingchai Zhang, Henry Tam, Kelly Wong, Rebecca Yue

Research Progress Summary

Hong Kong Diabetes Register (HKDR), Hong Kong Diabetes Surveilance Database (HKDSD) and Chinese Diabetes Outcome Model (CDOM)

In 2024, **Juliana Chan** and her research team's three decades of tenacity in using the HKDR data established since 1995 to create knowledge aimed at transforming care has come to fruition with the acceptance of the patient-level Chinese Diabetes Outcome Model (CDOM) for publication in Diabetes Care, a top diabetes journal. Based on 30 years of prospective data of 30,000 patients with diabetes in the HKDR, the CDOM accurately predicts lifetime risk of 10 major endpoints including cardiovascular-renal-cancer events, severe hypoglycemia and all-cause death with validation by the Hospital Authority (HA) territory-wide electronic medical record (EMR) data. The CDOM incorporates measurement of albuminuria, the most robust biomarker for clinical events, as far back as in 1995, which underlies its high performance. It is the outcome model with the longest follow-up period and highest number of clinical endpoints with particular relevance to Asians. With the publication of quality of life (QoL) and healthcare utilisation costs of HKDR enrollees, the integration of these data within the CDOM has made this a valuable tool for risk stratification, decision-making, health technology assessment and cost-effectiveness analysis. By applying the effect size of interventions

observed in randomised controlled trials (RCT) or real-world settings, the CDOM can simulate the long-term effects of intervention at an individual level and identify subgroups who will benefit most from contemporary or novel interventions such as dignostics, drugs, devices and digital solutions, to inform practice and policymakers.

Pharmacoepidemiology and real-world evidence

Using the HKDSD curated from the HA-EMR system, consisting of 4 million people with at least one blood glucose measurement (2000-2019), the team has identified 0.8 million people with diabetes. Whilst they have demonstrated 50-70% decline in major complications including all-cause death between 2000 and 2016, frailty and comorbidities including cancer and dementia are their next challenges in maintaining the well-being of patients with diabetes. Large scale observational and intervention studies have demonstrated the utmost importance of early diagnosis, treatment and control of glycemia and other risk factors to reduce long-term healthcare burden. In this light, the data granularity of HKDSD which captured laboratory results and medications allowed the team to evaluate the impacts of treatment especially in low-risk patients for whom RCT data are few and far between. Using this unique resource, they have reported the long-term benefits of intensified glycemic control using DPP4 is during early stage of diabetes (<2 years of diagnosis) and at low HbA1c threshold (HA1c<7.5%) in patients treated with metformin and/or sulphonylurea (as first line treatment in most care settings). These included reduced risk of glycemic variability, insulin initiation and major outcomes including cardiovascular(CV)-renal events, severe hypoglycemia and all-cause death. Likewise, early initiation with SGLT2i in patients with short disease duration and at low HbA1c level reduced rate of decline in kidney function, irrespective of baseline clinical profile and use of medications.

Having published the risk association of RASi discontinuation in patients with chronic kidney disease (CKD) grade 3b (eGFR<30 ml/min/1.73m^2) with major CV-renal events including death, they have also reported similar patterns upon metformin discontinuation in patients with CKD G3b. They have also reported the more potent CV protective effects of rosuvastatin than atorvastatin, the two most commonly prescribed statins in patients with diabetes. However, given the different pharmacokinetic profiles of rosuvastatin between Europeans and Asians with the latter requiring a considerably lower dose in patients with CKD, they have also observed the prescription of inappropriately high dose of rosuvastatin in patients with CKD and its association with albuminuria. Although there was no apparent adverse effects on kidney function, longer-term observations are warranted while these data have reinforced the need to use the EMR system to remind clinicans about dosage adjustment of rosuvastatin in patients with CKD.

Supported by the HA Data Collaboration Laboratory, they have applied advanced analytic models including machine learning to multidimensional EMR data and developed highly accurate models to predict 1-year risk of severe hypoglycemia and falls in elderly patients, as well as identify high risk individuals with prediabetes progressing to diabetes. These models can be integrated within the EMR system to identify high risk target populations for prevention of diabetes and timely review of clinical status and use of medications to prevent hypoglycemia in patients with diabetes. By integrating these risk models within the territory-wide diabetes risk assessment and management program, they shall efficiently identify these high risk patients for preventive and risk-mitigating strategies. When combined with cost-effectiveness analysis, these quality improvement (QI) programs can become exemplary examples of using data to maximise effectiveness and minimise harm of medications to save lives and money and make healthcare sustainable.

Reducing precision medicine in young onset diabetes (YOD) to clinical practice
Major unmet needs in young-onset diabetes

The power of using data to inform, inspire and instill actions cannot be understated. Detailed analyses of the HKDSD have confirmed 50-70% decline in incidence of major clinical events and death in people with diabetes between 2000 and 2016. However, the standard mortality ratio (SMR) of patients with YOD, diagnosed before age of 40 years, remained 5-8 fold higher than that of their peers without diabetes. Furthermore, these young patients had poor beta-cell function, suboptimal control of risk factors, complex clinical course including mental illness with higher risk of hospitalisations and premature death than their older counterparts. Their extensive publications on YOD have inspired many groups to explore this phenomenon with YOD now widely recognised as a global emergency. Apart from sharing their knowledge through original articles, reviews and presentations, the team has initiated an integrated program targeting these 20% of people with or at risk of YOD but contributing to nearly 80% of healthcare burden.

PRISM Study and Precision Medicine

The ongoing PRISM Project (**P**recision Medicine to **R**edefine **I**nsulin **S**ecretion and **M**onogenic Diabetes in Chinese Patients with Young Onset Diabetes) commissioned by the Health and Medical Research Fund (HMRF) commenced in 2020. In this 3-part study, they assessed the beta-cell function and auto-antibodies using the HKDR Biobank. They also used whole genome sequencing (WGS) to discover co-segregation of genetic variants with diabetes traits in the Hong Kong Diabetes in Family Study (HKDFS) Cohort, the majority of index patients having YOD. In the 3-year RCT, the team randomised 884 patients with YOD with half of them receiving multidisciplinary care guided by biogenetic markers and facilitated by information technology in a Diabetes Centre setting for 1 year before returning to usual care. In December 2024, they completed the 3-year RCT and published the baseline profiles of the PRISM cohort highlighting the heterogeneity of genotypes and phenotypes of YOD with various combinations of insulin deficiency and resistance, autoimmunity, common and rare variants in pathways related to energy metabolism as well as lifecourse events and psychosocial-behavioral factors.

In this unique PRISM cohort, they have tracked the progression of beta-cell function annually for correlation with upstream factors (e.g., biomarkers) and downstream outcomes (e.g., hospitalisations and major events). Using this cohort, their team has gathered extensive patient reported outcome measures (PROMs) including absenteeism and presenteeism which will allow them to evaluate the direct and indirect costs of YOD and the effectiveness and cost-effectiveness of their multicomponent intervention. The PRISM Biobank is another important resource which complements the HKDR Biobank and multi-centre Hong Kong Diabetes Biobank (HKDB) in their ongoing multiomic discovery programs. In 2024, they have published a series of original papers on the beta-cell function as measured by C peptide and during clamp studies in YOD, prevalence of monogenic diabetes due to rare variants in unrelated patients with YOD, novel genetic variants for age at diabetes diagnosis (AAD) and YOD, association of pathway-related genetic variants with AAD as well as that of common variants encoding genes implicated in monogenic diabetes with YOD and CV-renal events.

Collaboration with Hong Kong Genome Institute

To further unravel the complex aetiologies of YOD, they are collaborating with the Hong Kong Genome Institute where they apply WGS to the 884 PRISM index cases and their family members to discover familial clustering of common and rare variants of genes associated with YOD and related traits. This prospective family-based PRISM cohort is complemented by WGS analysis in 160 index cases of YOD and their 800 first-degree relatives in the HKFDS established since 2000. These cohorts of familial YOD have undergone genome-wide association study (GWAS), thus, together with the WGS data, The Chinese University of Hong Kong (CUHK) now possesses one of the most informative biobanks related to YOD with comprehensive clinical data, lifestyles, treatments and other biogenetic data. Using novel methodologies such as machine learning, clustering and modeling, they aim to unravel the multicausality of YOD and their heterogeneity in treatment responses and outcomes. Discoveries from these cohorts will be validated in other cohorts including but not limited to HKDR, HKDB, community-based Better Health for Better Hong Kong (BHBHK) Cohort, Hong Kong Prediabetes (HKPD) Cohort and Hong Kong School Children (HKSC) Cohort. This wealth of knowledge will help unravel the lifecourse determinants of prediabetes, diabetes and noncommunicable disease (NCD) in Chinese which will be relevant to other Asian and global populations.

Area of Excellence (AoE) in Diabetes – Using data to transform care and save patient lives

Based on more than three decades of combining research and clinical practice to set up cohorts, registers and databases, the team has been learning from individual patients and cohorts to understand the heterogeneity of causes, trajectories and outcomes. Their focus on improving outcomes and QoL through research, care and advocacy have gained international acclaim with the invitation of PI to lead the Lancet Commission Report on Diabetes. After four years of curation and appraisal of evidence as well as using modeling to synthesise new data, they have provided a roadmap to reduce the burden of diabetes/NCD by closing the gaps in professional knowledge, prevention, care and data. In 2024, their team was awarded a 5-year funding of HKD 70 million through the AoE scheme with 4 work packages: 1) establish a territory-wide gestational diabetes mellitus (GDM) register accompanied by a RCT to prevent incident diabetes in women with GDM; 2) implement a multicomponent RCT to address the psychosocial-behavioral needs in obese patients with YOD; 3) use the updated HKDSD to track secular trends of prediabetes, diabetes and

NCD, assess effectiveness and cost-effectiveness of medications and care strategies while identify unmet needs and 4) use web-based platform to hold regular webinars to promote data-driven diabetes prevention and care programs in Asia whilst establish a network of healthcare workers to expand the Joint Asia Diabetes Evaluation (JADE) Register for greater impact in Asia and beyond.

Precision Prevention and Care Program on Young Onset Diabetes supported by Jockey Club

In 2023-2024, the team received two major donations from the Hong Kong Jockey Club Charities Trusts (HKJCCT) to implement two territory-wide programs targeting young individuals, in partnership with non-government organisations (NGO) aimed at informing government policies. In a 5-year project with a funding of HKD 10 million, 900 patients with type 1 diabetes or diabetes diagnosed under the age of 35 years will be given 3 years of free continuous glucose monitoring (CGM) devices where their team is tasked to evaluate the acceptability, effectiveness and cost-effectiveness of CGM in improving outcomse and QoL (refer to report by Ronald Ma).

After 18-month of intense discussion initiated by their team, in 2024, CUHK, along with Asia Diabetes Foundation (ADF) governed by CUHK Foundation and St James' Settlement received a donation of HKD 66 million to implement a community-based multicomponent program of using biogenetic markers, digital tools, and multidisciplinary care to predict and prevent YOD through public private partnerships. In this Precision Prevention Program on Young-Onset Diabetes (PPPYOD) Program, they shall identify 9,000 adults aged less than 45 years with at least one risk factor for diabetes through out-reach programs, self-referrals or referrals by family doctors to undergo a 2-tier risk stratification program followed by a 2-year risk-stratified intervention. All participants will undergo saliva DNA testing, capillary blood glucose testing and simple clinical assessment. Using proprietary algorithms, they shall select patients with the top 25% risk score predicted to have 5-10% annual conversion rate to diabetes. These subjects will undergo yearly oral glucose tolerance test (OGTT) to detect undiagnosed diabetes or impaired glucose tolerance (IGT) based on 2-hour plasma glucose for early intervention. The latter includes empowerment by personalised genetic report, digital care and subsidised self-monitoring tools (weighing scale and CGM devices) and pairing with a doctor-nurse team for regular consultations and medications. The impact of this program on progression to prediabetes/diabetes, health literacy, resource utilisation and PROMs will be evaluated within the the REAIM (reach, effectiveness, adoption, implementation and maintainance) framework including cost-effectiveness analysis.

Technologies and therapeutics

As physician researchers, the principal investigators (PIs) in their group are tasked to implement evidence-based solutions and develop strategies to address unmet needs in partnership with relevant stakeholders. As clinical pharmacologists with research interests in the drug-human relationships, they collaborate with industry in phase 1-4 studies and design pragmatic trials aimed at maximising effectiveness and minimising harm. To this end, effective glucose metabolism starts with effective activity of glucokinase (GK) which senses prevailing blood glucose level to generate ATP for triggering insulin secretion followed by glycogen production in liver. Defective glucose sensing due to qualitative or quantitative changes in GK, exemplified by maturity onset diabetes of the young (MODY) due to GK mutations is a major unmet need. In partnership with a China-based pharmaceutical company which has brought the first glucokinase activator (GKA) to the market as a novel class of oral glucose-lowering drug, using hyperglycemic clamp techniques, they have reported the effect of GKA in lowering the glucose threshold in triggering insulin secretin in GK-MODY patients as well as the effects of GKA on insulin and other key hormones in glucose metabolism including glucagon like peptide 1 (GLP1) and glucagon in patients with normal glucose tolerance, IGT and type 2 diabetes. Leveraging these experiences, they are now evaluating the effects of longer term administration of GKA to explore its place of therapy in subjects with prediabetes, diabetes and GK-MODY.

Apart from conducting clinical trials on novel drug classes such as aldose reductase inhibitor for preventing heart failure, GLP1-GIP (glucose-dependent insulinotrophic peptide) dual receptor agonist (RA) for weight reduction, oral PCSK9 inhibitors for lipid lowering, their PIs are also leading investigator-initiated studies, supported by competitive grants including Health and Medical Research Fund (HMRF), Innovation and Technology Commission (ITC) and industry to explore the renoprotective effects of GLP1-RA in patients with CKD, sustained glucose lowering effects of proprietary Chinese Medicine and effects of metformin with or without poorly absorbed carbohydrates on microbiota and glucose metabolism.

Environmental health and holistic care

Obesity, diabetes and NCD are complex conditions with societal and personal factors. Apart from diet, exercise, sleep, stress, tobacco and alcohol as major behavioral risk factors, the importance of social determinants of health such as education, poverty and environmental pollution is gaining traction. Over the years, the team has established cohorts of adolescents, young adults, and patients with diabetes and GDM in whom some of these risk factors including metals and persistent chemicals (e.g., per- and polyfluoroalkyl substances, PFAS) have been studied. Elucidation of these gene-lifestyle-environment interactions aim to inform policies for creating a health-enabling environment apart from changing lifestyles. In 2000, in collaboration with their chemical pathologists, they have measured serum and urinary metals as well as cardiovascular-kidney-metabolic risk factors in 2,000 adolescents of the HKSC Cohort. Together with the establishment of the HKPD cohort, their group will be working with other researchers in Hong Kong and Mainland China to examine the independent and interactive effects of toxic and nutrent metals on metabolic health and explore the roles of interventions to mitigate the impact of these environmental factors.

In the same vein, their group has been exploring the roles of sleep and depression in their patients with diabetes. Apart from confirming their independent roles in adversely influencing clinical outcomes, they are conducting RCT to examine the effects of cognitive-behavioral therapy (CBT) on sleep hygiene in elderly patients. On the other hand, the impact of YOD on healthcare costs, productivity and psychosocial health are emerging areas with personal and social implications. In the upcoming AoE project, women with GDM and obese young adults with YOD are potential benefactors in whom multidimensional strategies using technology such as CGM, medications, peer support and CBT will be used to improve their wellbeing. Meanwhile, the team continues to collaborate with their metabolic surgeons to provide multicomponent care to address the unmet needs of people with diabetes whilst establishing a tissue biobank for research purposes. Supported by the CUHK Knowledge Transfer Project Fund (KTF), they are implementing a school-based program to inspire their adolescents on the utility of STEAM (science, technology, engineering, art and mathematics) in the context of health promotion and disease prevention. In another KTF, they are applying their learning from a RCT evaluating CGM-augmented lifestyle intervention program in people with IGT, funded by HMRF Fund, to implement a pragmatic community-based diabetes prevention oprogram.

The numerical nature of diabetes and cardiometabolic risk factors, which are silent and progressive, impedes decision-making by all relevant stakeholders including patients and care providers. The recent rapid advances of CGM technology with increasing user-friendliness have transformed the landscape of self-managemen as a cornerstone in diabetes prevention and care. To this end, supported by several research grants and more recently the Jockey Club program on YOD, the team continues to build capacity in the use of CGM for evaluation and intervention purposes.

Knowledge transfer, international profile and people development

2024 has been an eventful year when their group has received recognitions in the form of grants, donations and awards, including the inaugural lecture of Ronald for his S.H. Ho Professorship and David Todd Lectureship awarded by the Hong Kong College of Physicians by Elaine Chow. Apart from the AoE and HKJCCT donations, collectively, PIs have been awarded 2 HMRF grants/fellowships and 1 Research Grant Committee (RGC) grant to examine 1) the health effects of environmental and nutritional toxins; 2) the secular trends of cancer in type 2 diabetes; 3) determinants for responses to sulfonylureas and glitazone in type 2 diabetes. In 2024, they graduated 3 PhD students and collectively, the 8 PIs including 5 physician scientists and 3 RAPs are training 15 PhD/MPhil students and 12 postdoctoral fellows/ research associates, with several of them supported by the CU Fellowship Scheme or ITC Talent Research Hub Scheme. Apart from being reviewers of journal papers, their PIs are members of editorial boards of top medical journals and committees of international organisations in the field of diabetes, obesity and CKD where they contribute to development of practice guideline and position statements to create regional and global impacts. In 2024, Juliana was selected as one of the 12 members of the Global Council of the European Association for the Study of Diabetes to promote research, care and advocacy for the betterment of people with diabetes and those at risk.

Apart from serving on committees of government bodies including Food and Health Bureau, HA committees and Chinese Center for Disease Control and Prevention (China CDC) to advise on matters related to diabetes, NCD, drug utilisation and development, and environmental health, most PIs are members of grant review committees of ITC, RGC, HMRF and Professional Services Advancement Support Scheme (PASS) to contribute to development of knowledge workers in Hong Kong and Mainland China. Given the importance of industry in developing new technologies, their

PIs also serve on steering committees of international projects including outcome trials and/or provide consultancy to global and regional advisory boards of multinational companies including Amgen, Astra Zeneca, Bayer, Boehringer Ingelheim, Merck, MSD, Novo Nordisk, Sanofi, Pfizer, Viatris and Zuellig Therapeutics.

As an International Diabetes Federation (IDF) Centre of Excellence in Diabetes Care, they continue to build professional capacity through their bi-annual Master, Diploma and Certificate Courses in Endocrinology, Diabetes and Metabolism and their annual Hong Kong Diabetes and Cardiovascular Risk Factor – East Meets West Symposium organised by the Hong Kong Institute of Diabetes and Obesity (HKIDO) to promulgate the latest advances, share best practices and foster collaborations. In 2024, they have conducted their diabetes nurse exchange program with Jiangsu Provincial Hospital which commenced more than a decade ago, and brought the Mount Hood Diabetes Health Economics Conference in Clinical Decision Making to Hong Kong. One of the founders of this primier meeting for health economists and modellers, Philip Clarke from Oxford University, is one of their long-term collaborators in the CDOM development. This meeting, supported by the Croucher Foundation and PASS Scheme with 500 local and overseas registrants from healthcare and scientific disciplines, has provided a forum to foster collaborations in their pursuit of using health economics to inform decision-making by all relevant stakeholders.

Publicity and press release

In 2024, their productive research has led to award of multiple grants and publications including some high impact publications (impact factor ≥15 in any of 2021, 2022 or 2023) whilst at the same time, they have shared key findings with the public to raise awareness. Some examples include:

- CUHK develops an accurate machine learning model that uses big data to predict the risk of severe hypoglycemia in the next 12 months among older adults with diabetes
    - https://med.cuhk.edu.hk/press-releases/cuhk-develops-an-accurate-machine-learning-model-that-uses-big-data-to-predict-the-risk-of-severe-hypoglycemia
- Omnihealth Practice – NEWS & PERSPECTVE: Local EHR-based ML model accurately predicts the risk of severe hypoglycemia in older adults with diabetes
    - https://omnihealthpractice.com/article/6683bf226e89e4728d76fadf
- CUHK study shows few patients with type 2 diabetes can achieve diabetes remission in real-world settings through weight loss at early stage and eventually stop medications.
    - https://www.med.cuhk.edu.hk/press-releases/cuhk-study-shows-few-patients-with-type-2-diabetes-can-achieve-diabetes-remission-in-real-world-settings-through-weight-loss-at-early-stage-and-eventually-stop-medications

Research and Scholarship

Research Awards and Recognitions

Name	Details	
	Award	Organisation
Juliana Chan	Member, Global Council	European Association of Study of Diabetes
Ronald Ma Kevin Yup Kelly Li Cadmon Lim	Silver Medal	49th International Convention of Inventions Geneva
Ronald Ma Juliana Chan Wing Yee So Cadmon Lim	Silver Medal	49th International Convention of Inventions Geneva

Research Awards and Recognitions

Name	Details	
	Award	Organisation
Ronald Ma	S.H. Ho Professorship	The Chinese University of Hong Kong
	Member, Precision Medicine Committee	United States National Institute of Health
Elaine Chow	Sir David Todd Award lecture	Hong Kong College of Physicians
Edith Chow	Best Poster Presentation (Clinical)	41st Annual Scientific Meeting, Hong Kong Society of Endocrinology, Metabolism and Reproduction
Chun Kwan O	Certificate of Appreciation, Poster Presentation (Clinical)	41st Annual Scientific Meeting, Hong Kong Society of Endocrinology, Metabolism and Reproduction
Sandra Tsoi	Best Oral Presentation (Clinical)	41st Annual Scientific Meeting, Hong Kong Society of Endocrinology, Metabolism and Reproduction
Yingchai Zhang	Robert Turner Clinical Research Course	EASD and Oxford Centre for Diabetes, Endocrinology and Metabolism

Fellowships

Name	Details	
	Fellowship	Organisation
Chuiguo Huang Natural Chu James Ling Jiazhou Yu Tingting Chen	Postdoctoral Fellowship Scheme	Faculty of Medicine, The Chinese University of Hong Kong
Stephanie Cheung Baoqi Fan Phyllis Kwong Eric Lau	Research Talent Hub Scheme	Innovation and Technology Committee
Gechang Yu Yingchai Zhang Yuzhi Deng	Travel Grant	European Association for the Study of Diabetes 2024 meeting
Chun Kwan O	Travel Grant	67th Annual Meeting of the Japan Diabetes Society
Gechang Yu	Travel Grant	AASD 2025 Conference
Juliana Lui Yingchai Zhang Yuzhi Deng	Selected to attend the Cambridge Diabetes Seminar	MRC Epidemiology Unit, University of Cambridge
Yingchai Zhang	T1D Fellow program with travel grant	Endocrine Society, USA

Academic Editorships

Name	Details	
	Role	Journal
Juliana Chan	International Advisor	The Lancet Diabetes and Endocrinology
	Editorial Board Member	Diabetes Metabolism Research Review
		Journal of Diabetes
		Diabetes Obesity Metabolism
Ronald Ma	Expert Editor	Journal of Diabetes Investigation
	Associate Editor	Diabetologia
	Editorial Board Member	PLOS Medicine
		Obesity Reviews
		Diabetologia
		Diabetes
Alice Kong	Editor-in-chief	Primary Care Diabetes
	Associate Editor	Obesity Reviews
	Section Editor	Current Diabetes Reports
	Editorial Board Member	Diabetes Care
		Diabetes Technology & Therapeutics
		International Medical Education
Andrea Luk	Associate Editor	Diabetic Medicine
	Editorial Board Member	Diabetes Care
Elaine Chow	Associate Editor	Diabetes Research and Clinical Practice
	Editorial Board Member	Communications Medicine
		Diabetes & Metabolism Journal
Hongjiang Wu	Associate Editor	Cardiovascular Diabetology
	Editorial Board Member	BMC Medicine
	Young Editorial Board Member	Journal of Zhejiang University-SCIENCE B
		Military Medical Research
Aimin Yang	Guest Editor	Frontiers in Nutrition
		Frontiers in Public Health
	Associate Editor	Diabetes Obesity Metabolism
	Young Editorial Board Member	Eco-Environment & Health
	Guest Editor	Nutrients

Reviewers of Journal / Conference

Name	Details	
	Role	Journal / Conference
Juliana Chan	Reviewer	The Lancet
		The Lancet Endocrinology and Diabetes
		The Lancet Regional Health Western Pacific
		The Lancet Healthy Longevity
		Lancet Public Health
		Nature Review
		Nature Medicine
		Nature Communication
		Nature Metabolism
		BMJ
		PLOS Medicine
		PLOS ONE
		BMC Medicine
		Diabetes Care
		Diabetologia
		Diabetes Obesity Metabolism
		Diabetes Rsearch and Clinical Practice
		Diabetic Medicine
		Primary Care Diabetes
		Acta Diabetologia
		eClinicalMedicine
		Hormone and Metabolic Research
		Environment International
		International Journal of Epidemiology
		American Journal of Clinical Nutrition
		Chemosphere
		Environmental Pollution
		Science of The Total Environment
		Environmental Research
		Ecotoxicology and Environmental Safety
		Journal of Occupational and Environmental Medicine

Reviewers of Journal / Conference

Name	Details	
	Role	Journal / Conference
Juliana Chan	Reviewer	Annals of Academy of Medicine (Singapore)
		Frontiers in Public Health
		Biomolecules
		Biomedical and Environmental Sciences
		British Journal of Cancer

Grants and Consultancies

Name	Project Title	Funding Source	Start Date (dd/mm/yyyy)	End Date (dd/mm/yyyy)	Amount (HK$)
Juliana Chan	Empower our Youth and Transform our Future	The Chinese University of Hong Kong – Knowledge Transfer Project Fund	01/04/2023	30/09/2024	399,840
	Clinical Safety, Efficacy and Multiomic Evaluation of a Novel Chinese Medicine Formula in Type 2 Diabetes: Effects on Beta-cell Function and Insulin Resistance	Innovation and Technology Commission – Midstream Research Programme for Universities	01/06/2022	30/05/2025	4,966,735
	Precision Prevention Program on Young Onset Diabetes	Hong Kong Jockey Club Charties Trust	01/05/2024	30/04/2025	66,000,000
	Impact of Risk Factor Management on Cardiovascular Events in Patients Diagnosed with Type 2 Diabetes – The Joint Asia Diabetes Evaluation (JADE) Register	Servier via Asia Diabetes Foundation	01/04/2024	30/03/2025	1,200,000
Juliana Chan Ronald Ma	Using Whole Genome Sequencing, Computational Biology and Functional Analysis to Discover Biological Pathways Implicated in Diabetic Kidney Disease	Astra Zeneca Investigator Initiated Study	30/10/2019	30/09/2025	8,918,060

Grants and Consultancies

Name	Project Title	Funding Source	Start Date (dd/mm/yyyy)	End Date (dd/mm/yyyy)	Amount (HK$)
Juliana Chan Ronald Ma Andrea Luk	Precision Medicine to Redefine Insulin Secretion and Monogenic Diabetes (PRISM) in Chinese Patients with Young Onset Diabetes	Health Bureau – Health and Medical Research Fund	01/09/2019	31/08/2024	8,457,718
Juliana Chan Elaine Chow	Effects of Dorzagliatin on 1st Phase Insulin and Beta-cell Glucose Sensitivity in Individuals with Impaired and Normal Glucose Tolerance	Hua Medicine Investigator Initiated Study	03/03/2022	30/07/2024	1,221,800
Ronald Ma	Clinical Utility of Lipoprotein(a) and its related Polygenic Risk Score in Risk Stratification of Cardiovascular Complications among Chinese Patients with Type 2 Diabetes	Health Bureau – Health and Medical Research Fund	01/05/2024	31/10/2026	1,500,000
	Single-cell Multi-omics Study of Atherosclerotic Vascular Disease: Narrowing the Gap Between Bench and Bedside	Research Grants Council – Theme-based Research Scheme	01/01/2024	31/12/2028	1,800,000
	Single-cell Multi-omics Study of Atherosclerotic Vascular Disease: Narrowing the Gap Between Bench and Bedside	The Chinese University of Hong Kong – Theme-based Research Scheme Matching Fund	01/01/2024	31/12/2028	200,000
	S.H. Ho Professor of Diabetes	The Chinese University of Hong Kong	01/05/2023		Amount not to be disclosed
	Developing an e-Health Platform to Improve Maternal Health and Reducing Long-term Risk of Chronic Diseases for Women with Gestational Diabetes	The Chinese University of Hong Kong – Knowledge Transfer Project Fund	01/04/2023	31/05/2025	400,000

Grants and Consultancies

Name	Project Title	Funding Source	Start Date (dd/mm/yyyy)	End Date (dd/mm/yyyy)	Amount (HK$)
Ronald Ma	Improving Diabetes Care for Young Patients	Hong Kong Jockey Club Charities Trust	01/07/2023	30/06/2027	10,900,000
	A Nanotechnology Platform for Profiling Diabetes-related MiRNA for Precision Medicine	Innovation and Technology Commission – Midstream Research Programme for Universities	01/06/2021	31/05/2024	5,998,400
	A Nanotechnology Platform for Profiling Diabetes-related MiRNA for Precision Medicine	Innovation and Technology Commission – Innovation and Technology Fund Research Talent Hub	01/06/2021	31/05/2024	1,388,000
	A Nanotechnology Platform for Profiling Diabetes-related MiRNA for Precision Medicine	Innovation and Technology Commission – Innovation and Technology Fund Research Talent Hub	12/08/2022	31/05/2024	438,494
	A Nanotechnology Platform for Profiling Diabetes-related MiRNA for Precision Medicine	Innovation and Technology Commission – Innovation and Technology Fund Research Talent Hub	15/11/2022	31/05/2024	438,060
	A Nanotechnology Platform for Profiling Diabetes-related MiRNA for Precision Medicine	Innovation and Technology Commission – Innovation and Technology Fund Research Talent Hub	04/05/2023	31/05/2024	600,145
	Translating Multi-omic Discoveries to Transform Diabetes Care and Reduce Diabetic Complications	Research Grants Council – Research Impact Fund	01/05/2019	30/04/2024	8,400,000
	Translating Multi-omic Discoveries to Transform Diabetes Care and Reduce Diabetic Complications	The Chinese University of Hong Kong Research Committee – Research Impact Matching Fund	01/05/2019	30/04/2024	3,401,550

Grants and Consultancies

Name	Project Title	Funding Source	Start Date (dd/mm/yyyy)	End Date (dd/mm/yyyy)	Amount (HK$)
Ronald Ma	Translating Multi-omic Discoveries to Transform Diabetes Care and Reduce Diabetic Complications	The Chinese University of Hong KongResearch Committee – Funding for Research Sustainability of Major Research Grants Council Funding Schemes	27/05/2019	30/04/2024	500,000
	Genomic Medicine in Diabetic Kidney Disease	University Grants Committee – Research Matching Grant Scheme	01/06/2020	31/12/2026	3,579,544
	Precision Medicine in Diabetes	University Grants Committee – Research Matching Grant Scheme	10/12/2021	09/12/2024	520,762
	A Phase 3b, Randomized, Double-blind, Placebo-controlled Study to Evaluate the Efficacy and Safety of TRC101 in Delaying Chronic Kidney Disease Progression in Subjects with Metabolic Acidosis	Tricida Inc	01/04/2019	31/12/2024	1,605,460
	Semaglutide Cardiovascular Outcomes Trial in Patients with Type 2 Diabetes (SOUL)	Novo Nordisk Hong Kong Limited	29/08/2019	29/07/2024	9,424,000
	FAME 1 EYE - The Fenofibrate and Microvascular Events in Type 1 Diabetes Eye. A Randomised Trial to Evaluate the Efficacy on Retinopathy and Safety of Fenofibrate in Adults with Type 1 Diabetes; A Multicenter Double-blind Placebo-controlled Study in Australia and Internationally	University of Sydney	01/08/2019	31/12/2024	348,160

Grants and Consultancies

Name	Project Title	Funding Source	Start Date (dd/mm/yyyy)	End Date (dd/mm/yyyy)	Amount (HK$)
Ronald Ma	Effect and Safety of Semaglutide 2.4mg Once -weekly on Weight Management in Subjects with Overweight or Obesity	Novo Nordisk Hong Kong Limited	08/12/2020	31/12/2024	2,309,170
	A Non-blinded Retrospective Biomarker Add-on Study to FIGARO-DKD for Bioprofiling the Pharmacodynamic Response to Finerenone in FIGARO-DKD Subjects (FIGARO-BM)	Bayer HealthCare Limited	15/10/2021	31/12/2023	105,000
	Translating Multi-omics Analyses for Precision Medicine in Diabetes	The Chinese University of Hong Kong Research Committee – Postdoctoral Fellowship Scheme	12/05/2022	30/04/2026	750,000
	Metformin as a Neuroprotective Therapy for Glaucoma - a Randomized Controlled Trial	Research Grants Council – General Research Fund	01/01/2022	31/12/2024	1,160,564
Noel Ng	Evaluation of the Long-Term Healthcare Impact of Polycystic Ovary Syndrome	Health Bureau – Health and Medical Research Fund	01/10/2021	31/03/2024	1,304,136
Andrea Luk	A Pilot Program to Establish a Laboratory Service Hub for Multi-National Clinical Trials (396203964) sponsored by Teddy Clinical Research Laboratory (Hong Kong) Limited	Teddy Clinical Research Laboratory (Hong Kong) Limited	01/06/2023	30/09/2024	1,104,000

Grants and Consultancies

Name	Project Title	Funding Source	Start Date (dd/mm/yyyy)	End Date (dd/mm/yyyy)	Amount (HK$)
Andrea Luk	A Phase 2 Randomized, Placebo-controlled, Double-blind, Dose-ranging Study to Evaluate the Efficacy, Safety and Tolerability of AMG 133 in Adult Subjects with Overweight or Obesity, With or Without Type 2 Diabetes Mellitus	Amgen Asia Holding Ltd	01/06/2023	31/05/2026	1,322,633
	A Phase 3 Randomized, Placebo-Controlled Clinical Study to Evaluate the Efficacy and Safety of MK 0616 in Reducing Major Adverse Cardiovascular Events in Participants at High Cardiovascular Risk	Merck Sharp & Dohme (Asia) Ltd	01/12/2023	30/06/2030	4,057,618
	Prevention and Precision Care Programme for Young Onset Diabetes	Hong Kong Jockey Club Charity Trust	01/02/2024	31/01/2028	50,000,000
	Impact of Diabetes-related Complications on Long-term Temporal Hospital Costs and Quality of Life in Patients with Young-onset Diabetes in Hong Kong: A 12-year Study	Research Grants Council – General Research Fund	01/01/2024	31/08/2025	573,333
	Using Clinical-trials and Simulation-models to Estimate Cost-effectiveness of Nonsteroidal Mineralocorticoid Antagonists, RASi, SGLT2i as Triple Therapy in Patients with Type 2 Diabetes and Chronic Kidney Disease	Health Bureau – Health and Medical Research Fund	01/12/2023	31/07/2026	1,351,997

Grants and Consultancies

Name	Project Title	Funding Source	Start Date (dd/mm/yyyy)	End Date (dd/mm/yyyy)	Amount (HK$)
Andrea Luk	Modelling the Impact and Costs of Primary Care and Hypertension Outcomes in Hong Kong	Health Bureau – Health and Medical Research Fund	01/01/2024	31/12/2025	1,460,000
	Clinical Safety, Efficacy and Multiomic Evaluation of a Novel Chinese Medicine (CM) Formula in Type 2 Diabetes (T2D) : Effects on Beta-cell Function and Insulin Resistance	Innovation and Technology Commission – Innovation and Technology Support Programme	01/06/2022	31/05/2025	4,966,735
	Innovative Diagnosis and Treatment for Shrimp Allergy	The Chinese University of Hong Kong - Research Committee – Research Impact Matching Fund	01/06/2020	31/05/2025	8,397,098
	Commissioned Programme on Early Phase Testing of Novel Pharmaceutical Products in the Phase 1 Clinical Trial Centre, the Chinese University of Hong Kong	Health Bureau – Health and Medical Research Fund	02/05/2019	01/05/2024	50,000,000
	Effect of Glucagon-like Peptide 1 Receptor Agonist in Combination with Insulin on Glycaemic Variability and Time-in-range in Diabetic Kidney Disease: A Randomised Controlled Trial	Health Bureau – Health and Medical Research Fund	03/01/2022	02/01/2025	1,361,740
	Clinical utility of Anti-islet Autoantibodies and their Seroconversion in the Detection of Autoimmune Diabetes in Chinese	Health Bureau – Health and Medical Research Fund	18/09/2023	17/09/2025	934,000

Grants and Consultancies

Name	Project Title	Funding Source	Start Date (dd/mm/yyyy)	End Date (dd/mm/yyyy)	Amount (HK$)
Alice Kong	Metabolically Healthy and Unhealthy Obese Young Individuals in Hong Kong: A Prospective Follow-up Study	Health Bureau – Health and Medical Research Fund	23/08/2024	22/08/2027	1,484,180
	Dysregulated Host-gut Microbiota Co-Metabolism in Metabolic Associated Fatty Liver Disease	Research Grants Council – Theme-based Research Scheme (Exploratory Proposal with One-Year Budget)	01/01/2024	31/12/2024	7,285,000
Elaine Chow	Effectiveness and Safety Study of the Continuous Glucose Monitoring System (Fibersense) for Home Use (including in-clinic sessions) in Patients with Diabetes	Innovation and Technology Commission – Innovation and Technology Fund Guangdong-Hong Kong Technology Cooperation Funding Scheme	17/08/2020	16/11/2024	5,674,000
	A Phase 1b/2a Ascending dose Study of the Safety, Tolerability and Preliminary Efficacy of Sublingual Liraglutide in Patients with Type 2 Diabetes	Innovational and Technology Commission – Partnership Research Programme	01/09/2020	31/12/2024	3,680,203
	Effect of Glucagon-like Peptide 1 Receptor Agonist in Combination with Insulin on Glycaemic Variability and Time-in-range in Diabetic Kidney Disease: A Randomised Controlled Trial	Health Bureau – Health and Medical Research Fund	03/01/2022	31/05/2025	1,361,740
	The Impact of High or Low FODMAP Diets on Postprandial Glucose Response and Gut Microbiota in Individuals with Prediabetes Treated with Metformin: A Randomized Crossover Controlled-Feeding Trial	Merck Investigator Initiated Clinical Trial	01/11/2022	01/01/2024	669,575

Grants and Consultancies

Name	Project Title	Funding Source	Start Date (dd/mm/yyyy)	End Date (dd/mm/yyyy)	Amount (HK$)
Elaine Chow	Effects of Repeated dose of Dorzagliatin on Insulin Secretion, Glucagon Release and Incretin Function in Intermediate Hyperglycemia and Type 2 Diabetes	Hua Medicine Investigator Initiated Trial	17/09/2024	18/09/2025	1,968,925
	A Personlaised Health Coacth with Wearable Technologies for Intensive Lifestyle Intervention in Prediabetes	The Chinese University of Hong Kong – Social Innovation and Entrepreneurship Fellowship Scheme	31/03/2024	31/03/2026	399,998
Hongjiang Wu	Trends in Hospitalisation for Cancer and Major Modifiable Risk Factors for Cancer in People with Type 2 Diabetes in Hong Kong between 2002 and 2019	Health Bureau – Health and Medical Research Fund Research Fellowship Scheme	01/08/2024	31/07/2026	1,067,710
	Temporal Trajectories of Hospitalisations in People with Type 2 Diabetes	The Chinese University of Hong Kong Research Committee – Direct Grant	30/06/2024	29/06/2025	50,000
Aimin Yang	Detecting People at High-risk of Progression from Prediabetes to Diabetes for Early Intervention - A Machine Learning Approach Using Electronic Health Records	Health Bureau – Health and Medical Research Fund Research Fellowship Scheme	01/04/2023	31/03/2025	1,050,500
	Interactions between Environmental Toxic and Nutrient Metal Elements on Glucose Tolerance and Progression to Diabetes in Individuals with Prediabetes	Health Bureau – Health and Medical Research Fund	01/09/2024	31/08/2027	1,492,850

Grants and Consultancies

Name	Project Title	Funding Source	Start Date (dd/mm/yyyy)	End Date (dd/mm/yyyy)	Amount (HK$)
Juliana Lui	Using Clinical-trials and Simulation-Models to Estimate Cost-effectiveness of Non-steroidal Mineralocorticoid Antagonists, RASi, SGLT2i as Triple Therapy in Patients with Type-2 Diabetes and Chronic-kidney Disease	Health Bureau – Health and Medical Research Fund	01/12/2023	31/07/2026	1,352,000
	Impact of Diabetes-Related Complications on Long-term Temporal Hospital Costs and Quality of Life in Patients with Young-Onset Diabetes in Hong Kong: A 12-year Study	Research Grants Council – General Research Fund	01/01/2024	31/08/2025	573,000
	Health Economic Analysis on the NT-ProBNP Guided Cardiovascular Risk Assessment and Treatment in Patients with Type-2 Diabetes in Hong Kong	Roche Diagnostics Hong Kong Investigator Initiated Study	01/08/2023	01/08/2026	300,000
Baoqi Fan	Clinical Utility of Anti-islet Autoantibodies and their Seroconversion in the Detection of Autoimmune Diabetes in Chinese	Health Bureau – Health and Medical Research Fund	18/09/2023	17/09/2025	934,000

Publications

A. Journal Papers

1. Zhang Y, Wu H, Yang A, Y.H. Ng N, Zhang X, Lau ESH, Chow EWK, Kong APS, Chow EYK, Chan JCN, Luk AOY, Ma RCW. Higher risk of incident diabetes among patients with primary hyperparathyroidism. *Clinical Endocrinology*. 2024;101(6):605-613. doi:10.1111/cen.15118.

2. Zhang Y, Tam CHT, Lau ESH, Ng NYH, Yang A, Fan B, Wu H, Lim CKP, Chow EYK, Luk AOY, Kong APS, Tam WH, Chan JCN, Ma RCW. The relationship of changes in insulin demand and insulin adequacy over the life course. *Diabetologia*. 2024;68(3):526-536. doi:10.1007/s00125-024-06328-9/tables/2. (Epub ahead of print)

3. O CK, Fan B, Tsoi STF, Tam CHT, Wan R, Lau ESH, Shi M, Lim CKP, Yu G, Ho JPY, Chow EYK, Kong APS, Ozaki R, So WY, Ma RCW, Luk AOY, Chan JCN. A polygenic risk score derived from common variants of monogenic diabetes genes is associated with young-onset type 2 diabetes and cardiovascular–kidney complications. *Diabetologia*. 2024;68(2):367-381. doi:10.1007/s00125-024-06320-3/tables/5. (Epub ahead of print)

4. Yu G, Tam CHT, Lim CKP, Shi M, Lau ESH, Ozaki R, Lee HM, Ng ACW, Hou Y, Fan B, Huang C, Wu H, Yang A, Cheung HM, Lee KF, Siu SC, Hui G, Tsang CC, Lau KP, Leung JYY, Cheung EYN, Tsang MW, Kam G, Lau IT, Li JKY, Yeung VTF, Lau E, Lo S, Fung S, Cheng YL, Szeto CC, Chow E, Kong APS, Tam WH, Luk AOY, Weedon MN, So WY, Chan JCN, Oram RA, Ma RCW. Type 2 diabetes pathway-specific polygenic risk scores elucidate heterogeneity in clinical presentation, disease progression and diabetic complications in 18,217 Chinese individuals with type 2 diabetes. *Diabetologia*. 2024;68(3):602-614. doi:10.1007/s00125-024-06309-y/figures/4. (Epub ahead of print)

5. Abou Zaki R, Ma RCW, El-Osta A. Epigenomic biomarkers of cardiometabolic disease: How far are we from daily practice? *Cardiovascular Diabetology*. 2024;23(1):1-5. doi:10.1186/s12933-024-02497-4/figures/1. (Epub ahead of print)

6. Ma RCW, Tam CHT, Hou Y, Lau ESH, Ozaki R, Lui JNM, Chow E, Kong APS, Huang C, Ng ACW, Fung EG, Luk AOY, So WY, Lim CKP, Chan JCN. NT-proBNP improves prediction of cardiorenal complications in type 2 diabetes: The Hong Kong diabetes biobank. *Diabetologia*. 2024;68(2):342-356. doi:10.1007/s00125-024-06299-x/tables/4. (Epub ahead of print)

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14. Tsoi KY, Chan RCM, Zhang C, Tam WH, Ma RCW. A randomized controlled trial to evaluate the effects of an early postnatal lifestyle modification program on diet, adiposity and metabolic outcome in mothers with gestational diabetes mellitus. *International Journal of Gynecology & Obstetrics*. 2024;166(3):1170-1182. doi:10.1002/ijgo.15521.

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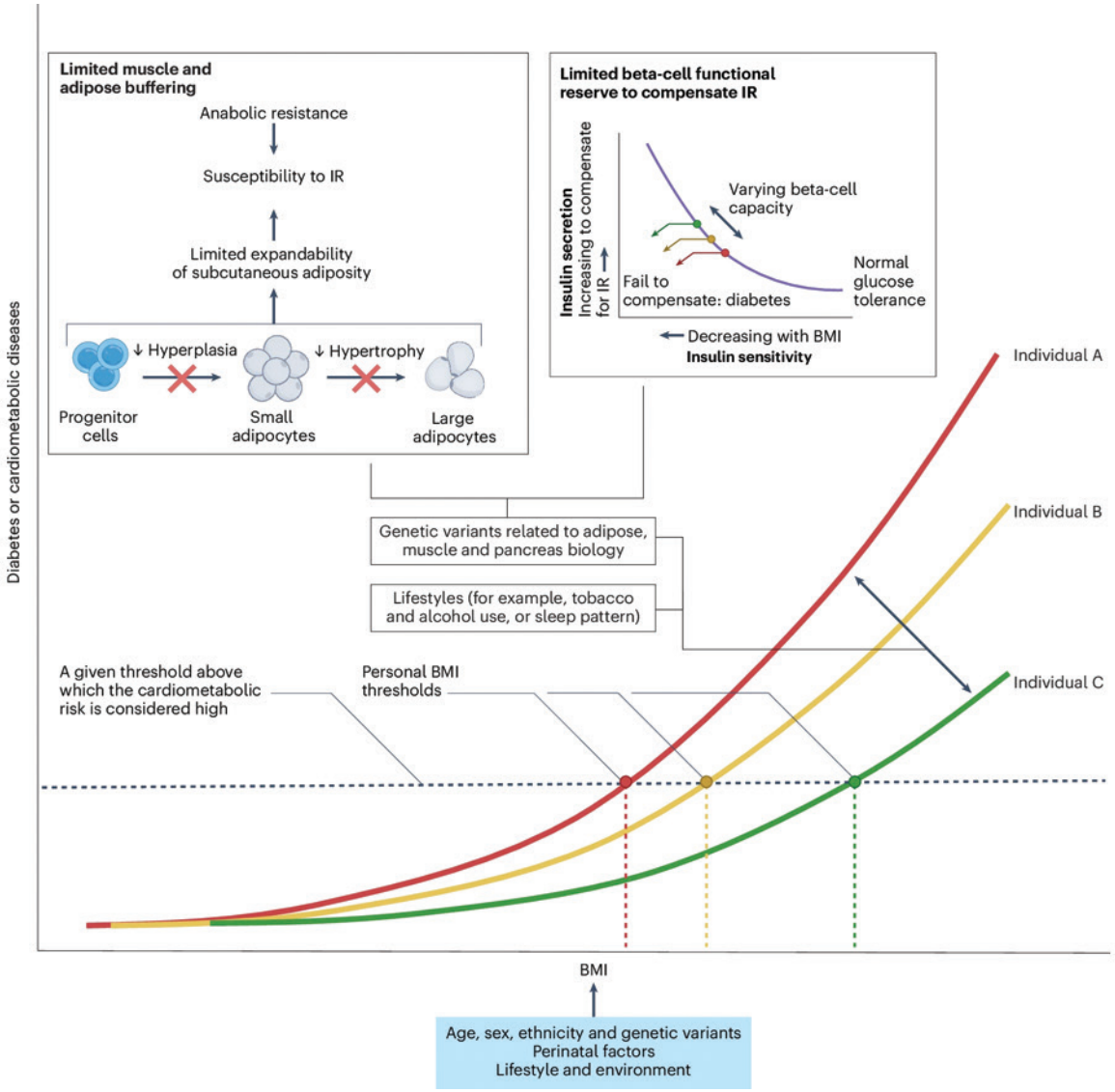
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Personalisation of optimal BMI for precision care. At a given BMI, individuals with higher anabolic resistance and limited expandability of subcutaneous adiposity are more susceptible to insulin resistance (IR). If pancreatic beta-cell functional reserve is limited and falls to increase insulin secretion and compensate for the increased insulin resistance, diabetes will occur. The genetic variants with significance in muscle, adipose and beta-cell biology could thus modulate the relationship between BMI and diabetes or cardiometabolic disease, along with further influences from lifestyles and the environment.

Source: O CK, Chan JCN. Insights into optimal BMI from the GlasVEGAS study. Nature Metabolism. 2024;6(8):1435-1437. doi:10.1038/s42255-024-01088-7.



Diabetes and Obesity
糖尿病與肥胖症研究

PRINCIPAL INVESTIGATOR | **Ronald Ma**

TEAM MEMBERS | Andrea Luk, Risa Ozaki, Wing Yee So, Hongjiang Wu, Cadmon Lim, Hoi Man Cheung, Claudia Tam, Raymond Wan, Guozhi Jiang, Mai Shi, Noel Ng, Kit Ying Tsoi, Eric Lau, Baoqi Fan, Chuiguo Huang, Vince Chan, Kelly Wong, Alex Ng, Atta Tsang, Chris Hui, Charmaine Lee, Yingnan Fan, Tsz Fung Tsoi, Xinge Zhang, Chun Hei Tam, Yingchai Zhang, Gechang Yu, Yuzhi Deng, Huishu Lin

Research Progress Summary

Epidemiology of Diabetes and Diabetes Complications in Asians

Ronald Ma and his research team have continued to generate novel insights on the epidemiology of diabetes and diabetic complications in Asians, to help inform formulation of strategies and policies to address this important public health burden. With previous support from the Theme-based Research Scheme (TRS) on Diabetes Complications and ongoing support from a Research Impact Fund (PC: Ronald Ma), they have charted the natural history of diabetic kidney disease and the progressive decline in renal function using various novel analytic approaches, including latent trajectory analysis. This work has highlighted the heterogeneity of decline in renal function and identified subgroups at particular risk of renal dysfunction. They are currently using proteomics, metabolomics and other omics approaches to identify predisposing factors and markers associated with rapid renal function decline and the development of diabetic kidney disease. The team has also conducted studies to examine sub-phenotype in diabetic kidney disease and the long-term impact of acute kidney injury on the progression of diabetic kidney disease. They have used big-data analytics to examine the epidemiology of diabetes complications based on population-based administrative data. Both Ronald and Andrea Luk were major contributors to the International Diabetes Federation (IDF) Diabetes Atlas, leading subgroups on type 1 diabetes in adults and young-onset diabetes, respectively. The systematic review on type 1 diabetes in adults was published in *Diabetes care*, and the data formed the basis of the newly launched *type 1 diabetes Index* (https://www.t1dindex.org/), the first comprehensive resource on the global burden of type 1 diabetes, in an international effort led by the Juvenile Diabetes Research Foundation (JDRF).

In work led by Andrea, the research team continues to use population-based data to provide novel insights into the epidemiology of diabetes and its complications in Asia. Recent advances include establishing the lifetime risk of diabetes among Chinese people with normoglycaemia and pre-diabetes (*PLOS Medicine* 2022), as well as the impact of age on diabetes-related complications and the impact of different drugs on diabetes outcomes. They have examined age-specific associations and population attributable fractions of risk factors for all-cause and cause-specific mortality in people with type 2 diabetes (*PLOS Medicine* 2023). Another major analysis undertaken established the hospital bed-days for a variety of medical conditions for people with or without diabetes, as well as highlighting the burden of mental health disorders for people diagnosed with diabetes at a young age (*PLOS Medicine* 2023). They are also examining the link between endocrine disorders and diabetes (*Clinical Endocrinology* 2024) and the long-term impact of gestational diabetes (*Journal of Diabetes Investigation* 2024).

Earlier work has also highlighted the burden of young-onset diabetes and conditions that predispose to young-onset diabetes. Having published one of the longest follow-up studies to investigate the impact of Polycystic Ovary Syndrome (PCOS) on the development of glucose intolerance and diabetes among young women, the team has been invited to contribute to co-lead a systematic review on this topic, as well as lead the related section in the recently completed 2023 International evidence-based guideline for the assessment and management of PCOS. Their work in this area has also extended to the long-term follow-up of cardiovascular complications and metabolic outcomes in women with PCOS and their offspring, as well as analyses based on population-based data. Recent work on the offspring of women with PCOS, led by Noel Ng and supported by a Health and Medical Research Fund, was selected by the Androgen Excess-PCOS Society for the Azziz-Baumgartner Family Early Career Investigator Award in 2022.

Genetics of Diabetes and Gestational Diabetes

Work from Ronald's group has contributed significantly to advancing the understanding of the genetic basis of type 2 diabetes. Together with colleagues across Asia, they have completed one of the largest genome-wide association studies (GWAS) for type 2 diabetes, and identified 61 novel loci for type 2 diabetes. This study has considerably expanded the number of genetic loci associated with type 2 diabetes in Asians, and would form the basis of future translation towards clinical prediction and care. The group contributed to one of the largest genetic studies of type 2 diabetes (*Nature* 2024). Furthermore, using pathway-specific polygenic risk scores developed in the project, they have utilised this to highlight the heterogeneity of diabetes. They are currently investigating the role of these markers in the development of glucose intolerance and other metabolic abnormalities among adolescents and children.

In a project supported by the Research Grants Council (RGC) – General Research Fund, Andrea completed an analysis to identify monogenic forms of diabetes among their cohort of patients with young-onset diabetes (*Diabetes/Metabolism Research and Reviews* 2024). This represents one of the largest studies on monogenic diabetes among Asian populations, and the work will provide complementary information on rare genetic variations that contribute to the heritability of diabetes in Asians, and help to advance precision medicine in diabetes.

Gestational diabetes has become a common major complication of pregnancy and has long-term adverse effects for the mother and offspring. In collaboration with Xilin Yang from Tianjin Medical University, China, the research team has conducted a meta-analysis of a genome-wide association study to identify novel genetic variants associated with gestational diabetes in the Chinese population (*Diabetes & Metabolism Journal* 2024), as well as search for metabolomic markers associated with Gestational Diabetes Mellitus (GDM).

Long-term Consequences of Gestational Diabetes and Related Biomarkers

In a long-term collaborative study together with Wing Hung Tam from the Department of Obstetrics and Gynaecology, the team has investigated the long-term health impact of gestational diabetes. This includes the long-term follow-up of a GDM mother-offspring cohort over more than 2 decades to follow their long-term progression to metabolic abnormalities as well as diabetes (supported by several RGC grants), and the multi-centre Hyperglycaemia and Adverse Pregnancy Outcome (HAPO) Follow Up Study. The latter has highlighted the long-term risk of diabetes among women with gestational diabetes, as well as the independent association between maternal GDM and offspring adiposity. To unravel the link between maternal hyperglycaemia and offspring metabolic abnormalities, in work supported by the RGC, they have applied epigenomic profiling to identify methylation changes to offspring DNA following exposure to maternal hyperglycaemia, which has identified novel methylation markers for GDM. They have recently completed a long-term follow-up study in offspring of mothers with GDM as they now enter adulthood, to evaluate their metabolic

profile as well as skeletal health. The recognition of the long-term risks of mothers with GDM and their offspring has led to the completion of an interventional study to evaluate how to reduce this risk of future diabetes (*International Journal of Gynecology & Obstetrics* 2024), and they have incorporated some elements of the intervention into tools to facilitate scaling up such efforts. This earlier research has supported the development of a new large-scale project supported by the RGC Area of Excellence Scheme.

Genetic and Novel Biomarkers of Diabetes Complications

In work supported by the Research Grants Council – Theme-based Research Scheme (TRS), Ronald's team has completed one of the largest genome-wide association studies for diabetes complications globally, and identified a number of genomic regions associated with diabetic kidney disease in Asians. In addition, through the TRS, they have established the multi-centre Hong Kong Diabetes Biobank (HKDB), which forms a unique dataset with detailed clinical phenotyping, multi-omics profiling and long-term follow-up which would serve to advance future epidemiology research as well as biomarker discovery. Ongoing work includes investigating the biological mechanisms whereby the new genes impact on development of diabetes complications, with views to develop novel treatments to target diabetes complications. With support from the Research Grants Council – Research Impact Fund, they are continuing their work on biomarkers for diabetes complications, and have expanded that effort to incorporate methylation and metabolomic profiling to integrate into their multi-omics analyses to obtain a better picture of key disease pathways. Their GWAS for coronary heart disease (CHD) risk in type 2 diabetes has identified a novel variant associated with the risk of CHD in diabetes, with novel insights on risk factors control (*Diabetes Care* 2023). They have developed novel methylation signatures for diabetic kidney disease, providing new strategies to identify those at risk of kidney failure (*Nature Communications* 2023). They have identified metabolomics markers linked to increased cardiovascular risk in individuals with diabetic kidney disease (*Diabetologia* 2024), as well as highlighted the clinical utility of NT-proBNP for cardiorenal complications in diabetes (*Diabetologia* 2024).

Precision Medicine in Diabetes

Through support from the RGC – Research Impact Fund and the Croucher Foundation, the team aims to bring some of the discoveries generated from their work to translate to the bedside to impact clinical care. This includes incorporating their biomarkers into the clinical management of patients with diabetes, development of various polygenic risk scores, as well as pharmacogenomics studies to stratify patients based on treatment response for better selection of glucose-lowering and other treatments. Leveraging large-scale genetic meta-analyses and genetic variants related to underlying pathophysiology, they have developed pathway-specific polygenic risk scores and highlighted their potential utility in precision medicine. In collaboration with colleagues in China, they have developed genetic risk scores for stratifying risk of type 1 diabetes in Chinese. Their group has played a major role in the recent global initiative on precision medicine in diabetes, including leading a systematic review of biomarkers for predicting diabetes cardiovascular complications (*Communications Medicine* 2024) (*Nature Medicine* 2023). This series of work will deliver tools that can facilitate personalised treatment of people with diabetes, and hopefully improve long-term outcome.

COVID-19 and Diabetes

During the pandemic, COVID-19 has impacted every aspect of daily life. People with diabetes have increased susceptibilities to COVID-19 and adverse outcomes following COVID-19 infections. The research group has been conducting epidemiological analyses relating to diabetes and COVID-19, including the impact of diabetes treatments on outcomes, as well as genetic studies relating to adverse outcomes in COVID-19. Given the increasing focus on the roles of hyperglycaemia and infections, they have contributed to a major review article on the topic (*Diabetologia* 2024).

Much of their research is highly multidisciplinary and collaborative, with ongoing collaborations with more than 20 research groups across the world.

Research and Scholarship

Research Awards and Recognitions

Name	Details	
	Award	Organisation
Endocrine and Diabetes Team in The Chinese University of Hong Kong	Number 1 in Asia for Endocrinology and Metabolism 2022-2024	U.S. News Best Global Universities Rankings
Ronald Ma Andrea Luk Alice Kong Juliana Chan Elaine Chow	Research Grants Council – Areas of Excellence	University Grants Committee
Ronald Ma Kevin Yup Kelly Li Cadmon Lim	Silver Medal	49th International Convention of Inventions Geneva
Ronald Ma Juliana Chan Wing Yee So Cadmon Lim	Silver Medal	49th International Convention of Inventions Geneva
Ronald Ma	Top Cited Paper	Quantitation of plasma angiotensin II in healthy Chinese subjects by a validated liquid chromatography tandem mass spectrometry method in journal *Biomedical Chromatography*

Fellowships

Name	Details	
	Fellowship	Organisation
Ronald Ma	Nominated Committee Member	Human Phenome Consortium of China
	Plenary Lecture	National Diabetes Institute, Malaysia Diabetes Asia 2024
	Plenary Lecture	Korean Diabetes Association 14th International Congress of Diabetes and Metabolism
Yingchai Zhang	Robert Turner Clinical Research Course	EASD and Oxford Centre for Diabetes, Endocrinology and Metabolism
Yingchai Zhang Yuzhi Deng	Selected to attend the Cambridge Diabetes Seminar	MRC Epidemiology Unit, University of Cambridge
Gechang Yu Yingchai Zhang Yuzhi Deng	Travel Grant	European Association for the Study of Diabetes 2024 meeting
Yingchai Zhang	T1D Fellow Program with Travel Grant	Endocrine Society, USA
Kit Ying Tsoi	Postdoctoral Fellowship	Faculty of Medicine, The Chinese University of Hong Kong

Fellowships

Name	Details	
	Fellowship	Organisation
Chuiguo Huang	Postdoctoral Fellowship	Research Committee, The Chinese University of Hong Kong
Yingchai Zhang	Vice-Chancellor's PhD Scholarship	The Chinese University of Hong Kong
Yuzhi Deng	Hong Kong PhD Fellowship	Research Grants Council

Academic Editorships

Name	Details	
	Role	Journal
Ronald Ma	Expert Editor	Journal of Diabetes Investigation
	Member of Editorial Board	PLOS Medicine
		Obesity Reviews
		Diabetes
		Diabetologia
		Maternal-Fetal Medicine
Andrea Luk	Associate Editor	Diabetic Medicine
	Member of Editorial Board	Diabetes Care

Reviewers of Journal / Conference

Name	Details	
	Role	Journal / Conference
Ronald Ma	Reviewer	Cell Metabolism
		PLOS Medicine
		BMJ
		Diabetes Care
		Diabetologia
		Diabetes
		Diabetic Medicine
		Journal of Diabetes Investigation
		Diabetes/ Metabolism Research and Reviews
		Diabetes Research and Clinical Practice
		Journal of Clinical Endocrinology and Metabolism
		Journal of the American College of Cardiology

Reviewers of Journal / Conference

Name	Details	
	Role	Journal / Conference
Ronald Ma	Reviewer	Circulation Genome Medicine
		American Journal of Clinical Nutrition
		Obesity Reviews
		Obesity
		International Journal of Obesity
Andrea Luk	Reviewer	Diabetes Care
		Diabetologia
		Diabetic Medicine
		Diabetes
		Obesity and Metabolism
		Journal of Diabetes
		Diabetes/Metabolism Research and Reviews
		Diabetes Research and Clinical Practice
		Cardiovascular Diabetology
		Journal of Clinical Endocrinology and Metabolism
		Lancet Regional Health - Western Pacific

Grants and Consultancies

Name	Project Title	Funding Source	Start Date (dd/mm/yyyy)	End Date (dd/mm/yyyy)	Amount (HK$)
Ronald Ma	Clinical Utility of Lipoprotein(A) and Its Related Polygenic Risk Score in Risk Stratification of Cardiovascular Complications among Chinese Patients with Type 2 Diabetes	Health Bureau – Health and Medical Research Fund	01/05/2024	31/10/2026	1,500,000
	Single-cell Multi-omics Study of Atherosclerotic Vascular Disease: Narrowing the Gap Between Bench and Bedside	Research Grants Council – Theme-based Research Scheme	01/01/2024	31/12/2028	1,800,000

Grants and Consultancies

Name	Project Title	Funding Source	Start Date (dd/mm/yyyy)	End Date (dd/mm/yyyy)	Amount (HK$)
Ronald Ma	Single-cell Multi-omics Study of Atherosclerotic Vascular Disease: Narrowing the Gap Between Bench and Bedside	The Chinese University of Hong Kong – Theme-based Research Scheme Matching Fund	01/01/2024	31/12/2028	200,000
	S.H.Ho Professor of Diabetes	The Chinese University of Hong Kong	01/05/2023		Amount not to be disclosed
	Developing an e-Health Platform to Improve Maternal Health and Reducing Long-term Risk of Chronic Diseases for Women with Gestational Diabetes	The Chinese University of Hong Kong – Knowledge Transfer Project Fund	01/04/2023	31/05/2025	400,000
	Improving Diabetes Care for Young Patients	Hong Kong Jockey Club Charities Trust	01/07/2023	30/06/2027	10,900,000
	A Nanotechnology Platform For Profiling Diabetes-related MiRNA For Precision Medicine	Innovation and Technology Commission – Midstream Research Programme for Universities	01/06/2021	31/05/2024	5,998,400
	A Nanotechnology Platform for Profiling Diabetes-related MiRNA for Precision Medicine	Innovation and Technology Commission – Innovation and Technology Fund Research Talent Hub	01/06/2021	31/05/2024	1,388,000
	A Nanotechnology Platform for Profiling Diabetes-related MiRNA for Precision Medicine	Innovation and Technology Commission – Innovation and Technology Fund Research Talent Hub	12/08/2022	31/05/2024	438,493.54
	A Nanotechnology Platform for Profiling Diabetes-related MiRNA for Precision Medicine	Innovation and Technology Commission – Innovation and Technology Fund Research Talent Hub	15/11/2022	31/05/2024	438,060

Grants and Consultancies

Name	Project Title	Funding Source	Start Date (dd/mm/yyyy)	End Date (dd/mm/yyyy)	Amount (HK$)
Ronald Ma	A Nanotechnology Platform for Profiling Diabetes-related MiRNA for Precision Medicine	Innovation and Technology Commission – Innovation and Technology Fund Research Talent Hub	04/05/2023	31/05/2024	600,145.16
	Translating Multi-omic Discoveries to Transform Diabetes Care and Reduce Diabetic Complications	Research Grants Council – Research Impact Fund	01/05/2019	30/04/2024	8,400,000
	Translating Multi-omic Discoveries to Transform Diabetes Care and Reduce Diabetic Complications	The Chinese University of Hong Kong Research Committee – Research Impact Matching Fund	01/05/2019	30/04/2024	3,401,550
	Translating Multi-omic Discoveries to Transform Diabetes Care and Reduce Diabetic Complications	The Chinese University of Hong Kong Research Committee – Funding for Research Sustainability of Major Research Grants Council Funding Schemes	27/05/2019	30/04/2024	500,000
	Genomic Medicine in Diabetic Kidney Disease	University Grants Committee – Research Matching Grant Scheme	01/06/2020	31/12/2026	3,579,544
	Precision Medicine in Diabetes	University Grants Committee – Research Matching Grant Scheme	10/12/2021	9/12/2024	520,762.27
	A Phase 3b, Randomized, Double-blind, Placebo-controlled Study to Evaluate the Efficacy and Safety of TRC101 in Delaying Chronic Kidney Disease Progression in Subjects with Metabolic Acidosis	Tricida Inc	01/04/2019	31/12/2024	1,605,460
	Semaglutide Cardiovascular Outcomes Trial in Patients with Type 2 Diabetes (SOUL)	Novo Nordisk Hong Kong Limited	29/08/2019	29/07/2024	9,424,000

Grants and Consultancies

Name	Project Title	Funding Source	Start Date (dd/mm/yyyy)	End Date (dd/mm/yyyy)	Amount (HK$)
Ronald Ma	FAME 1 EYE - The Fenofibrate and Microvascular Events in Type 1 Diabetes Eye. A Randomised Trial to Evaluate the Efficacy on Retinopathy and Safety of Fenofibrate in Adults with Type 1 Diabetes; A Multicenter Double-Blind Placebo-Controlled Study in Australia and Internationally	University of Sydney	01/08/2019	31/12/2024	348,160
	Effect and Safety of Semaglutide 2.4mg Once -weekly on Weight Management in Subjects with Overweight or Obesity	Novo Nordisk Hong Kong Limited	08/12/2020	31/12/2024	2,309,170
	Translating Multi-omics Analyses for Precision Medicine in Diabetes	The Chinese University of Hong Kong Research Committee –- Postdoctoral Fellowship Scheme	12/05/2022	30/04/2026	750,000
	Metformin as a Neuroprotective Therapy for Glaucoma - a Randomized Controlled Trial	Research Grants Council – General Research Fund	01/01/2022	31/12/2024	1,160,564
Ronald Ma Andrea Luk	Precision Medicine to Redefine Insulin Secretion and Monogenic Diabetes (PRISM) in Chinese Patients with Young Onset Diabetes	Health Bureau – Health and Medical Research Fund	01/09/2019	31/08/2024	8,457,718
Noel Ng	Evaluation of the Long-Term Healthcare Impact of Polycystic Ovary Syndrome	Health Bureau – Health and Medical Research Fund	01/10/2021	31/03/2024	1,304,136

Grants and Consultancies

Name	Project Title	Funding Source	Start Date (dd/mm/yyyy)	End Date (dd/mm/yyyy)	Amount (HK$)
Andrea Luk	A Pilot Program to Establish a Laboratory Service Hub for Multi-National Clinical Trials (396203964) sponsored by Teddy Clinical Research Laboratory (Hong Kong) Limited	Teddy Clinical Research Laboratory (Hong Kong) Limited	01/06/2023	30/09/2024	1,104,000
	A Phase 2 Randomized, Placebo-controlled, Double-blind, Dose-ranging Study to Evaluate the Efficacy, Safety and Tolerability of AMG 133 in Adult Subjects with Overweight or Obesity, With or Without Type 2 Diabetes Mellitus	Amgen Asia Holding Ltd	01/06/2023	31/05/2026	1,322,633
	A Phase 3 Randomized, Placebo-Controlled Clinical Study to Evaluate the Efficacy and Safety of MK 0616 in Reducing Major Adverse Cardiovascular Events in Participants at High Cardiovascular Risk	Merck Sharp & Dohme (Asia) Ltd	01/12/2023	30/06/2030	4,057,618
	Prevention and precision care programme for young onset diabetes	Hong Kong Jockey Club Charity Trust	01/02/2024	31/01/2028	50,000,000
	Impact of Diabetes-Related Complications on Long-term Temporal Hospital Costs and Quality of Life in Patients with Young-Onset Diabetes in Hong Kong: A 12-Year Study	Research Grants Council – General Research Fund	01/01/2024	31/08/2025	573,333

Grants and Consultancies

Name	Project Title	Funding Source	Start Date (dd/mm/yyyy)	End Date (dd/mm/yyyy)	Amount (HK$)
Andrea Luk	Using Clinical-Trials and Simulation-Models to Estimate Cost-effectiveness of Nonsteroidal Mineralocorticoid Antagonists, RASi, SGLT2i as Triple Therapy in Patients with Type 2 Diabetes and Chronic Kidney Disease	Health Bureau – Health and Medical Research Fund	01/12/2023	31/07/2026	1,351,997
	Modelling the Impact and Costs of Primary Care and Hypertension Outcomes in Hong Kong	Health Bureau – Health and Medical Research Fund	01/01/2024	31/12/2025	1,460,000
	Clinical Safety, Efficacy and Multiomic Evaluation of a Novel Chinese Medicine (CM) Formula in Type 2 Diabetes (T2D) : Effects on Beta-Cell Function and Insulin Resistance	Innovation and Technology Commission – Innovation and Technology Support Programme	01/06/2022	31/05/2025	4,966,735
	Innovative Diagnosis and Treatment for Shrimp Allergy	The Chinese University of Hong Kong - Research Committee – Research Impact Matching Fund	01/06/2020	31/05/2025	8,397,098
	Commissioned Programme on Early Phase Testing of Novel Pharmaceutical Products in the Phase 1 Clinical Trial Centre, The Chinese University of Hong Kong	Health Bureau – Health and Medical Research Fund	02/05/2019	01/05/2024	50,000,000

Grants and Consultancies

Name	Project Title	Funding Source	Start Date (dd/mm/yyyy)	End Date (dd/mm/yyyy)	Amount (HK$)
Andrea Luk	Effect of Glucagon-like Peptide 1 Receptor Agonist in Combination with Insulin on Glycaemic Variability and Time-in-range in Diabetic Kidney Disease: A Randomised Controlled Trial	Health Bureau – Health and Medical Research Fund	03/01/2022	02/01/2025	1,361,740
	Clinical Utility of Anti-islet Autoantibodies and Their Seroconversion in the Detection of Autoimmune Diabetes in Chinese	Health Bureau – Health and Medical Research Fund	18/09/2023	17/09/2025	934,000

Publications

A. Journal Papers

1. Ahmad A, Lim LL, Morieri ML, Tam CH, Cheng F, Chikowore T, Dudenhöffer-Pfeifer M, Fitipaldi H, Huang C, Kanbour S, Sarkar S, Koivula RW, Motala AA, Tye SC, Yu G, Zhang Y, Provenzano M, Sherifali D, de Souza RJ, Tobias DK, ADA/EASD PMDI, Gomez MF, Ma RCW, Mathioudakis N. Precision prognostics for cardiovascular disease in type 2 diabetes: A systematic review and meta-analysis. *Communications Medicine*. 2024;4(1):1-28. doi:10.1038/s43856-023-00429-z.
2. Wu H, Yang A, Lau ESH, Zhang X, Fan B, Ma RCW, Kong APS, Chow E, So WY, Chan JCN, Luk AOY. 1-year weight change after diabetes diagnosis and long-term incidence and sustainability of remission of type 2 diabetes in real-world settings in Hong Kong: An observational cohort study. *PLOS Medicine*. 2024;21(1):e1004327. doi:10.1371/journal.pmed.1004327.
3. Mu Y, Bao X, Eliaschewitz FG, Hansen MR, Kim BT, Koroleva A, Ma RCW, Yang T, Zu N, Liu M. Efficacy and safety of once weekly semaglutide 2.4 mg for weight management in a predominantly east Asian population with overweight or obesity (STEP 7): A double-blind, multicentre, randomised controlled trial. *The Lancet Diabetes & Endocrinology*. 2024;12(3):184-195. doi:10.1016/s2213-8587(23)00388-1.
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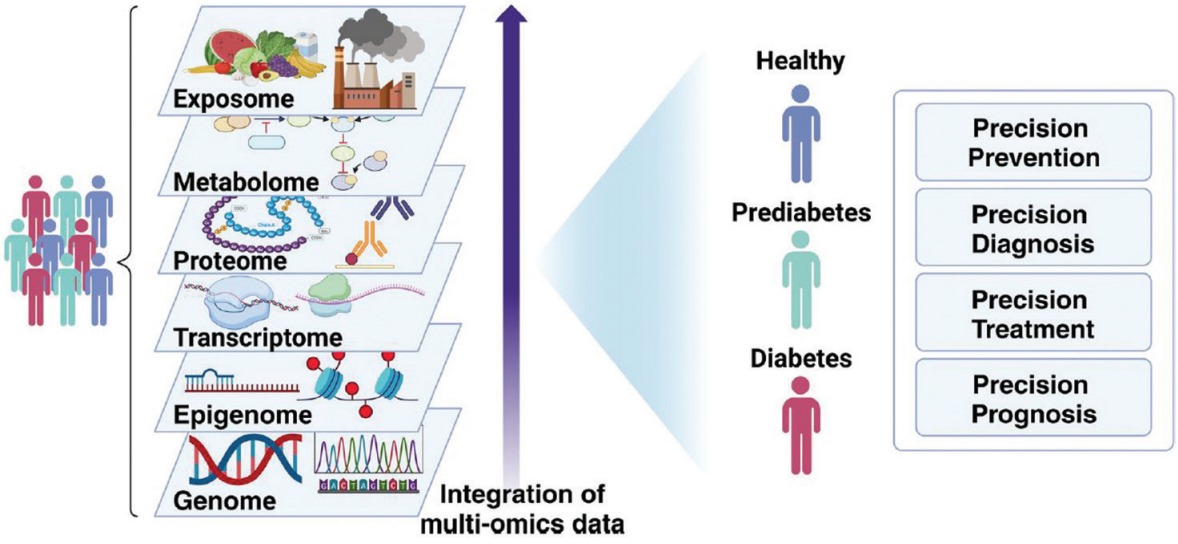
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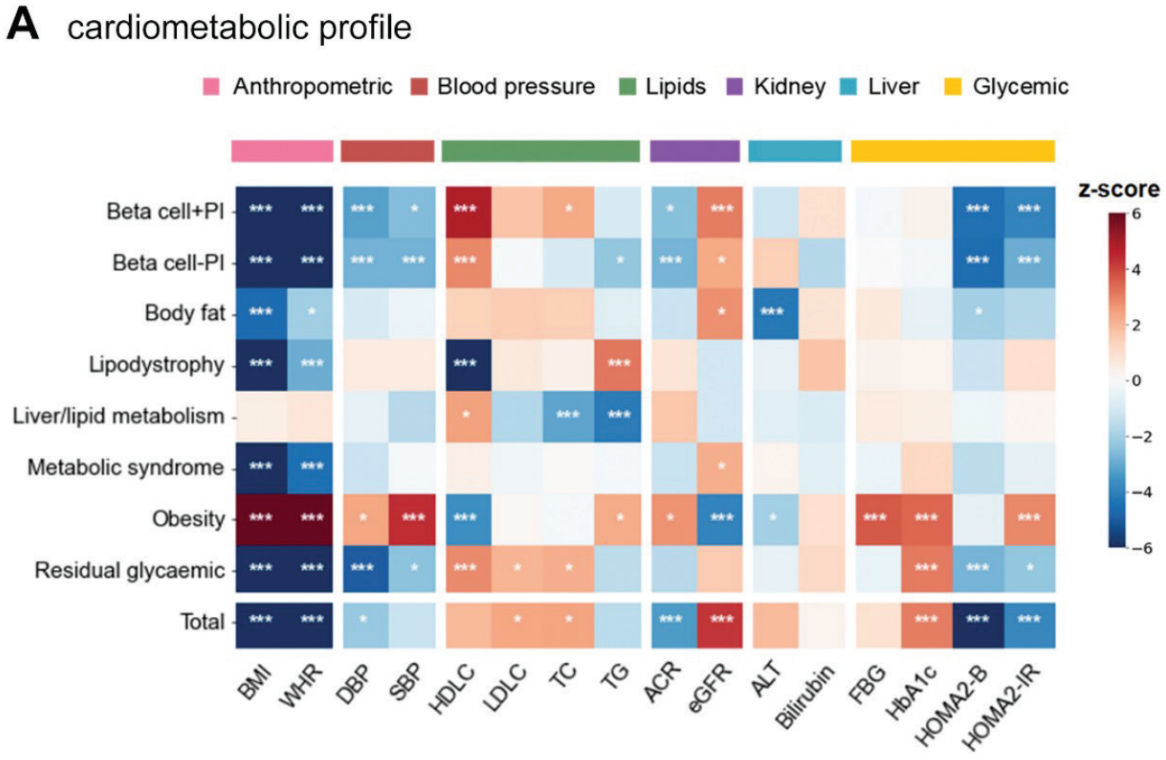
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Overall summary of multi-omics discovery for precision medicine in diabetes

Source: Yu G, Tam HCH, Huang C, Shi M, Lim CKP, Chan JCN, Ma RCW. Lessons and applications of omics research in diabetes epidemiology. Current Diabetes Reports. 2024;24(3):27-44. doi:10.1007/s11892-024-01533-7. (Review)



Pathway-specific polygenic risk scores and clinical implications

Source: Yu G, Tam CHT, Lim CKP, Shi M, Lau ESH, Ozaki R, Lee HM, Ng ACW, Hou Y, Fan B, Huang C, Wu H, Yang A, Cheung HM, Lee KF, Siu SC, Hui G, Tsang CC, Lau KP, Leung JYY, Cheung EYN, Tsang MW, Kam G, Lau IT, Li JKY, Yeung VTF, Lau E, Lo S, Fung S, Cheng YL, Szeto CC, Chow E, Kong APS, Tam WH, Luk AOY, Weedon MN, So WY, Chan JCN, Oram RA, Ma RCW. Type 2 diabetes pathway-specific polygenic risk scores elucidate heterogeneity in clinical presentation, disease progression and diabetic complications in 18,217 Chinese individuals with type 2 diabetes. Diabetologia. 2024;68(3):602-614. doi:10.1007/s00125-024-06309-y.



Neuroscience and Neurotechnology
神經科學及神經技術

PRINCIPAL INVESTIGATOR | **Owen Ko**

TEAM MEMBERS | Danny Chan, Roy Chan, Junzhe Huang, Dorothy Ieong, Bonaventure Ip, Andrew Kwok, Phil Xie, Nenghan Lin, Samuel Sy, Alice Tung, Derek Wang, Manyu Wang, Felicia Wong, Peng Xiao, Isabel Xiong, Leo Yan, Jenny Zhang, Panwu Zhao, Sasa Yuen, Erin Chan, Jasamine Lau

Research Progress Summary

Gliovascular Dysfunction in Ageing and Neurodegeneration

Owen Ko and his team study how ageing and neurodegenerative disease-related genetic mutations cause gliovascular dysfunction in the brain and drive neuropathological changes. Through understanding the underlying pathogenesis, the team focuses on using this knowledge to guide the testing and development of disease-modifying therapeutics. An exemplary outcome of their basic science research is the identification of glucagon-like peptide-1 receptor (GLP-1R) agonists as potential treatments to modify the disease course of age-related vasculopathy. This has led to collaborations with clinical colleagues and the initiation of an ongoing phase II trial (GAPP-SVD trial, NCT05356104) to test the efficacy of a GLP-1R agonist in the treatment of cerebral small vessel disease (cSVD), which is the second commonest cause of dementia and the most frequent neurological co-morbidity with Alzheimer's disease, and accounts for one-fourth of stroke. In recent interim analysis, the team made exciting preliminary discoveries on the potential efficacies of GLP-1RA use in cSVD, and they are now working towards confirming and completing the trial, and publishing their findings, while also planning to launch the next phase III trial.

In addition, their recent laboratory work showed that GLP-1R agonism is a potent method for mitigating age-related functional and molecular changes throughout the body in mice, notably via a brain-body axis, and rivals mTOR inhibition in efficacy (manuscript submitted, US/PCT patent application filed). These findings advance the understanding of how GLP-1 analogues exert their diverse effects in age-related diseases, providing crucial insights for expanding clinical applications, designing new clinical trials, and developing next-generation therapeutics targeting this signalling axis. Building upon this foundation, the team is conducting further mechanistic studies and developing new experimental therapeutics.

Under this research theme, they have successfully acquired new funding support and recognition over the past two years. These include an inaugural Asian Young Scientist Fellowship (AYSF) from the Future Science Awards Foundation, research grants from the Research Grants Council and the Innovation and Technology Fund, and numerous invited lectures at prestigious venues, including the Annual conference of the AYSF, the 10th Singapore International Parkinson Disease and Movement Disorders Symposium, the 1st Greater Bay Area Life and Health Science Forum, the 5th Oujiang International Forum on Alzheimer's Disease, as well as seminars at several first-tier universities, including Peking University and Sun Yat-Sen University.

Development of Tools for Translational Neuroscience and Neurology

Recognising that methodological limitations often create bottlenecks in brain disorder investigations and clinical diagnostics, the team develops advanced imaging tools for both preclinical studies and clinical applications. They concentrate on two key areas: (i) high-throughput, three-dimensional neuronal activity and molecular profiling in the brain, and (ii) deployable clinical diagnostics that enhance the management of neurological disorders. Their aim is to not only empower their own investigations into brain functions and dysfunction but also benefit other fields within the biomedical sciences. The team's recent achievements include the development of an optofluidic system for assaying whole-brain chemosensory responses (Sy et al., *Nature Communications*, 2023) and the publication of a comprehensive review outlining technical approaches and future directions for volumetric histology (Yau et al., *Cell Reports Methods*, 2023).

Currently, they are advancing (i) high-throughput brain-wide imaging platforms for studying sensorimotor integration in healthy animals and disease models, (ii) machine learning-enhanced image processing algorithms for brain perfusion analysis to enhance their capability to optimise treatment plans and predict clinical outcomes for stroke patients, and (iii) deep learning-based MRI brain analysis algorithms for Alzheimer's dementia biological staging that emphasise generalisability across variable imaging acquisition settings. These developments complement their research on pathogenesis and therapeutics for age-related neurovascular and neurodegenerative diseases. Some of these works, such as the optofluidic platform, have been presented at invited lectures at the 16th Annual Meeting of Chinese Neuroscience Society & the 2nd China-Japan-Korea International Meeting, and the Brain on Chips Symposium at Technical University of Braunschweig, Germany.

Other Collaborations

The team maintains wide collaborations with other basic science and clinical research teams on several projects. These include (i) a preclinical study reporting how cranial bone maneuver modulates Alzheimer's pathology via enhanced meningeal lymphatic drainage in collaboration with Gang Li from The Chinese University of Hong Kong (CUHK), now Shenzhen Institute of Advanced Technology SIAT) (Lu et al., *Alzheimer's and Dementia*, accepted; co-corresponding author), (ii) a clinical study that established the role of combining machine learning & MRI-based approaches with blood biomarkers for the diagnosis of Alzheimer's disease pathology (Cai et al., *Alzheimer's and Dementia*, 2023; co-corresponding author) in collaboration with Vincent Mok (CUHK), (iii) ongoing development of a computed tomography perfusion (CTP) imaging analysis method for the clinical prognostication of acute ischemic stroke patients in collaboration with Bonaventure Ip (CUHK), and (iv) modelling of brain pathology with 3D-printed neural tissues in collaboration with Francis Szele and Linna Zhou (Oxford).

Research and Scholarship

Research Awards and Recognitions

Name	Details	
	Award	Organisation
Owen Ko	Outstanding Alumni Award	The London Ball Foundation

Fellowships

Name	Details	
	Fellowship	Organisation
Owen Ko	Life Science Fellow (2023-2025)	Asian Young Scientist Fellowship, Future Science Awards Foundation

Academic Editorships

Name	Details	
	Role	Journal
Owen Ko	Editorial Board Member and Associate Editor	BMC Biology

Reviewers of Journal / Conference

Name	Details	
	Role	Journal / Conference
Owen Ko	Reviewer	Science Translational Medicine
		Nature Communications
		Neuron

Grants and Consultancies

Name	Project Title	Funding Source	Start Date (dd/mm/yyyy)	End Date (dd/mm/yyyy)	Amount (HK$)
Owen Ko	Research Grant for Awardees of Asian Young Scientist Fellowship	Future Science Awards Foundation – Asian Young Scientist Fellowship	01/12/2023	30/11/2025	780,000
	Mechanisms of Cognitive Aging Repair via Targeting GLP-1 Signaling	Research Grants Council – General Research Fund	01/01/2023	31/12/2025	1,155,631

Grants and Consultancies

Name	Project Title	Funding Source	Start Date (dd/mm/yyyy)	End Date (dd/mm/yyyy)	Amount (HK$)
Owen Ko	Development and Preclinical Test of Optical Pumping-based Hyperpolarized Carbon-13 Magnetic Resonance Spectroscopic Imaging for Diagnosis of Neurological Diseases	Innovation and Technology Commission – Innovation and Technology Fund Partnership Research Programme	01/12/2022	30/11/2025	3,921,592
	Anti-aging Effects of GLP-1R Agonism and Companion Non-invasive Diagnostics	National Natural Science Foundation of China – Excellent Young Scientists Fund (Hong Kong and Macau)	01/01/2021	31/12/2024	2,400,000
	Investigating Neurovascular and Astrocyte Dysfunction in Neurodegenerative Diseases	Croucher Foundation – Croucher Innovation Awards	01/07/2020	30/06/2025	5,000,000
	Novel MRI-based Machine Learning Tool to Detect Mild Cognitive Impairment Associated with Alzheimer's Disease	Health Bureau – Health and Medical Research fund	05/02/2022	04/02/2024	911,140
	Optogenetic Neuromodulation of Brian-wide Resting-state fMRI Networks and Functions	Research Grants Council – Collaborative Research Fund	01/03/2024	28/02/2027	8,500,000
	Establisment of Spatial Multi-Omics Core Facility	Research Grants Council – Collaborative Research Fund	30/06/2023	29/06/2026	4,000,000
	Unveiling Neural Activities Through Spatiotemporally Optimized Multiphoton (STOMP) Microscopy	Research Grants Council – Collaborative Research Fund	01/04/2022	31/03/2025	7,883,046

Grants and Consultancies

Name	Project Title	Funding Source	Start Date (dd/mm/yyyy)	End Date (dd/mm/yyyy)	Amount (HK$)
Owen Ko	Multi-modal Approaches to Determine Digital Clinical Phenotyping, Novel Proteomic Biomakers, and Microbiota-host Responses of REM Sleep Behavior Disorder, A Prodromal Stage of Alpha-synucleinopathy Neurodegeneration, in a Prospective Family Court	Research Grants Council – Collaborative Research Fund for 2021/22 One-off CRF Coronavirus Disease and Novel Infectious Disease	01/04/2022	31/03/2025	7,214,620
	Cellular Mechanisms of Synaptic Functions and Plasticity in Health and Neurodegenerative Diseases	Research Grants Council – Area of Excellence Scheme	01/06/2019	31/05/2025	77,516,000
	Accelerated, Ultra-Multiplexed, Signal-amplified 3D Immunofluorescence	Innovation and Technology Commission – Innovation and Technology Support Programme	01/10/2022	31/03/2024	1,398,584

Publications

A. Journal Papers

1. Chan VTT, Ran AR, Wagner SK, Hui HYH, Hu X, Ko H, Fekrat S, Wang Y, Lee CS, Young AL, Tham CC, Tham YC, Keane PA, Milea D, Chen C, Wong TY, Mok VCT, Cheung CY. Value proposition of retinal imaging in Alzheimer's disease screening: A review of eight evolving trends. *Progress in Retinal and Eye Research*. 2024;103. doi:10.1016/j.preteyeres.2024.101290. (Review)
2. Ip B, Yip T, Hung T, Yam TF, Yeung C, Ko H, Wong G, Leng X, Mok V, Soo Y, Seiffge D, Shoamanesh A, Leung T. Lipid control and stroke risk in atrial fibrillation patients treated with direct oral anticoagulants and statins. *European Stroke Journal*. Published online 2024. doi:10.1177/23969873241272530.
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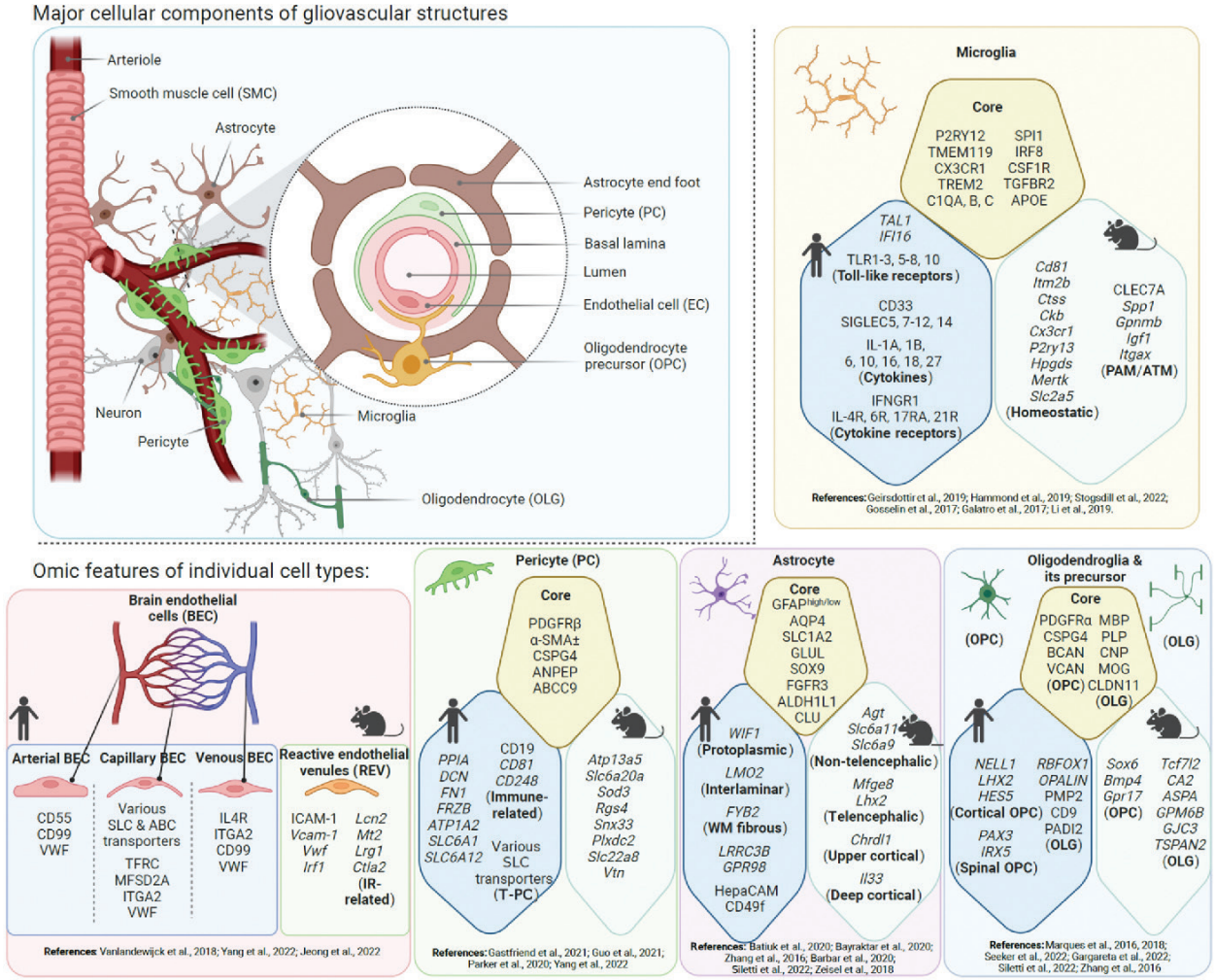
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8. Ip B, Pan S, Yuan Z, Hung T, Ko H, Leng X, Liu Y, Li S, Lee SY, Cheng C, Chan H, Mok V, Soo Y, Wu X, Lui LT, Chan R, Abrigo J, Dou Q, Seiffge D, Leung T. Prothrombin complex concentrate vs conservative management in ICH associated with direct oral anticoagulants. *JAMA Network Open*. Published online 2024. doi:10.1001/jamanetworkopen.2023.54916.

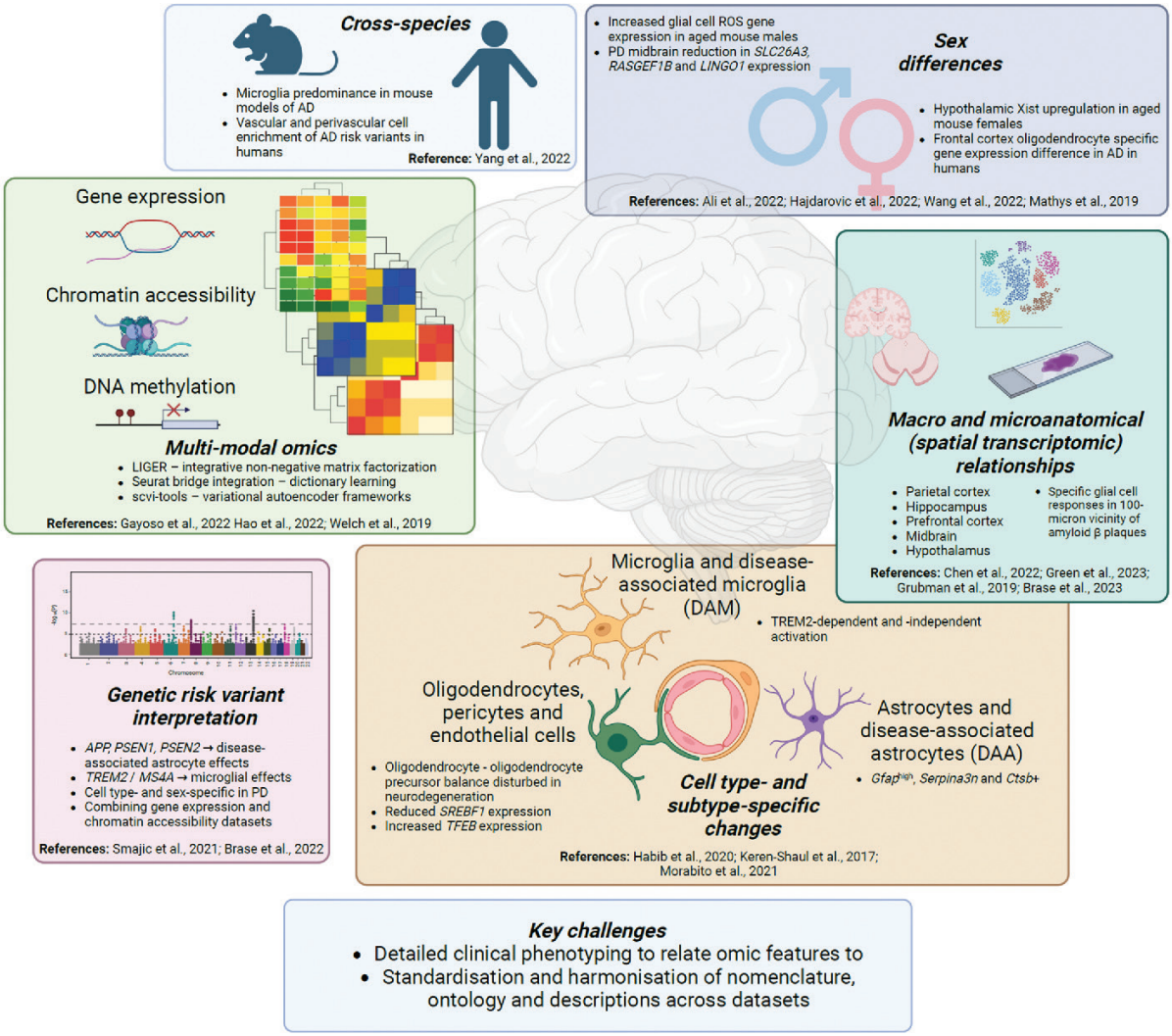
9. Kam NW, Lo AWI, Hung DTY, Ko H, Wu KC, Kwong DLW, Lam KO, Leung TW, Che CM, Lee VHF. Shift in tissue-specific immune niches and CD137 expression in tuberculoma of pembrolizumab-treated nasopharyngeal carcinoma patients. *Cancers*. 2024;16(2). doi:10.3390/cancers16020268.

10. Sy SKH, Ko H. Fish-on-Chips: Unveiling neural processing of chemicals in small animals through precise fluidic control. *Neural Regeneration Research*. 2024;19(11):2351-2353. doi:10.4103/1673-5374.392876.



An overview of cellular diversity and key omic features of gliovascular cells.

Source: Kwok AJ, Lu J, Huang J, Ip BY, Mok VCT, Lai HM, Ko H. High-resolution omics of vascular ageing and inflammatory pathways in neurodegeneration. Seminars in Cell and Developmental Biology. 2024; 155:30-49. doi: 10.1016/j.semcdb.2023.06.005. (Review)



Key findings and challenges from high resolution omic profiling of animal models and human samples of ageing and neurodegeneration.

Source: Kwok AJ, Lu J, Huang J, Ip BY, Mok VCT, Lai HM, Ko H. High-resolution omics of vascular ageing and inflammatory pathways in neurodegeneration. Seminars in Cell and Developmental Biology. 2024; 155:30-49. doi: 10.1016/j.semcdb.2023.06.005. (Review)



Neuroscience and Neurotechnology
神經科學及神經技術

PRINCIPAL INVESTIGATOR | **Hei Ming Lai**

TEAM MEMBERS | Ka Wai Chan, Ben Wong, Lichun Zhang, Cathy Chan, Jacky Hung, Eldric Tsoi, Juno Yau, Nick Chow

Research Progress Summary

Hei Ming Lai and his research team develop and integrate novel technologies to achieve scalable and translatable 3D histology. The below paragraphs illustrate their team's innovative and multidisciplinary approaches towards scientific problems.

The research team first aimed to resolve the bottleneck in achieving consistent, scalable deep immunohistochemistry techniques. They conceptualised the penetration of antibodies into tissue as a reaction-diffusion model. However, traditional mathematical physical models give singularities and hence cannot provide insights into the further development of technology. The team thus started from stochastic statistical mechanics and reconceptualised antibody penetration as Onsager's phenomenological fluxes, revealing that antibody can potentially dissolve into a protein matrix – that is, a solute dissolving into a solid is equivalent to a solid dissolving and becoming a solute. Next is to implement these theoretical ideas chemically. They looked up superchaotropes by all solutes' specific heat capacity values, followed by their weakly coordinating characteristics as conjugates bases of superacids and agents in the crystallisation of strongly electrophilic species for X-ray crystallography. This led them to identify *closo*-dodecaborates

as universal protein-protein interaction inhibitory agents, which allows antibodies to uniformly distribute throughout the tissue matrix. To reinstate system-wide antibody-antigen binding, they utilised enthalpy-driven host-guest complexation of *closo*-dodecaborates with cyclodextrins, enabling bio-orthogonal removal of protein-protein interaction at the centimetre scale. With this method, they demonstrate its applicability to visualise phosphorylations in a centimetre-sized human hemi-brainstem that can be mapped to gross whole human brain MRI imaging, as well as the first 28-plex imaging in 1mm-thick formalin-fixed tissues.

This technology work now lays the foundation chemistry towards universal 3D histology, akin to the use of detergents in 2D histology. In the latest form, the team found tissues stained with technology are indistinguishable from pathology specialists when re-embedded, sectioned, and stained using hematoxylin and eosin (H&E), special stains, and traditional immunohistochemistry, as well as by bulk transcriptomics sequencing (no differentially quantified genes), whole genome sequencing, and spatially resolved proteomics (over ~7000 proteins identified) by laser microdissection and data-independent mass spectrometry.

The research team next developed the first room temperature antigen retrieval method, hence extending their scope to archived samples retrieved from paraffin blocks for 3D histology. This is the first low-temperature method for antigen retrieval that is complete within a day, which is in stark contrast that even with 2D sections it required treatment at 95°C for 20 minutes. The first antigen retrieval methods invented in 1995 opened the door towards reliable and reproducible immunohistochemistry for clinical use, which made possible the use of now-common markers such as PD-L1, HER2, and p53, etc. for diagnostic pathology, created the market of using monoclonal antibodies in histopathology companion diagnostics, and revolutionised the workflow of pathologists. Analogously, they believe overcoming this technical challenge will also allow them to perform retrospective studies for rapid biomarker discovery, accelerating the path toward diagnostic assay development using 3D histology. Of course, such a technology may also benefit conventional 2D histology workflows.

Apart from continued rising sales of the associated 3D immunostaining reagents from their start-up Illumos Ltd, they were approached by multiple companies for strategic partnerships that are ongoing or in negotiation. Examples include the co-development of a 3D spatial multi-omics platform with Burker Nanostring, strategic business partnerships with Light Innovation Technology Ltd on widening the 3D histology market, and research collaboration with AstraZeneca (in collaboration). They were invited to join the Inception Program of NVIDIA Inc. They were also invited to present their work at the European Microscopy Congress 2024 (held every 4 years) and the EMBO workshop on spatial multi-omics. Illumos Ltd also successfully raised its Angel round investment, including investment from WT Health Limited – a rapidly expanding healthcare company which opened 10 clinics in 1 year.

Research and Scholarship

Research Awards and Recognitions

Name	Details	
	Award	Organisation
Hei Ming Lai	Croucher Tak Wah Mak Innovation Award 2024	Croucher Foundation
	Life Sciences Global Finalist, Falling Walls Summit	Falling Walls Foundation
Juno Yau Jacky Hung Nick Chow	1st Runners-up, Life Sciences, The 10th Hong Kong University Student Innovation and Entrepreneurship Competition	Hong Kong New Generation Cultural Association

Grants and Consultancies

Name	Project Title	Funding Source	Start Date (dd/mm/yyyy)	End Date (dd/mm/yyyy)	Amount (HK$)
Hei Ming Lai	From Spatial Multi-omics to Systems Biophysics and 3D Tissue Diagnostics	The Croucher Foundation – Croucher Tak Wah Mak Innovation Award 2024	01/08/2024	31/07/2029	5,000,000
	Association between IL10 Polymorphisms with Tardive Dyskinesia in Chinese Patients Receiving Antipsychotic Treatment	Hong Kong Genome Institute and Hong Kong Academy of Medicine – HKAM-HKGI Research Excellence Grants in Genomics Medicine	01/01/2024	31/12/2024	250,000
	Multi-modal Approaches to Determine Digital Clinical Phenotyping, Novel Proteomic Biomarkers, and Microbiota-host Responses of REM Sleep Behaviour Disorder, a Prodromal Stage of Alpha-synucleinopathy Neurodegeneration, in a Prospective Family Cohort	Research Grants Council – Collaborative Research Fund	01/02/2022	31/01/2025	7,214,620

Publications

A. Journal Papers

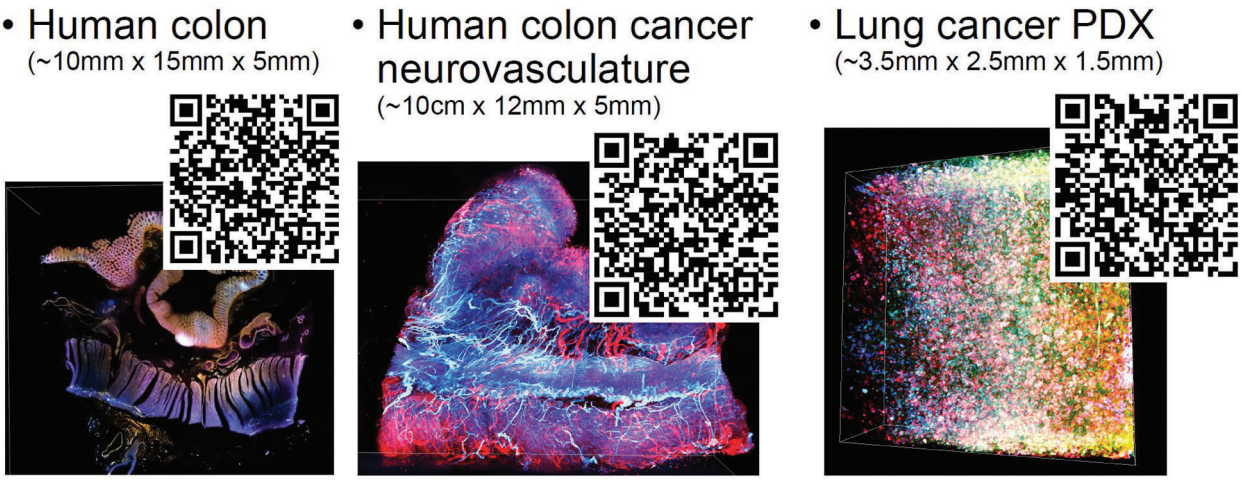
1. Yau CN, Hung JTS, Campbell RAA, Wong TCY, Huang B, Wong BTY, Chow NKN, Zhang L, Tsoi EPL, Tan Y, Li JJX, Wing YK, Lai HM. INSIHGT: An accessible multi-scale, multi-modal 3D spatial biology platform. *Nature Communications*. 2024 15:1. 2024;15(1):1-20. doi:10.1038/s41467-024-55248-0.



2D versus 3D histology

Source: Hei Ming Lai

***Uniform and deeply penetrating staining is essential**



3D multiplexed histology with human normal and cancerous specimens

Source: Hei Ming Lai



Neuroscience and Neurotechnology
神經科學及神經技術

PRINCIPAL INVESTIGATOR | **Vincent Mok**

TEAM MEMBERS | Owen Ko, Bonaventure Ip, Lisa Au, Bonnie Lam, Andrew Kwok, Mandy Liu, Pauline Kwan, Elyia Han, Anthea Ng, Seraphina Lo, Huijing Zheng, Alison Wei, Ami Li, Dorothy Ieong, Junzhe Huang, Nathan Lin, Erin Chan, Angel Ng, Winky Leung, Nathalie Ng, Michael Chan

Research Progress Summary

Vincent Mok and his team focus on Alzheimer's disease (AD), stroke, cerebral small vessel disease (SVD), and Parkinson's disease (PD). They made significant achievement in areas including:

Research Studies

1. Establish registries for Alzheimer's disease, intracranial large artery disease, sporadic cerebral small vessel disease (SVD), stroke, and Parkinson's disease (PD) in Chinese subjects respectively to develop precise biomarkers and diagnostics (e.g. AI-powered technologies based on MRI, retinal imaging, speech characteristics) for early diagnosis and to understand putative causative factors, as well as to predict and monitor disease progression of these brain diseases.
2. Development of a large population-based cohort (n=2,000) in Hong Kong with longitudinal follow-up, consisting of citizens aged 60-80 years who have early symptomatic Alzheimer's disease (AD) or are at risk of the disease. Data on cardiovascular risk profile, cognition, brain imaging, and retinal imaging are being collected. The goal is to

develop more affordable and accessible diagnostic tests that will help to advance detection and treatment of early AD and may thus help to delay onset of dementia.

3. Development of an animal model for sporadic SVD with utilisation of *in-vivo* multiphoton microscope and single cell-RNA sequencing for pathophysiology research and drug development.

4. Recent studies from the team led by Vincent Mok have shown that a particular class of anti-diabetic drug, namely glucagon-like peptide 1 receptor agonist (GLP-1 RA) is able to reverse aging-related SVD. Clinical trial is urgently warranted to clarify whether re-purposing this anti-diabetic drug is able to slow down SVD progression. To this end, the research team has commenced a phase 2 open-label randomised controlled trial to investigate the effects and safety of GLP1-1 RA (exenatide) in slowing down the progression of early SVD.

Academic Conferences

Vincent and his team attended a number of significant worldwide in 2024 with details as follows:

1. GLP-1R agonism as anti-aging pharmacology for neurological diseases: From preclinical exploration to human tests. The 4th International Summit on Brain Health and the 5th Oujiang International Forum on Alzheimer's Disease. Wenzhou, China. 16 November 2024. (Owen Ko)
2. Atrial fibrillation & dementia. Advances in Medicine 2024. Hong Kong. 26 May 2024. (Vincent Mok)
3. AI-empowered Retinal Imaging for the Assessment of Alzheimer's Disease in Symposium on A.I. & Health Sciences. Macau. 23 March 2024. (Owen Ko)
4. Functional and multi-omic aging rejuvenation with GLP-1R agonism. Hong Kong Society of Biological Psychiatry Annual Scientific Meeting. Hong Kong. 17 March 2024. (Owen Ko)
5. Functional and multi-omic aging rejuvenation with GLP-1R agonism. Chinese Dementia Research Association Seminar. Hong Kong. 27 January 2024. (Owen Ko)

Research and Scholarship

Research Awards and Recognitions

Name	Details	
	Award	Organisation
Vincent Mok	2024 Advance Global Australian Award (Education, Science, and Research Category)	Advance Global Australians
Owen Ko	Outstanding Alumni Award	The London Ball Foundation

Fellowships

Name	Details	
	Fellowship	Organisation
Owen Ko	Life Science Fellow (2023-2025)	Asian Young Scientist Fellowship, Future Science Awards Foundation

Academic Editorships

Name	Details	
	Role	Journal
Vincent Mok	Editorial Board Member	Cerebral Circulation – Cognition and Behavior
		Journal of Neurology, Neurosurgery and Psychiatry
		Movement Disorders Clinical Practice
		Frontiers in Neurology

Reviewers of Journal / Conference

Name	Details	
	Role	Journal / Conference
Vincent Mok	Reviewer	Lancet Neurology
		Neurology
		Stroke
		Alzheimer's and Dementia
		Dementia and Geriatric Cognitive Disorders
		Alzheimer's Disease and Associated Disorders
		Parkinsonism and Related Disorders
		Journal of the Neurological Sciences
		Journal of Alzheimer Disease
		International Journal of Stroke
		BMC Geriatrics
		Acta Pharmacologica Sinica
		Peritoneal Dialysis International
		Hong Kong Medical Journal
		CNS Neuroscience and Therapeutics
		Frontiers Neurology
Owen Ko	Reviewer	Alzheimer's and Dementia
		Journal of Neurology, Neurosurgery and Psychiatry
		Translational Neurodegeneration

Grants and Consultancies

Name	Project Title	Funding Source	Start Date (dd/mm/yyyy)	End Date (dd/mm/yyyy)	Amount (HK$)
Vincent Mok	Genetic Studies on Early Alzheimer's Disease	The Hong Kong University of Science and Technology – Hong Kong Center for Neurodegenerative Disease	01/05/2022	01/05/2025	650,000
	Neuroimaging Biomarkers in Parkinsonian Syndromes	Hong Kong Neurological Society	07/02/2022	06/02/2024	200,000
	Research and Development of Artificial Intelligence in Extraction and Identification of Spoken Language Biomarkers for Screening and Monitoring of Neurocognitive Disorders	Research Grants Council – Theme-based Research Scheme	01/01/2020	31/12/2024	50,000,000
	Multi-modal Approaches to Determine Digital Clinical Phenotyping, Novel Proteomic Biomarkers, and Microbiota-host Responses of REM Sleep Behavior Disorder, A Prodromal Stage of Alpha-synucleinopathy Neurodegeneration, in a Prospective Family Cohort	Research Grants Council – Collaborative Research Fund (CRF) for 2021/22 One-off CRF Coronavirus Disease (COVID-19) and Novel Infectious Disease (NID)	01/04/2022	31/03/2025	7,214,620
	Altered Impulsivity in the Progression of Early Synucleinopathies: A 3-year Prospective Follow-up Study	Health Bureau – Health and Medical Research Fund	01/06/2024	30/11/2026	1,472,870
	Changing Experiences of Chinese Older Couples Living with Mild Cognitive Impairment in Hong Kong: A Longitudinal Dyadic Mixed-methods Investigation	Research Grants Council – General Research Fund	01/01/2024	31/12/2026	1,273,900

Grants and Consultancies

Name	Project Title	Funding Source	Start Date (dd/mm/yyyy)	End Date (dd/mm/yyyy)	Amount (HK$)
Vincent Mok	Gut Microbiota in Major Depressive Disorders with and Without Rapid Eye Movement Behavior Disorder: Tracing a Subtype of Depression with Underlying Neurodegeneration	Health Bureau – Health and Medical Research Fund	01/10/2021	30/09/2024	1,104,304
	Transcranial Direct Current Stimulation in Post-stroke Fatigue: A Double-blind Randomised Control Trial	Research Grants Council – General Research Fund	01/01/2023	31/12/2025	1,090,616
	Multimodal Brain Connectomics Markers of Idiopathic Rapid Eye Movement (REM) Sleep Behavior Disorder and their Prediction Towards α-Synucleinopathy	Health Bureau – Health and Medical Research Fund	10/06/2023	09/06/2026	1,486,340
	AI-Based Day and Night Digital Phenotyping of Rapid Eye Movement (REM) Sleep Behaviors Disorder (RBD) and its Prediction towards α-Synucleinopathy	Health Bureau – Health and Medical Research Fund	01/01/2023	30/06/2025	1,495,330
	Randomized Placebo- and Active-controlled Trial for Assessing the Efficacy of Bright Light Therapy for Sleep and Mood Symptoms in Patients with Parkinson's Disease	Health Bureau – Health and Medical Research Fund	01/08/2022	31/07/2025	1,413,200
	Progression of Prodromal Markers of α-Synucleinopathy Neurodegeneration in the First-Degree Relatives of Patients with REM Sleep Behavior Disorder: A 7-Year Prospective Study	Research Grants Council – General Research Fund	01/11/2021	31/10/2024	1,154,476

Grants and Consultancies

Name	Project Title	Funding Source	Start Date (dd/mm/yyyy)	End Date (dd/mm/yyyy)	Amount (HK$)
Vincent Mok	Neural Correlates of Impulsivity in Idiopathic REM Sleep Behavior Disorder and Parkinson's disease: A Functional Magnetic Resonance Imaging Case-control Study	Health Bureau – Health and Medical Research Fund	01/04/2021	31/03/2024	1,122,120
	Novel MRI-based Machine Learning Tool to Detect Mild Cognitive Impairment Associated with Alzheimer's Disease	Food and Health Bureau – Health and Medical Research Fund	05/02/2022	04/02/2024	911,140

Publications

A. Journal Papers

1. Huang J, Biessels GJ, de Leeuw FE, Ii Y, Skoog I, Mok V, Chen C, Hilal S. Cerebral microinfarcts revisited: Detection, causes, and clinical relevance. *International Journal of Stroke*. 2024;19(1):7-15. doi:10.1177/17474930231187979. (Review)
2. Ip BYM, Ko H, Lam BYK, Au LWC, Lau AYL, Huang J, Kwok AJ, Leng X, Cai Y, Leung TWH, Mok VCT. Current and future treatments of vascular cognitive impairment. *Stroke*. 2024;55(4):822-839. doi:10.1161/strokeaha.123.044174.
3. Fan X, Cai Y, Zhao L, Liu W, Luo Y, Chi Au LW, Shi L, Tong Mok VC. Machine learning-derived MRI-based neurodegeneration biomarker for Alzheimer's disease: A multi-database validation study. *Journal of Alzheimer's Disease*. 2024;97(2):883-893. doi:10.3233/jad-230574.
4. Jiang Y, Uhm H, Ip FC, Ouyang L, Lo RMN, Cheng EYL, Cao X, Tan CMC, Law BCH, Ortiz-Romero P, Puig-Pijoan A, Fernández-Lebrero A, Contador J, Mok KY, Hardy J, Kwok TCY, Mok VCT, Suárez-Calvet M, Zetterberg H, Fu AKY, Ip NY. A blood-based multi-pathway biomarker assay for early detection and staging of Alzheimer's disease across ethnic groups. *Alzheimer's and Dementia*. 2024;20(3):2000-2015. doi:10.1002/alz.13676.
5. Wang J, Huang B, Zhou L, Tang S, Feng H, Chan JWY, Chau SWH, Zhang J, Li SX, Mok V, Wing YK, Liu Y. Visuospatial dysfunction predicts dementia-first phenoconversion in isolated REM sleep behaviour disorder. *Journal of Neurology, Neurosurgery and Psychiatry*. Published online December 16, 2024. doi:10.1136/jnnp-2024-333865. (Epub ahead of print)
6. Chan VTT, Ran AR, Wagner SK, Hui HYH, Hu X, Ko H, Fekrat S, Wang Y, Lee CS, Young AL, Tham CC, Tham YC, Keane PA, Milea D, Chen C, Wong TY, Mok VCT, Cheung CY. Value proposition of retinal imaging in Alzheimer's disease screening: A review of eight evolving trends. *Progress in Retinal and Eye Research*. 2024;103. doi:10.1016/j.preteyeres.2024.101290. (Review)
7. Ip B, Yip T, Hung T, Yam TF, Yeung C, Ko H, Wong G, Leng X, Mok V, Soo Y, Seiffge D, Shoamanesh A, Leung T. Lipid control and stroke risk in atrial fibrillation patients treated with direct oral anticoagulants and statins. *European Stroke Journal*. Published online 2024. doi:10.1177/23969873241272530.

8. Mok VCT, Cai Y, Markus HS. Vascular cognitive impairment and dementia: Mechanisms, treatment, and future directions. *International Journal of Stroke*. 2024;19(8):838-856. doi:10.1177/17474930241279888.

9. Chew EG, Liu Z, Li Z, Chung SJ, Lian MM, Tandiono M, Heng YJ, Ng EY, Tan LC, Chng WL, Tan TJ, Peh EK, Ho YS, Chen XY, Lim EY, Chang CH, Leong JJ, Peh TX, Chan LL, Chao Y, Au WL, Prakash KM, Lim JL, Tay YW, Mok V, Chan AY, Lin J-J, Jeon BS, Song K, Tham CC, Pang CP, Ahn J, Park KH, Wiggs JL, Aung T, Tan AH, Ahmad Annuar A, Makarious MB, Blauwendraat C, Nalls MA, Robak LA, Alcalay RN, Gan-Or Z, Reynolds R, Lim SY, Xia Y, Khor CC, Tan EK, Wang Z, Foo JN. Exome sequencing in Asian populations identifies low-frequency and rare coding variation influencing Parkinson's disease risk. *Nature Aging*. 2024;5(2):205-218. doi:10.1038/s43587-024-00760-7.

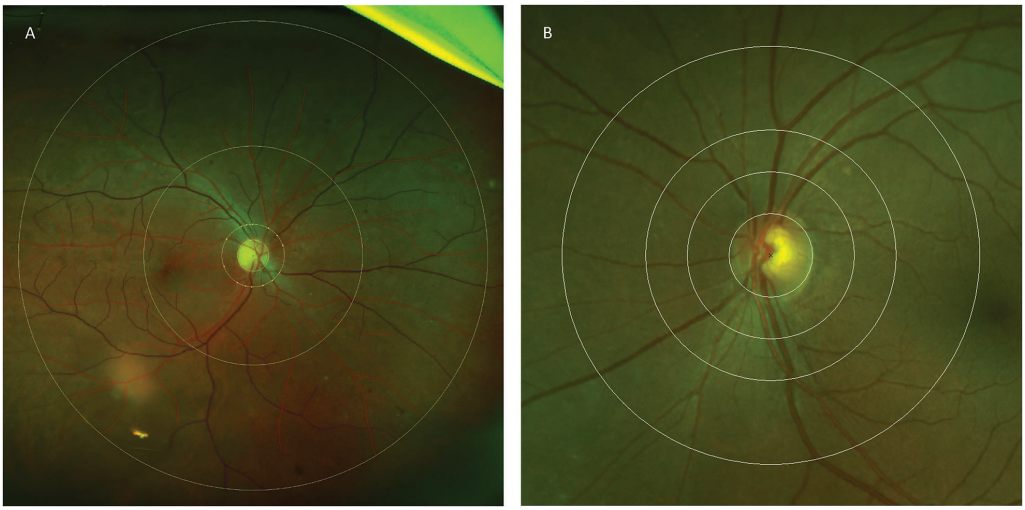
10. Ip B, Pan S, Yao A, Lau L, Miu A, Chiu K, Ko H, Kwok A, Chan HY, Lee S, Chan H, Hung T, Lam B, Hui V, Li H, Shi L, Abrigo J, Leng X, Soo Y, Ma SH, Mok V, Markus HS, Mok C, Hui D, Leung T. COVID-19 vaccination and cerebral small vessel disease progression - A prospective cohort study. *International Journal of Infectious Diseases*. Published online December 3, 2024:107324. doi:10.1016/j.ijid.2024.107324. (Epub ahead of print)

11. Hing K, Leung C, Chan VTT, Yin B, Lam K, Mok VC, Cheung CY. Retinal vascular changes are associated with PET-based biomarkers of Alzheimer's disease: A pilot study. *Journal of Alzheimer's Disease Reports*. 2024;8(1):1639-1648. doi:10.1177/25424823241300416.

B. Conference Papers

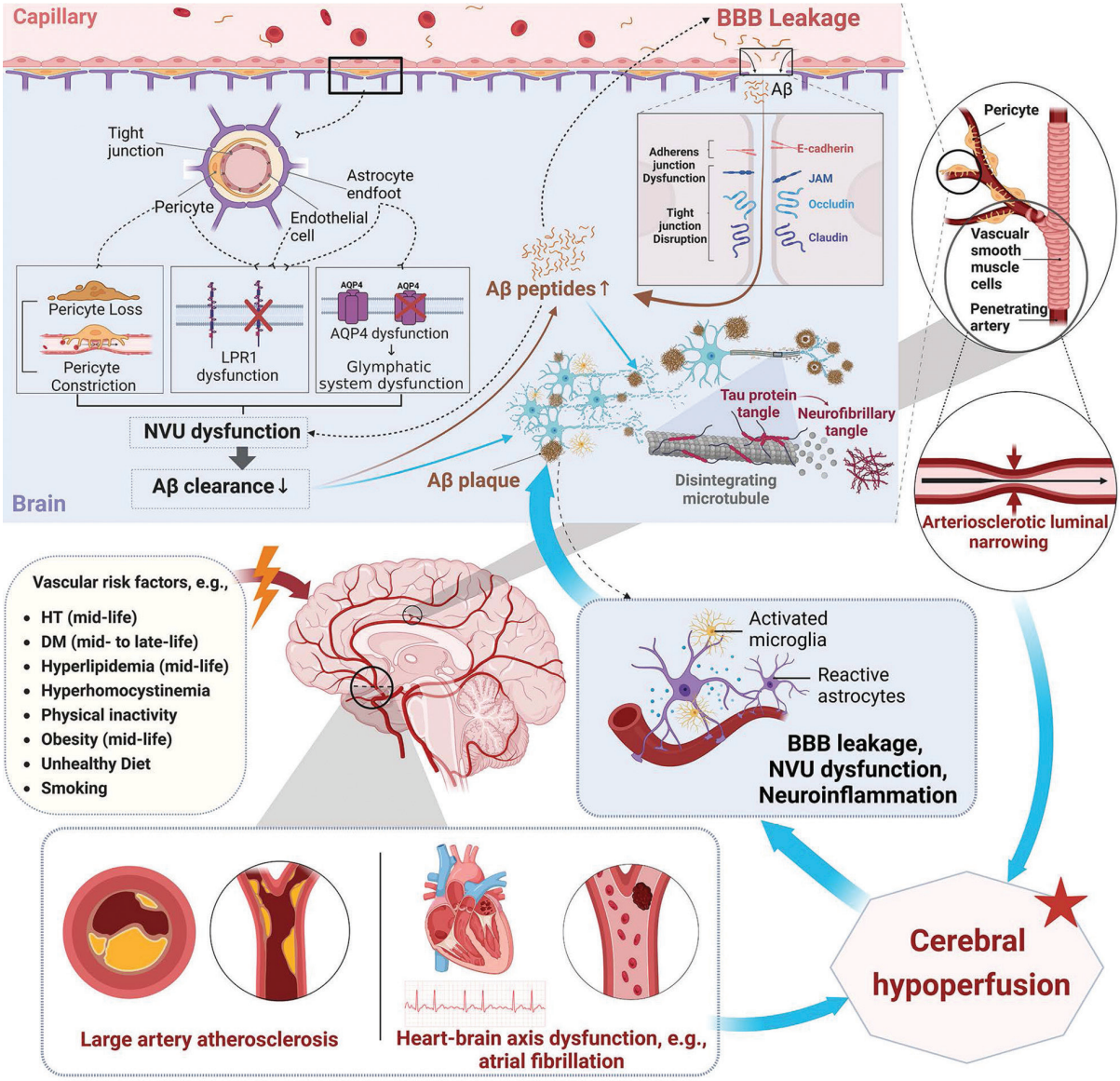
1. Li S, Lan L, Ip B, Ip HL, Abrigo J, Liu H, Zheng L, Tian X, Liu Y, Liu Y, Ma KKY, Fan FSY, Ma SH, Fang H, Xu Y, Leung H, Soo YOY, Mok VCT, Wong KS, Leng X, Leung TW. Artery-to-artery embolism and stroke risks in intracranial atherosclerotic stenosis: High wall shear stress and turbulent flow. *Asia Pacific Multidisciplinary Meeting for Nervous System Diseases (BRAIN) 2024*.486428071.

2. Li HP, Ko H, Pan SQ, Lui L, Hung T, Yau CN, Hui E, Leng XY, Abrigo JM, Lam BYK, Mok VC, Chan RHM, Leung WHT, Wang H, Feng YC, Ip BYM. Prediction of thrombectomy outcomes using perfusion profile of eloquent brain regions: A multicenter study. *Cerebrovascular Diseases*. 2024 Sep; 53 (Suppl. 1): 5–297.



Ultra-wide field (UWF) retinal photograph assessed by Singapore I vessel assessment (SIVA) software. Retinal vascular parameters were measured either between 0.5- and 7.0-disc diameters (A) and 0.5- to 2.0-disc diameters (B) away from the disc margin.

Source: Leung KHC, Chan VTT, Lam BYK, Mok VC, Cheung CY. Retinal vascular changes are associated with PET-based biomarkers of Alzheimer's disease: A pilot study. Journal of Alzheimer's Disease Reports. 2024;8(1):1639-1648. doi:10.1177/25424823241300416.



Interplay of vascular dysfunction and neurodegenerative pathways in Aβ and tau pathology. This figure highlights the complex relationship between vascular dysfunction and pathways leading to the accumulation of Aβ and tau protein formation. Modifiable vascular risk factors probably cause dysfunction of the neurovascular unit (NVU), leakage of the BBB, and neuroinflammation. The disruption of tight junctions facilitates the increased entry of Aβ from the bloodstream into the brain. Features of NVU dysfunction, such as pericyte constriction and loss, along with AQP4 mis-localisation and decreased levels of LRP1, lead to inefficient Aβ clearance and promote its accumulation in the brain. In addition, activated microglia and reactive astrocytes intensify neuroinflammation, which further exacerbates BBB leakage and NVU dysfunction. All these changes contribute to the formation of Aβ plaques and the hyperphosphorylation of tau proteins, resulting in neurofibrillary tangles. The figure also connects vascular risk factors with changes in vascular smooth muscle cells that lead to arteriosclerotic luminal narrowing. Furthermore, conditions like LAD and heart–brain axis dysfunction, exemplified by atrial fibrillation, also aggravate cerebral hypoperfusion. The cerebral hypoperfusion may exacerbate NVU dysfunction, BBB leakage, and neuroinflammation, further promoting Aβ deposition and tau pathology. Aβ deposition in turn reverberates with neuroimmune and vascular dysfunction, further exacerbating the progression of this process.

Aβ: amyloid-beta; BBB: blood–brain barrier; NVU: neurovascular unit; AQP4: aquaporin 4; LRP1: low-density lipoprotein receptor-related protein 1; HT: hypertension; DM: diabetes mellitus; CAA: cerebral amyloid angiopathy.

Source: Mok VCT, Cai Y, Markus HS. Vascular cognitive impairment and dementia: mechanisms, treatment, and future directions. International journal of stroke: official journal of the International Stroke Society. 2024;19(8):838-856. doi:10.1177/17474930241279888.



Neuroscience and Neurotechnology
神經科學及神經技術

PRINCIPAL INVESTIGATOR | **Thomas Leung**

TEAM MEMBERS | Bonaventure Ip, Cindy Leng, Cheryl Au, Suk Fung Tsang, Sangqi Pan, Trista Hung, Katerina Chiu, Xuan Tian, Gillian Liang, Shuang Li, Yuying Liu, Yu Liu, Ziqi Li, Yue Gu, Jiaping Chen, Haipeng Li, Katerina Chiu, Janice Lee, Isabel Tse

Research Progress Summary

Stroke Prevention, Treatment and Outcome

Stroke is a leading cause of death and long-term physical disability worldwide, imposing immense health and socioeconomic burdens. Although many causative factors of neurological diseases that bring irreversible disabling cognitive and physical decline are potentially modifiable, local population-based data on brain health from mid-life onwards are lacking. To this end, **Thomas Leung** and his team are conducting a longitudinal population-based cohort study (n=5,000) in Hong Kong, involving healthy individuals and at-risk subjects aged 45-74 years. Data on genomics, metabolomics, microbiota, cardiovascular health, cognition, linguistics, psychology, and brain imaging are being collected to explore how lifestyle and environmental factors across the lifespan impact brain health.

For acute ischemic stroke, timely reperfusion therapies, including intravenous thrombolysis (IVT) and endovascular thrombectomy (EVT), are critical. To improve efficiency, they introduced the Emergency Stroke Unit (ESU) concept at the Prince of Wales Hospital, featuring a portable low-field MRI (lfMRI) for rapid stroke diagnosis and treatment. Ongoing studies evaluate the ESU-lfMRI workflow's impact on shortening door-to-needle time and door-to-puncture time, and enhancing functional outcomes in acute ischemic stroke patients compared to conventional practices.

Stroke Imaging

Intracranial atherosclerotic disease (ICAD) is an important cause of ischemic stroke and transient ischemic attack worldwide. ICAD-related strokes have the highest rates of stroke recurrence and death, leading to an urgent need for further research. Their team is utilising state-of-the-art imaging techniques to identify plaque morphology associated with worse outcome in ICAD strokes.

Other Collaborations

The team is actively collaborating with esteemed research teams in the Greater Bay Area, across China and overseas, including the Beijing Tiantan Hospital affiliated with Capital Medical University, the First Affiliated Hospital of Sun Yat-sen University, Henry and Allison McCance Center for Brain Health in Massachusetts General Hospital, and the Stroke and Dementia Prevention Team at The George Institute for Global Health (TGI). The team is working closely with the collaborators to develop joint research initiatives on neurodegenerative disease and vascular brain health. These collaborations involve population and hospital-based neuroscience studies aiming to understand the genetics and biology underlying different stroke subtypes.

Academic Conferences

1. Updates in Endovascular Treatment for Atherosclerotic Stroke. International Conference Stroke Update 2024. Seoul, South Korea. 29 November 2024. (Thomas Leung)
2. Lifestyle, Brain Health and Stroke Risk. World Stroke Congress 2024. Abu Dhabi. 2 October 2024. (Thomas Leung)
3. CFD-based Hemodynamic Studies in Symptomatic ICAS and the Clinical Implications. The 8th Annual Scientific Session of Stroke Association of Guangdong Province. Guangzhou, China. 6-7 September 2024. (Cindy Leng)
4. The Hemodynamic Impact of Intracranial Arterial Stenosis and The Clinical Implications. Seminar on Multimodal Assessment Techniques on Neurovascular Function. Shenzhen, China. 29-30 August 2024. (Cindy Leng)
5. The Hemodynamic Impact of Intracranial Arterial Stenosis and the Clinical Implications. 16th World Congress on Computational Mechanics & 4th Pan American Congress on Computational Mechanics (WCCM-PANACM 2024). Vancouver, Canada. 21-26 July 2024. (Cindy Leng)
6. How to Write a Clinical Research Paper. Webinar Series organised by the Chinese Stroke Association: Clinical Study Design and Data Analyses. Virtual. 9 July 2024. (Cindy Leng)
7. Pathogenesis-based Treatment of Intracranial Atherosclerosis. Hong Kong Neurological Society Greater Bay Area Neuroscience Meeting 2024. Shenzhen, China. 22 June 2024. (Thomas Leung)
8. Research Progress in Imaging Studies in Intracranial Atherosclerotic Disease. Hong Kong Neurological Society Greater Bay Area Neuroscience Meeting 2024. Shenzhen, China. 22 June 2024. (Cindy Leng)
9. The Latest Progress of Clinical Research in Cerebrovascular Disease CUHK Brain Health Cohort. The 10th Annual Conference of Chinese Stroke Association & Tiantan International Stroke Conference 2024. Beijing, China. 15 June 2024. (Thomas Leung)
10. Intracranial Stenosis is not the Key Indicator to Guide Treatment of Ischemic Stroke Patients. The 10th Annual Conference of Chinese Stroke Association & Tiantan International Stroke Conference 2024. Beijing, China. 14-16 June 2024. (Cindy Leng)
11. Research Progress on Cerebral Hemodynamics in Symptomatic Intracranial Atherosclerotic Stenosis. The 10th Annual Conference of Chinese Stroke Association & Tiantan International Stroke Conference 2024. Beijing, China. 14-16 June 2024. (Cindy Leng)
12. Techniques for Assessment of Cerebral Hemodynamics and the Clinical Applications. The 10th Annual Conference of Chinese Stroke Association & Tiantan International Stroke Conference 2024. Beijing, China. 14-16 June 2024. (Cindy Leng)
13. Prime Time News for Stroke. Advances in Medicine 2024. Hong Kong. 26 May 2024. (Thomas Leung)
14. Angioplasty and Stenting of Symptomatic ICAS as Secondary Stroke Prevention. The 10th European Stroke Organisation Conference. Basel, Switzerland. 16 May 2024. (Thomas Leung)

15. CUHK Brain Health Cohort - The Burden of Brain Diseases and Challenges in Asia. McCance Center Faculty Seminar Series. Virtual. 1 April 2024. (Thomas Leung)
16. Stroke Risk Stratification in Intracranial Atherosclerotic Stenosis. The 20th Asia Pacific Multidisciplinary Meeting for Nervous System Diseases (BRAIN 2024). Hong Kong. 27 January 2024. (Cindy Leng)

Research and Scholarship

Research Awards and Recognitions

Name	Details	
	Award	Organisation
Shuang Li	The Best Presentation Award of Brain Conference 2024 – "The Spatial and Temporal Dynamics of Microglia Cells Following Transient Focal Cerebral Ischemia"	The 20th Multidisciplinary Meeting for Nervous System Diseases, BRAIN 2024 Organiser: Division of Neurosurgery, Division of Neurology, and Neuropathology, Faculty of Medicine, The Chinese University of Hong Kong
Thomas Leung Cindy Leng	Award for Best Visual Abstract of the European Stroke Journal 2023/2024 – "Hemodynamic significance of intracranial atherosclerotic disease and ipsilateral imaging markers of cerebral small vessel disease	European Stroke Journal
Thomas Leung	Heroic Volunteer Award 2024	Hong Kong Volunteer Award

Fellowships

Name	Details	
	Fellowship	Organisation
Cindy Leng	Fellow	American Heart Association

Academic Editorships

Name	Details	
	Role	Journal
Thomas Leung	Associate Editor	International Journal of Stroke
	Assistant Editor	Stroke
	Guest Associate Editor	Frontiers in Neurology
	Editorial Board Member	Interventional Neurology
		Journal of Cardiovascular Research
		Journal of Cardiac Circulation
		International Scholarly Research Network (ISRN) Radiology

Academic Editorships

Name	Details	
	Role	Journal
Thomas Leung	Editorial Board Member	Precision Medicine
		Hong Kong Medical Journal
Cindy Leng	Associate Editor	Stroke and Vascular Neurology
	Editorial Board Member	Stroke
		International Journal of Stroke
		European Stroke Journal

Reviewers of Journal / Conference

Name	Details	
	Role	Journal / Conference
Thomas Leung	Reviewer	Frontiers Neurology
		The Lancet
		The British Medical Journal
		Annals of Neurology
		Hypertension
		Cerebrovascular Diseases
		Acta Neurologica Scandinavica
		Journal of Neuro-Interventional Surgery
		American Journal of Neuroradiology
		BMJ Open
		European Neurology
		The Lancet Regional Health (Western Pacific)
		International Journal for Numerical Methods in Biomedical Engineering
		International Journal of Cardiology
		Clinical Medicine Insights: Therapeutics
		Cardiovascular Therapeutics
		Surgical Practice
		Clinical and Experimental Pharmacology and Physiology
Thomas Leung Cindy Leng	Reviewer	Neurology
		Journal of Neurology, Neurosurgery and Psychiatry
		European Journal of Neurology

Reviewers of Journal / Conference

Name	Details	
	Role	Journal / Conference
Cindy Leng	Reviewer	Stroke
		Expert Review of Neurotherapeutics
		Scientific Reports
		Frontiers in Neurology
		Frontiers in Neural Circuits
		Annals of Pharmacotherapy
		Journal of Neuroimaging
		Neurological Research

Grants and Consultancies

Name	Project Title	Funding Source	Start Date (dd/mm/yyyy)	End Date (dd/mm/yyyy)	Amount (HK$)
Thomas Leung	Clinical Effectiveness Study for Integrated Chinese – Western Medicine Programme in Stroke Care	Hospital Authority	26/04/2023	31/03/2025	663,044
	A Phase 2b, Multinational, Randomized, Double-blind Study to Investigate the Efficacy and Safety of Redasemtide (S-005151) Compared with Placebo in Adult Participants with Acute Ischemic Stroke Who Are Not Eligible for Tissue Plasminogen Activator or Thrombectomy	Shionogi & Co., Ltd.	15/12/ 2023	14/12/2025	508,581
	AI-assisted Microrobotic Platform for Minimally Invasive Interventions	Research Grants Council – Strategic Topics Grant Scheme	01/01/2024	31/12/2028	29,655,000
Bonaventure Ip Thomas Leung	Intravenous Thrombolytic Therapy in Acute Ischemic Stroke Patient Oral Anticoagulants – A Prospective Multicenter Study	Health Bureau – Health and Medical Research Fund	01/08/2024	31/07/2027	1,397,096

Grants and Consultancies

Name	Project Title	Funding Source	Start Date (dd/mm/yyyy)	End Date (dd/mm/yyyy)	Amount (HK$)
Bonaventure Ip Thomas Leung	A Phase 3, Randomized, Double-Blind, Parallel-Group, Placebo-Controlled Study to Demonstrate the Efficacy and Safety of Milvexian, an Oral Factor Xla Inhibitor, for Stroke Prevention after an Acute Ischemic Stroke or High-risk Transient Ischemic Attack	Janssen Research & Development, LLC	01/11/2023	09/03/2027	2,168,466
Thomas Leung	Transcranial Direct Current Stimulation in Post-stroke Fatigue: A Double-blind Randomised Control Trial	Research Grants Council – General Research Fund	01/01/2023	31/12/2025	1,090,616
	Design of Elastomer-based Soft Actuator and Flexible Electronic Polymers Sensor for Rehabilitation of Hand Function after Stroke	Research Grants Council – General Research Fund	01/01/2023	31/12/2025	844,415
Cindy Leng Thomas Leung	Secondary Stroke Prevention in Symptomatic Intracranial Atherosclerotic Stenosis: Will Cerebral Hemodynamics Alter the Optimal Target for Blood Pressure Management?	Health Bureau – Health and Medical Research Fund	01/08/2023	31/07/2026	1,498,112
Cindy Leng Thomas Leung Bonaventure Ip	The Hemodynamic Mechanisms of Cortical Microinfarcts in Intracranial Arterial Stenosis: A Multimodal MRI and Computational Fluid Dynamics Study	Research Grants Council – General Research Fund	01/01/2024	31/12/2026	1,400,000

Publications

A. Journal Papers

1. Kam NW, Lo AWI, Hung DTY, Ko H, Wu KC, Kwong DLW, Lam KO, Leung TW, Che CM, Lee VHF. Shift in tissue-specific immune niches and CD137 expression in tuberculoma of pembrolizumab-treated nasopharyngeal carcinoma patients. *Cancers (Basel)*. 2024;16(2). doi:10.3390/cancers16020268.
2. Kam NW, Lo AWI, Hung DTY, Ko H, Wu KC, Kwong DLW, Lam KO, Leung TW, Che CM, Lee VHF. Shift in tissue-specific immune niches and CD137 expression in tuberculoma of pembrolizumab-treated nasopharyngeal carcinoma patients. *Cancers (Basel)*. 2024;16(2). doi:10.3390/cancers16020268.
3. Tang WK, Lu H, Leung TWH, Kim JS, Fon gKNK. Study protocol of a double-blind randomised control trial of transcranial direct current stimulation in post-stroke fatigue. *Frontiers in Neurology*. 2023;14(January):1-9. doi:10.3389/fneur.2023.1297429.
4. Ip BYM, Ko H, Lam BYK, Au LWC, Lau AYL, Huang J, Kwok AJ, Leng X, Cai Y, Leung TWH, Mok VCT. Current and future treatments of vascular cognitive impairment. *Stroke*. 2024;55(4):822-839. doi:10.1161/strokeaha.123.044174. (Review)
5. Ip B, Pan S, Yuan Z, Hung T, Ko H, Leng X, LiuY, Li S, Lee SY, Cheng C, Chan H, Mok V, Soo Y, Wu X, Lui LT, Chan R, Abrigo J, Dou Q, Seiffge D, Leung T. Prothrombin complex concentrate vs conservative management in ICH associated with direct oral anticoagulants. *JAMA Network Open*. Published online 2024:1-12. doi:10.1001/jamanetworkopen.2023.54916.
6. Liu Y, Li S, Liu H, Tian X, Liu Y, Li Z, Leung TW, Leng X. Clinical implications of haemodynamics in symptomatic intracranial atherosclerotic stenosis by computational fluid dynamics modelling: A systematic review. *Stroke and Vascular Neurology*. Published online 2024. doi:10.1136/svn-2024-003202.
7. Ip B, Yip T, Hung T, Yam TF, Yeung C, Ko H, Wong G, Leng X, Mok V, Soo Y, Seiffge D, Shoamanesh A, Leung T. Lipid control and stroke risk in atrial fibrillation patients treated with direct oral anticoagulants and statins. *European Stroke Journal*. Published online 2024. doi:10.1177/23969873241272530.
8. Liu Y, Li S, Tian X, Abrigo J, Lam BYK, Wei J, Zheng L, Liu Y, Li Z, Liang T, Ip BYM, Leung TW, Leng X. More severe cerebral small vessel disease associated with poor leptomeningeal collaterals in symptomatic intracranial atherosclerotic stenosis. *Journal of Cerebral Blood Flow and Metabolism*. Published online 2024. doi:10.1177/0271678x241292537.
9. Ip YMB, Pan S, Yao A, Lau L, Miu A, Chiu K, Ko H, Kwok A, Chan HY, Lee S, Chan H, Hung T, Lam B, Hui V, Li H, Shi L, Abrigo J, Leng X, Soo Y, Ma SH, Mok V, Markus HS, Mok C, Hui DSC, Leung TW. COVID-19 vaccination and cerebral small vessel disease progression - A prospective cohort study. *International Journal of Infectious Diseases*. 2024;151:107324. doi:10.1016/j.ijid.2024.107324.

B. Conference Papers

1. Leng X, Ip BY, Ma SH, Lui WT, Fan F, Ip HL, Yu SC, Leung TW. Symptomatic middle cerebral artery and basilar artery stenoses: Different plaque morphology in 3D rotational angiography. *European Stroke Journal*. 2024 May; 9(1S): 3-747.
2. Li S, Tian X, Liu Y, Ip B, Ip HL, Abrigo J, Fan FSY, Ma SH, Leung TW, Leng X. Stroke mechanism in symptomatic intracranial atherosclerotic disease: A modified classification. *European Stroke Journal*. 2024 May; 9(1S): 3-747.
3. Tian X, Liu Y, Li S, Liu Y, Abrigo J, Ip BYM, Ma SH, Lui WT, Leung TW, Leng X. Associations between plaque morphology and stroke mechanisms in symptomatic intracranial atherosclerotic disease. *European Stroke Journal*. 2024 May; 9(1S): 3-747.
4. Liu Y, Li S, Tian X, Abrigo J, Ip BYM, Ma SH, Fan FSY, Ip HL, Leung TW, Leng X. Overestimation of luminal stenosis by MRA over CTA as a prognostic marker for stroke recurrence in ICAS. *European Stroke Journal*. 2024 May; 9(1S): 3-747.

5. Liu Y, Li S, Lan L, Tian X, Liu Y, Li Z, Liu H, Ip BYM, Leung T, Leng X. Associations of ICA Bifurcation Geometry, MCA Geometry and Plaque Location in Symptomatic Atherosclerotic MCA Stenosis. *European Stroke Journal.* 2024 May; 9(1S): 3-747.

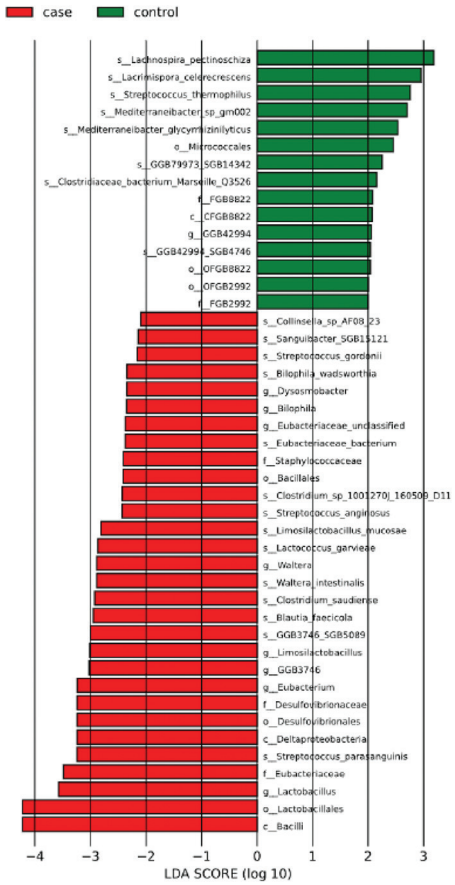
6. Li S, Liu Y, Tian X, Ip BYM, Ip HL, Abrigo J, Fan SY, Ma SH, Leng X, Leung T. Artery-to-artery Embolism in Intracranial Atherosclerotic Stenosis: High Wall Shear Stress and Diabetics. *European Stroke Journal.* 2024 May; 9(1S): 3-747.

7. Li H, Ko H, Pan S, Lui LT, Hung T, Mok VCT, Leung T, Wang H, Fung YC, Ip BYM. Prediction of Thrombectomy Outcomes Using Perfusion Profile of Eloquent Brain Regions: A Multicenter Study. *European Stroke Journal.* 2024 May; 9(1S): 3-747.

8. Li HP, Ko H, Pan SQ, Lui L, Hung T, Yau CN, Hui E, Leng XY, Abrigo JM, Lam BYK, Mok VC, Chan RHM, Leung WHT, Wang H, Feng YC, Ip BYM. Prediction of thrombectomy outcomes using perfusion profile of eloquent brain regions: A multicenter study. *Cerebrovascular Diseases.* 2024 Sep; 53 (Suppl. 1): 69.

9. Ip B, Peng Y, S Pan, Leung T, Tun HM. Gut Dysbiosis and Cerebral Small Vessel Disease: A Multimodal Study. *International Journal of Stroke.* 2024 Oct; 19 (2S): 3 – 498.

10. Liu Y, Li S, Tian X, Abrigo J, Zheng L, Liu Y, Li Z, Liang T, Ip B, Leung T, Leng X. Cerebral Small Vessel Disease and Leptomeningeal Collateral Status in Symptomatic Intracranial Atherosclerotic Stenosis. *International Journal of Stroke.* 2024 Oct; 19 (2S): 3 – 498.



In a propensity score matched case-control study, Thomas Leung and his team prospectively collected demographic data, medical comorbidities, brain magnetic resonance imaging (MRI) data, stool and blood samples from patients with asymptomatic CSVD. They found that gut dysbiosis was associated with CSVD in community-dwelling citizens, possibly through metabolite pathways involving cholesterol synthesis and the regulation of anti-inflammatory cytokine expression.

Source: Ip B, Peng Y, S Pan, Leung T, Tun HM. Gut Dysbiosis and Cerebral Small Vessel Disease: A Multimodal Study. International Journal of Stroke. 2024;19(2S): 3–498. doi: 10.1177/17474930241274956.

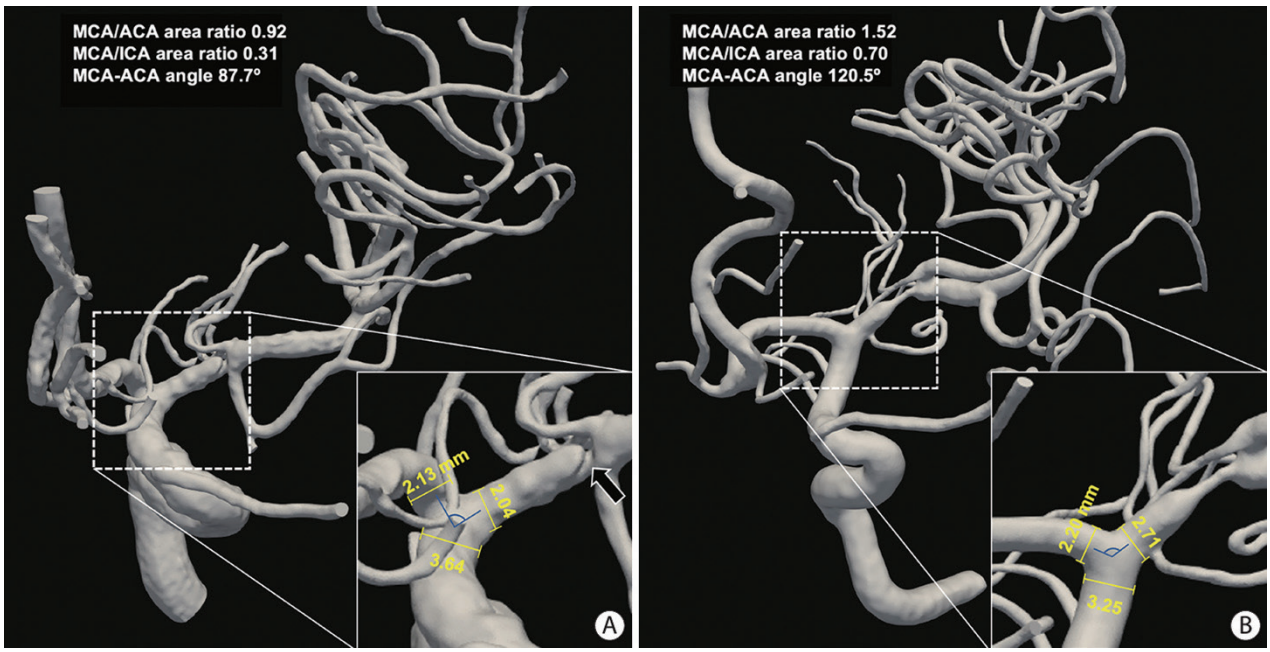


Illustration of terminal ICA bifurcation geometry in 2 patients with ulcerative and non-ulcerative MCA-M1 plaques. (A) In a patient with an ulcerative (black arrow) MCA-M1 plaque of 83% luminal stenosis, the diameters of MCA origin, ACA origin, and terminal ICA were 2.04, 2.13, and 3.64 mm, respectively, and the MCA/ACA and MCA/ICA area ratios were 0.92 and 0.31, respectively, with an MCA-ACA angle of 87.7°. (B) In a patient with a non-ulcerative MCA-M1 plaque of 88% luminal stenosis, the diameters of MCA origin, ACA origin, and terminal ICA were 2.71, 2.20, and 3.25 mm, respectively, and the MCA/ACA and MCA/ICA area ratios were 1.52 and 0.70, respectively, with an MCA-ACA angle of 120.5°.

Source: Leng X, Ip BYM, Ma SH, Lui WT, Ip VHL, Fan FSY, Leung H, Mok VCT, Yu SCH, Leung TW. Geometry of terminal internal carotid artery bifurcation may be associated with middle cerebral artery plaque ulceration: A three-dimensional rotational angiography study. Journal of Stroke. 2024;26(3):446-449. doi:10.5853/jos.2024.00129.



Neuroscience and Neurotechnology

Neurology

神經科學及神經技術

PRINCIPAL INVESTIGATOR | **Bonaventure Ip**

TEAM MEMBERS | Cheryl Au, Suk Fung Tsang, Trista Hung, Alison Wei, Haipeng Li, Sangqi Pan, Katerina Chiu, Janice Lee, Isabel Tse

Research Progress Summary

Stroke Prevention, Treatment and Outcome

Cerebrovascular diseases like stroke and cerebral small vessel disease (CSVD) are leading causes of disability worldwide, imposing tremendous health and socioeconomic burdens. With CSVD contributing to one-third of all ischemic strokes, recent studies from the research team have revealed promising findings that glucagon-like peptide 1 receptor agonists (GLP-1 RAs), a class of anti-diabetic drugs, may reverse aging-related CSVD. To investigate this further, the team has commenced a phase 2 open-label randomised controlled trial to investigate the effects and safety of the GLP-1 RA exenatide in slowing early CSVD progression.

Among ischemic stroke subtypes, large vessel occlusion (LVO) strokes are the most severe, carrying high risks of severe neurological damage and mortality. While endovascular thrombectomy (EVT) has emerged as an effective revascularization treatment, over half of the patients still experience moderate-to-severe disability despite successful recanalization. Recent research by the team led by **Bonaventure Ip** has shown promising results in GLP-1RAs to

improve outcomes in LVO stroke patients. Their preliminary clinical trial with semaglutide in LVO stroke patients has shown that semaglutide may reduce poor neurological recovery, hemorrhagic transformation and promote early neurological recovery among patients with LVO who did not receive thrombolytic therapy.

Stroke-related Big Data Analytics

The team has made significant strides in leveraging big data analytics to advance understanding and management of cardioembolic stroke risk in atrial fibrillation (AF) patients on direct oral anticoagulants (DOACs). AF can lead to blood clot formation, which when carried to the brain, can cause vessel occlusion and cardioembolic stroke. While DOACs reduce ischemic stroke risk by 60-70% in AF patients, they also increase bleeding risk, including rare but serious intracerebral hemorrhage (ICH).

Timely and effective hemostatic treatment is crucial for ICH patients. However, recommendations on using prothrombin complex concentrates (PCCs) to replenish coagulation factors has been based on expert opinion and animal models, with a lack of comparative studies that estimated the clinical benefit of such treatment. Their pioneering population-based study, published in *JAMA Network Open*, is the first to compare PCC versus conservative treatment for Chinese AF patients with ICH while on DOACs.

Advanced Neuroimaging

To reveal new indications of EVT, facilitate clinical communication and decision making, and aid future research, a deployable tool that rapidly and precisely determines the neurological prognosis after EVT integrating advanced image processing and clinical parameters should be subjected to timely research. The preliminary study demonstrated the feasibility of the image processing pipeline, and that salvageability in high-eloquent brain area may predict good neurological prognosis. The team is currently developing an image processing pipeline that rapidly determines the infarct core and ischemic penumbra in functionally important brain regions (i.e. high-eloquent brain regions) among LVO patients from computer tomography (CT) perfusion images.

Other Collaborations

The team is actively collaborating with esteemed research teams in the Greater Bay Area, across China and overseas, including the Neurology department at Linyi People's Hospital, the Affiliated Hospital of Medical College of Qingdao University, The First Affiliated Hospital of University of Science and Technology of China, the University of Bern; and the Stroke and Dementia Prevention Team at The George Institute for Global Health (TGI). The team is working closely with the collaborators to develop joint research initiatives on neurodegenerative disease and vascular brain health. These collaborations involve population and hospital-based neuroscience studies aimed at understanding the genetics and biology underlying different stroke subtypes.

Academic Conferences

1. Use of NOAC Antidote. CUHK-PWH Neuroscience Meeting. Hong Kong, 13 September 2024.
2. Advancement in the Management of VCI and SVD. Asian Society Against Dementia 2024. Malaysia. 16 August 2024.
3. The Unresolved Issue with Ischemic Stroke During DOAC Usage. The 10th Annual Conference of Chinese Stroke Association & Tiantan International Stroke Conference 2024. Beijing, China. 14 June 2024.
4. Managing Stroke during DOAC Use. Advances in Medicine 2024. Hong Kong. 26 May 2024.
5. CUHK Brain Health Study. Global Brain Care Coalition Meeting Series. Virtual. 9 May 2024.
6. What have we learned from a decade of NOAC usage. Associação de Diagnóstico e de Terapêutica de Intervenção de Macau conference. Macau. 25 February 2024.
7. Interventional Treatment for Stroke. Dr Stanley Ho Medical Development Foundation Symposium 2024. Macau. 27 January 2024.

Research and Scholarship

Fellowships

Name	Details	
	Fellowship	Organisation
Bonaventure Ip	First Fellow, Genetics and Genomics (Medicine)	Hong Kong College of Physicians

Academic Editorships

Name	Details	
	Role	Journal
Bonaventure Ip	Editorial Board Member	International Journal of Stroke

Reviewers of Journal / Conference

Name	Details	
	Role	Journal / Conference
Bonaventure Ip	Reviewer	European Stroke Journal
		Alzheimer's and Dementia
		Lancet
		Frontiers in Neurology
		International Journal of Stroke
		Hong Kong Medical Journal

Grants and Consultancies

Name	Project Title	Funding Source	Start Date (dd/mm/yyyy)	End Date (dd/mm/yyyy)	Amount (HK$)
Bonaventure Ip	Intravenous Thrombolytic Therapy in Acute Ischemic Stroke Patient Oral Anticoagulants – A Prospective Multicenter Study	Health Bureau – Health and Medical Research Fund	01/08/2024	31/07/2027	1,397,096
	Impact of COVID-19 Vaccines on Brain Health – A Community-based Study	Research Grants Council – Early Career Scheme	01/01/2023	31/08/2024	1,171,919

Grants and Consultancies

Name	Project Title	Funding Source	Start Date (dd/mm/yyyy)	End Date (dd/mm/yyyy)	Amount (HK$)
Bonaventure Ip	A Phase 3, Randomized, Double-blind, Parallel-group, Placebo-controlled Study to Demonstrate the Efficacy and Safety of Milvexian, an Oral Factor XIa Inhibitor, for Stroke Prevention after an Acute Ischemic Stroke or High-risk Transient Ischemic Attack	Janssen Research & Development, LLC	01/11/2023	09/03/2027	2,168,466
	A Phase 2b, Multinational, Randomized, Double-blind Study to Investigate the Efficacy and Safety of Redasemtide (S-005151) Compared with Placebo in Adult Participants with Acute Ischemic Stroke Who Are Not Eligible for Tissue Plasminogen Activator or Thrombectomy	Shionogi & Co., Ltd.	15/12/2023	14/12/2025	508,581
	Development and Preclinical Test of Optical Pumping-based Hyperpolarized Carbon-13 Magnetic Resonance Spectroscopic Imaging for Diagnosis of Neurological Diseases	Innovation and Technology Commission – Innovation and Technology Fund Partnership Research Programme	01/12/2022	30/11/2025	1,960,792
	Development and Preclinical Test of Optical Pumping-based Hyperpolarized Carbon-13 Magnetic Resonance Spectroscopic Imaging for Diagnosis of Neurological Diseases	Primemax Biotech Limited	01/12/2022	30/11/2025	1,960,800

Grants and Consultancies

Name	Project Title	Funding Source	Start Date (dd/mm/yyyy)	End Date (dd/mm/yyyy)	Amount (HK$)
Bonaventure Ip	Secondary Stroke Prevention in Symptomatic Intracranial Atherosclerotic Stenosis: Will Cerebral Hemodynamics Alter the Optimal Target for Blood Pressure Management?	Health Bureau – Health and Medical Research Fund	01/08/2023	31/07/2026	1,498,112
	The Hemodynamic Mechanisms of Cortical Microinfarcts in Intracranial Arterial Stenosis: A Multimodal MRI and Computational Fluid Dynamics Study	Research Grants Council – General Research Fund	01/01/2024	31/12/2026	1,400,000
	Clinical Effectiveness Study for Integrated Chinese – Western Medicine Programme in Stroke Care	Hospital Authority	26/04/2023	31/03/2025	663,044
	Mechanisms of Cognitive Aging Repair via Targeting GLP-1 Signaling	Research Grants Council – General Research Fund	01/01/2023	31/12/2025	1,155,631

Publications

A. Journal Papers

1. Ip B, Pan S, Yuan Z, Hung T, Ko H, Leng X, Liu Y, Li S, Lee SY, Cheng C, Chan H, Mok V, Soo Y, Wu X, Lui LT, Chan R, Abrigo J, Dou Q, Seiffge D, Leung T. Prothrombin complex concentrate vs conservative management in ICH associated with direct oral anticoagulants. *JAMA Network Open*. Published online 2024. doi:10.1001/jamanetworkopen.2023.54916.
2. Ip B, Wang H, Yu SCH. Use of tirofiban in endovascular thrombectomy: More questions than answers. *CardioVascular and Interventional Radiology*. 2024;47(2):216-217. doi:10.1007/s00270-023-03644-2. (Editorial)
3. Ip BYM, Ko H, Lam BYK, Au LWC, Lau AYL, Huang J, Kwok AJ, Leng X, Cai Y, Leung TWH, Mok VCT. Current and future treatments of vascular cognitive impairment. *Stroke*. 2024;55(4):822-839. doi:10.1161/strokeaha.123.044174. (Review)
4. Chow JCH, Ho JCS, Cheung KM, Johnson D, Ip BYM, Beitler JJ, Strojan P, Mäkitie AA, Eisbruch A, Ng SP, Nuyts S, Mendenhall WM, Babighian S, Ferlito A. Neurological complications of modern radiotherapy for head and neck cancer. *Radiotherapy and Oncology*. 2024;194. doi:10.1016/j.radonc.2024.110200. (Review)

5. Ip B, Yip T, Hung T, Yam TF, Yeung C, Ko H, Wong G, Leng X, Mok V, Soo Y, Seiffge D, Shoamanesh A, Leung T. Lipid control and stroke risk in atrial fibrillation patients treated with direct oral anticoagulants and statins. *European Stroke Journal*. Published online 2024. doi:10.1177/23969873241272530.

6. Ip B, Pan S, Yao A, Lau L, Miu A, Chiu K, Ko H, Kwok A, Chan HY, Lee S, Chan H, Hung T, Lam B, Hui V, Li H, Shi L, Abrigo J, Leng X, Soo Y, Ma SH, Mok V, Markus HS, Mok C, Hui D, Leung T. COVID-19 vaccination and cerebral small vessel disease progression - A prospective cohort study. *International Journal of Infectious Diseases*. Published online December 3, 2024:107324. doi:10.1016/j.ijid.2024.107324.

B. Conference Papers

1. Leng X, Ip BYM, Ma SH, Lui WT, Fan F, Ip HL, Yu SC, Leung T. Symptomatic middle cerebral artery and basilar artery stenoses: Different plaque morphology in 3D rotational angiography. *European Stroke Journal*. 2024 May; 9(1S): 3-747. doi:10.1177/23969873241245672

2. Li S, Tian X, Liu Y, Ip BYM, Ip HL, Abrigo J, Fan SY, Ma SH, Leung T, Leng X. Stroke mechanism in symptomatic intracranial atherosclerotic disease: A modified classification. *European Stroke Journal*. 2024 May; 9(1S): 3-747. doi:10.1177/23969873241245672

3. Tian X, Liu Y, Li S, Liu Y, Abrigo J, Ip BYM, Ma SH, Lui WT, Leung T, Leng X. Associations between plaque morphology and stroke mechanisms in symptomatic intracranial atherosclerotic disease. *European Stroke Journal*. 2024 May; 9(1S): 3-747. doi:10.1177/23969873241245672

4. Liu Y, Li S, Tian X, Abrigo J, Ip BYM, Ma SH, Fan FSY, Ip HL, Leung T, Leng X. Overestimation of luminal stenosis by MRA over CTA as a prognostic marker for stroke recurrence in ICAS. *European Stroke Journal*. 2024 May; 9(1S): 3-747. doi:10.1177/23969873241245672

5. Liu Y, Li S, Lan L, Tian X, Liu Y, Li Z, Liu H, Ip BYM, Leung T, Leng X. Associations of ICA bifurcation geometry, MCA geometry and plaque location in symptomatic atherosclerotic MCA stenosis. *European Stroke Journal*. 2024 May; 9(1S): 3-747. doi:10.1177/23969873241245672

6. Li S, Liu Y, Tian X, Ip BYM, Ip HL, Abrigo J, Fan SY, Ma SH, Leng X, Leung T. Artery-to-artery embolism in intracranial atherosclerotic stenosis: High wall shear stress and diabetics. *European Stroke Journal*. 2024 May; 9(1S): 3-747. doi:10.1177/23969873241245672

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8. Ip BYM, Nash P, Lau KK, Martí-Fàbregas J, Jung S, Peters N, Dilek Orken F, Best J, Werring D, Soo YOY. Association of intracerebral hemorrhage subtype and cerebral microbleeds location in patients with ischaemic cerebrovascular events. *European Stroke Journal*. 2024 May; 9(1S): 3-747. doi:10.1177/23969873241245672

9. Lau LHS, Xiao X, Yip TC, Ip BY, Hui VWK, Guo CL, Wong V, Chan FK, Wong GL. Risk of upper gastrointestinal bleeding in direct oral anticoagulant users: An Asian population-based propensity-score analysis. In: *Digestive Disease Week 2024*. Washington, D.C.. 2024 May 18-21.

10. Li HP, Ko H, Pan SQ, Lui L, Hung T, Yau CN, Hui E, Leng XY, Abrigo JM, Lam BYK, Mok VC, Chan RHM, Leung WHT, Wang H, Feng YC, Ip BYM. Prediction of thrombectomy outcomes using perfusion profile of eloquent brain regions: A multicenter study. *Cerebrovascular diseases* (Basel, Switzerland). 2024 Sep; 53 (Suppl. 1): 69.

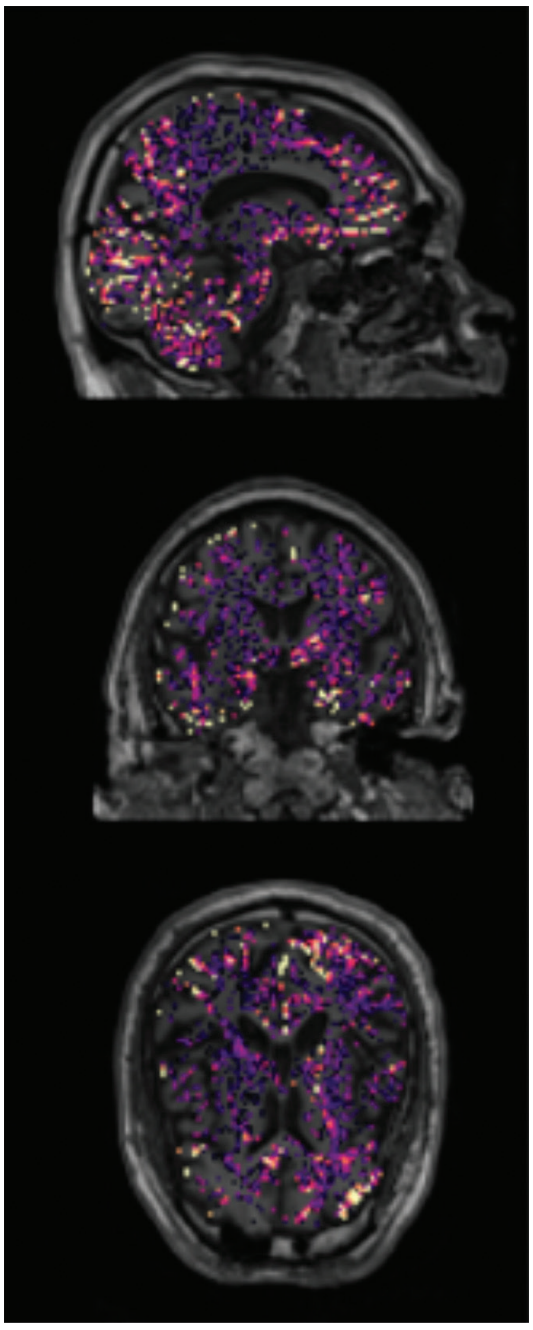
11. Ip B, Peng Y, S Pan, Leung T, Tun HM. Gut Dysbiosis and cerebral small vessel disease: A multimodal study. *International Journal of Stroke*. 2024 Oct; 19 (2S): 3 – 498.

12. Liu Y, Li S, Tian X, Abrigo J, Zheng L, Liu Y, Li Z, Liang T, Ip B, Leung T, Leng X. cerebral small vessel disease and leptomeningeal collateral status in symptomatic intracranial atherosclerotic stenosis. *International Journal of Stroke*. 2024 Oct; 19 (2S): 3 – 498.

C. Patents

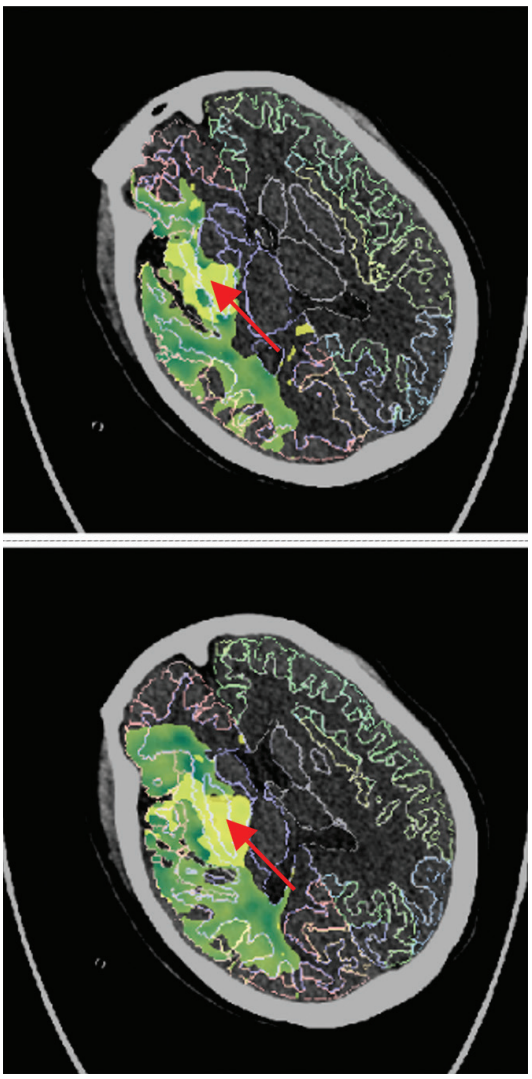
1. **The United States Patent**

   Title: Method of Image Processing for Effectively Identifying Stroke
   Inventors: IP BYM, Ko H, Chan DCW, Li H
   National Application No: US63/644,197
   Filing Date: 8 May 2024



Studying blood-brain barrier leakage among patients with atrial fibrillation and small vessel disease

Source: Ip BYM, Ko H, Chan DCW, Li H.



Identifying regional perfusion profile in patients with acute large vessel occlusion strokes

Source: Ip BYM, Ko H, Chan DCW, Li H.



Neuroscience and Neurotechnology

Neurodegenerative Disease; Neuropsychiatry

神經科學及神經技術

PRINCIPAL INVESTIGATOR | **Yun Kwok Wing**

TEAM MEMBERS | Joanne Huang, Mandy Yu, Jessie Tsang, Leo Chan, Michael Ng, Man Ling Li, Melody Lam, Shi Tang, Yuhua Yang, Siyi Gong, Ningning Li, Jianzhang Ni, Zhixuan He, Sudan Zhu, Yonglong Ye, Bo Li

Research Progress Summary

Yun Kwok Wing and his research team have implemented multimodal research across the prodromal and early stages of neurodegenerative alpha-synucleinoapthies, including patients with REM sleep behaviour disorder (RBD), their first-degree relatives (RBD-FDR) and early Parkinson's disease (PD), from the advanced digital detection of motor and non-motor signs of neurodegeneration to in-depth exploration of biological markers and pathophysiology of alpha-synucleinopathies.

Over the past 2 decades, the team has conducted a series of studies on the outcomes, potential markers, and assessment instrument of RBD, including the first epidemiological study of RBD in Hong Kong Chinese, and developed an internationally adopted RBD instrument (RBDQ-HK) for diagnostic and monitoring purpose. By the end of 2024, RBDQ-HK has been used in 76 original research papers from 33 centres worldwide and is currently translated into 7 different languages, including English, Japanese, Korea, Italian, Swiss, Serbian, and Danish. Yun Kwok's team also established an RBD prospective cohort with regular clinical/research follow-up and conducted the world-first case-

control-family study in RBD, which employed systematic measurement of neurodegenerative biomarkers related to PD and environmental risk factors, to determine the rate and progression of RBD and other prodromal markers and to calculate the research criteria of likelihood ratio of prodromal PD in the FDRs of patients with RBD. In addition, the team has established both case and family cohorts for RBD patients in the context of depression/other psychiatric disorders, the identification of a subtype of depression comorbid with RBD will help to refine the heterogeneity of depression nosology, etiology and intervention.

Recently, the team discovered that visuospatial dysfunction already occurred in RBD and can predict the dementia-first phenoconversion of RBD, with the modified posterior subscore of Montreal Cognitive Assessment (MoCA) showing the maximum discriminative power. The results suggested that the modified posterior MoCA score as potential biomarker for clinical prognostic prediction and potential neuroprotective trials aiming to delay or prevent dementia in patients with RBD (*Journal Neurology Neurosurgery Psychiatry*, IF: 8.8). In addition, a cross-sectional study with a panel of computerised impulsivity tasks indicated that decreased risk taking, but increased reflection and motor impulsivity, has already occurred at the prodromal and early stages of alpha-synucleinopathy, which have implications for underlying pathophysiology and clinical management of neurodegeneration, especially for impulse control behaviours upon dopaminergic drug treatment (*Annals of Neurology*, IF: 8.1). Additionally, the team firstly evaluated factors associated with sleep related injury (SRI) and persistent SRI (pSRI) in patients with RBD by using a retrospective cohort study design. The data showed that SRI is common in RBD (83%) and 18 % of RBD patients had pSRI despite intensive treatment, emphasising the importance of bedside safety. Also, depression, alcohol drinking and higher muscle activity were identified as risk factors for SRI, while frequent nightmare, adult-onset sleepwalking, restless leg syndrome were associated with pSRI, which underscores the need for systematic clinical screening and targeted interventions for at-risk patients (*Sleep Medicine*, IF 3.8). As based on the research findings on gut microbiome, Yun Kwok and his team also filed an US Patent (US 18/443,879.) titled "Early detection and intervention of at-risk subjects for prodromal Parkinson's disease." on 16 February 2024. This invention provides for compositions and methods for the early detection of prodromal PD as well as for the early medical intervention for the treatment and prevention of among prodromal PD individuals, especially those who may not have been diagnosed but are at an elevated risk of developing this and related diseases.

In the reporting period, the team has made notable progress in multimodal research as supported by Collaborative Research Fund. Over 500 subjects, including 200 RBD patients, completed clinical interview, questionnaire, digital assessment (App- and camera-based assessments), video-polysomnography assessment, as well as faecal and blood sample collection. Of note, the team has developed a comprehensive smartphone-based digital assessment 'SmartBrain' to capture the early subtle motor and non-motor features of neurodegeneration, which contains digitalised tests that assess psychomotor, cognitive, impulsivity, motor, voice and facial expression functions. Initial validation in controls and PD patients showed that most of the tests had fair-to-strong correlations with the traditional assessments, and also presented good-to-excellent test-retest reliability.

In addition, novel biological markers have been discovered for early stages of neurodegenerative alpha-synucleinoapthies, including microbial markers, genetic factors, inflammatory and proteomic markers. For example, a case-control gut metagenomics study on patients with depression comorbid with RBD (MDD+RBD), depression-only (MDD-only), and healthy controls (HC) revealed that proinflammatory Eggerthella lenta and Collinsella aerofaciens were potential biomarkers for MDD+RBD group. In addition, gut microbiome and gastrointestinal features are capable to distinguish MDD+RBD from MDD-only subjects with an AUC of 0.80 (sensitivity of 87.7% and specificity of 72.4%). Peripheral blood mononuclear cell (PBMC) RNA sequencing in 120 subjects identified 43 upregulated and 43 downregulated differentially expressed genes (DEGs) in patients with parkinsonism, including NLRP3, IL12A, CXCL2, CD69, and ICAM1. Although the RBD group exhibited fewer inflammation-related DEGs, increases in IL2, CD69, and SIK1 were also observed, consistent with findings in the parkinsonism group. Pilot plasma proteomics analyses in 148 subjects totally identified 2114 proteins. Among these, 72 differential proteins were found in the RBD group, 153 in the PD group, and 33 in the RBD-FDR group. RBD patients displayed changes in proteins linked to abnormal aggregation/misfolding, such as *β-tubulin* and *ATP5F1B*, as well as proteasome function, including *PSMD2*, *PSMD7*, and *PSMB2*. Likewise, PD patients exhibited increases in *PSMD14* and *MAP3K5* compared to controls, aligning with pathways implicated in PD. Finally, whole exome sequencing in 63 RBD families revealed that rare nonsynonymous variants in the genes *VPS13C* (rs76341351 and rs375711746), *SYBU* (rs748101787 and rs141149968), and *SPPL2B* (rs78751031) may be associated with the familial RBD.

The team's research achievements have also gained extensive international recognitions. Yun Kwok was invited to give lecture titled "Digital Phenotyping of Rapid Eye Movement (REM) Sleep Behaviours Disorder (RBD) and its Prediction towards α-Synucleinopathy" on International RBD Study Group (IRBDSG) meeting 2024. In addition, Yun Kwok was invited for organising an RBD symposium in the Asian Society of Sleep Medicine (ASSM) interim meeting in Tokyo in October 2024, and Bei Huang was invited to deliver a speech on "Gut microbiota: a missing link in REM sleep behaviour disorder and synucleinopathy" at the same conference. Also, the team is working closely with international researchers/study groups, Yun Kwok and Shi are collaborating with Jean-François Gagnon from Université du Québec à Montréal for a large-scale neuroimaging study in patients with RBD and identify two distinct biotypes of RBD that may suggest different neurodegenerative progression (under review by *npj Parkinson's Disease*). Additionally, Yun Kwok and Siyi discovered that long COVID participants are at risk for having prodromal PD symptoms, and the emergence or exacerbation of post-infection RBD features further enhanced the potential risk in long COVID, the manuscript was collaborated with the International COVID-19 Sleep Study (ICOSS) (under review by *Movement Disorders*).

Research and Scholarship

Research Awards and Recognitions

Name	Details	
	Award	Organisation
Yuhua Yang	Travel grant (for poster) winner	The International REM sleep behavior disorder study group, Oxford, UK 2024
Sudan Zhu	CUHK Vice-Chancellor's PhD Scholarship Scheme	Graduate School, The Chinese University of Hong Kong

Academic Editorships

Name	Details	
	Role	Journal
Yun Kwok Wing	Editorial Board Member	Journal of Sleep Research, UK
		Sleep Science and Practice, USA
	Deputy Editor	Sleep Medicine Research, Korea
	Associate Editor	Behavioral Sleep Medicine, USA

Reviewers of Journal / Conference

Name	Details	
	Role	Journal / Conference
Bei Huang	Reviewer	Nature Communications
		Cell Reports Medicine
Shi Tang	Reviewer	Molecular Psychiatry
Yun Kwok Wing	Reviewer	Cell Reports Medicine
		Computers in Human Behavior
		eBioMedicine
		Journal of Affective Disorders

Reviewers of Journal / Conference

Name	Details	
	Role	Journal / Conference
Yun Kwok Wing	Reviewer	Journal of Clinical Neuroscience
		Sleep Health
		Sleep Medicine Reviews
		Sleep Medicine
		The Innovation
	Strategic Planning Committee Member	World Sleep Society
	Program Committee Member	World Sleep 2025 Conference

Grants and Consultancies

Name	Project Title	Funding Source	Start Date (dd/mm/yyyy)	End Date (dd/mm/yyyy)	Amount (HK$)
Yun Kwok Wing	Multi-modal Approaches to Determine Digital Clinical Phenotyping, Novel Proteomic Biomarkers, and Microbiota-host Responses of REM Sleep Behavior Disorder, a Prodromal Stage of Alpha-synucleinopathy Neurodegeneration, in a Prospective Family Cohort	Research Grants Council – Collaborative Research Fund	01/06/2022	30/06/2026	7,214,620
	Digital Mental Health in Depression – Deep Phenotyping and Monitoring	Health Bureau – Health and Medical Research Fund	04/07/2022	02/07/2025	1,491,604
	Multimodal Brain Connectomics Markers of Idiopathic Rapid Eye Movement (REM) Sleep Behavior Disorder and Their Prediction Towards α-Synucleinopathy	Health Bureau – Health and Medical Research Fund	10/06/2023	09/06/2026	1,486,340
	Altered Impulsivity in the Progression of Early Synucleinopathies: A 3-year Prospective Follow-up Study	Health Bureau – Health and Medical Research Fund	14/06/2024	30/11/2026	1,472,870

Grants and Consultancies

Name	Project Title	Funding Source	Start Date (dd/mm/yyyy)	End Date (dd/mm/yyyy)	Amount (HK$)
Yun Kwok Wing	Family-based Association Study in Idiopathic Rapid Eye Movement Sleep Behavior Disorder: A Two-Phase Study Using Whole Exome Sequencing	Research Grants Council – General Research Fund	01/01/2023	30/06/2025	1,327,746
	Colonic Dysfunction and Gut Microbiome Dysbiosis at Prodromal Alpha-synucleinopathy – Towards a Better Understanding of Aetiology and Pathogenesis	Health Bureau – Health and Medical Research Fund	01/08/2024	31/01/2027	1,436,900
	A Randomized Placebo-controlled Trial for Adjunctive Bright Light Therapy in Patients with Bipolar Depression and Eveningness	Research Grants Council – General Research Fund	01/01/2022	31/12/2024	887,716
	Randomized Placebo- and Active-controlled Trial for Assessing the Efficacy of Bright Light Therapy for Sleep and Mood Symptoms in Patients with Parkinson's Disease	Health Bureau – Health and Medical Research Fund	01/08/2022	31/07/2025	1,413,200
	Prevention of Insomnia in at-risk Youth: A Randomized Controlled Trial Comparing Cognitive Behavioral Prevention Program for Insomnia with Active Control Condition	Research Grants Council – General Research Fund	01/01/2022	31/12/2024	1,005,012
	Effect of a Smartphone-based, Mood-enhanced Cognitive Behavioral Therapy for Insomnia in Adolescents at Risk of Depression: A Cluster Randomized Trial	Health Bureau – Health and Medical Research Fund	01/01/2023	30/04/2026	1,316,510

Grants and Consultancies

Name	Project Title	Funding Source	Start Date (dd/mm/yyyy)	End Date (dd/mm/yyyy)	Amount (HK$)
Yun Kwok Wing	Multimodal Digital Speech Analysis for Detection of Depressive Symptomatology in Youth	Health Bureau – Health and Medical Research Fund	01/09/2024	28/02/2027	1,388,728
	Efficacy of Digital Cognitive Behavioral Therapy for Insomnia (CBT-I) with Artifical Intelligence Chatbot for Youth with Insomnia: An Assessor-blind, Randomized Controlled Trial	Research Grants Council – General Research Fund	01/06/2024	30/06/2026	1,148,000
	An Intelligent Coaching System for Insomnia: Towards the Next-generation Digital Intervention	Innovation and Technology Commission – Innovation and Technology Support Programme	01/01/2024	31/12/2025	1,339,430

Publications

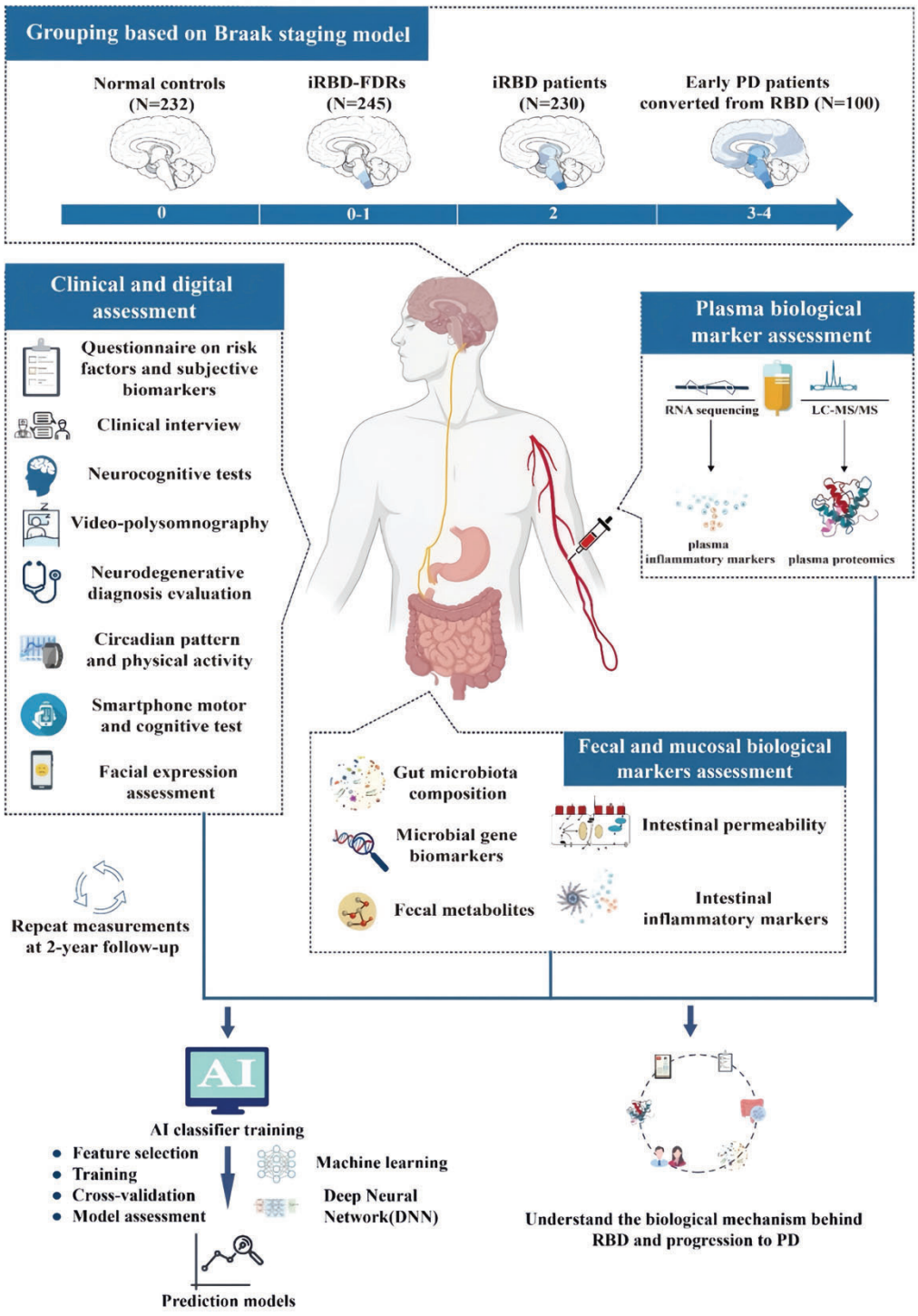
A. Journal Papers

1. Yau CN, Hung JTS, Campbell RAA, Wong TCY, Huang B, Wong BTY, Chow NKN, Zhang L, Tsoi EPL, Tan Y, Li JJX, Wing YK, Lai HM. INSIHGT: An accessible multi-scale, multi-modal 3D spatial biology platform. *Nature Communications*. 2024;15(1):10888. doi:10.1038/s41467-024-55248-0.
2. Wang J, Huang B, Zhou L, Tang S, Feng H, Chan JWY, Chau SWH, Zhang J, Li SX, Mok V, Wing YK, Liu Y. Visuospatial dysfunction predicts dementia-first phenoconversion in isolated REM sleep behaviour disorder. *Journal of Neurology, Neurosurgery and Psychiatry*. Published online December16, 2024. doi:10.1136/jnnp-2024-333865. (Epub ahead of print)
3. Yang Y, Wang J, Zhou L, Liu Y, Tang S, Gong S, Li N, He Z, Ni J, Chan JWY, Chau SWH, Wing YK, Huang B. Sleep related injury and its correlates in isolated rapid eye movement sleep behaviour disorder. *Sleep Medicine*. 2025;126:9-18. doi:10.1016/j.sleep.2024.11.032. (Epub ahead of print)

B. Conference Papers

1. Huang B, Yang Y, Zhou Li, Wang J, Tang S, Gong S, Liu Y, Chan JWY, Chau SWH, Chen Z, Wing YK. Gut metagenomes of patients with REM sleep behaviour disorder: A 3-year longitudinal study. *International RBD Study Group (IRBDSG) Meeting 2024*, 2024 June 19-20, Oxford, UK
2. Yang Y, Huang B, Zhou L, Tang S, Liu Y, Chan JWY, Chau SWH, Wang J, Wing YK. Gut microbiota in major depressive disorders with and without Rapid Eye Movement Behavior Disorder: Tracing a subtype of depression with underlying neurodegeneration. *International RBD Study Group (IRBDSG) Meeting 2024*, 2024 June 19-20, Oxford, UK

3. Huang B, Chau SWH, Liu Y, Chan JWY, Wang J, Ma SL, Zhang J, Chen Z, Zhou L, Wing YK. Gut microbiome dysbiosis across prodromal and early stages of Parkinson's disease. *Health Research Symposium 2024*, 26 November 2024, Hong Kong.



Abbreviations: iRBD: isolated Idiopathic/isolated REM sleep behaviour disorder; FDRs: first-degree relatives

Source: Flowchart of Collaborative Research Fund (CRF Ref No: C4044-21G, PC: Prof WING Yun Kwok) titled: "Multi-modal approaches to determine digital clinical phenotyping, novel proteomic biomarkers, and microbiota-host responses of REM sleep behaviour disorder, a prodromal stage of alpha-synucleinopathy neurodegeneration, in a prospective family cohort".



Neuroscience and Neurotechnology

Neurodegenerative Disease

神經科學及神經技術

PRINCIPAL INVESTIGATOR | **Bei Huang**

TEAM MEMBERS | Shi Tang, Yuhua Yang, Siyi Gong, Ningning Li, Jianzhang Ni, Zhixuan He, Sudan Zhu, Yonglong Ye, Bo Li

Research Progress Summary

Bei Huang and her team centres on the early identification and monitoring of at-risk populations for neurodegenerative disease, and searching for novel biomarkers and therapeutic targets for individuals at prodromal stages of Parkinson's disease (PD) as well as other alpha-synucleinopathy neurodegeneration, including patients with REM sleep behaviour disorder (RBD) and their first-degree relatives (RBD-FDR).

Over the past few years, the team has first reported similar changes in the gut microbiome among patients with RBD, RBD-FDR and early PD patients, and discovered novel microbial markers that could facilitate further screening for prodromal neurodegeneration in both clinical and community settings. With the support of the Collaborative Research Fund, the team has expanded its microbiome research to a larger group of at-risk individuals, conducting in-depth investigations into areas such as gut metagenomics, gut metabolomics, nasal microbiome, intestinal inflammation, mucosal microbiota and staining of pathological alpha-synuclein aggregates in the colons of RBD and RBD-FDR. On

the other hand, the team is also in the validation of a mobile app-based survey (with comprehensive and simplified questionnaires) for screening at-risk populations of neurodegeneration (i.e., subjects with possible prodromal PD) and exploring the associations of neurodegenerative risk with lifestyle, mental and environmental factors in the Hong Kong community. The ultimate goal of this study is to estimate the preliminary prevalence of at-risk Parkinson's disease and establish a pilot high-risk cohort of prodromal PD in Hong Kong community.

Additionally, Bei and her team are particularly interested in understanding why alpha-synucleinopathy originates in the gut and that constipation is one of the earliest markers of PD. They were funded for a study involving constipated RBD and controls with constipation from the community, to explore differences in both subjective and objective constipation symptoms (e.g., colon transit test) and gut microbiome variations between these two groups. Their work aims to enhance the understanding of disease pathophysiology and identify prodromal alpha-synucleinopathy neurodegeneration even earlier than RBD. Finally, based on their research findings related to the gut microbiome, Bei is the inventor of a US Patent (US 18/443,879.) titled "Early detection and intervention of at-risk subjects for prodromal Parkinson's disease", filed on 16 February, 2024. This invention outlines compositions and methods for the early detection of prodromal PD and early medical interventions for treatment and prevention among individuals at risk.

Recently, the research team found that visuospatial dysfunction occurs in individuals with REM sleep behaviour disorder (RBD) and can predict the dementia-first phenoconversion of RBD. The modified posterior subscore of the Montreal Cognitive Assessment (MoCA) demonstrated the highest discriminative power in this regard. These findings suggest that the modified posterior MoCA score could serve as a potential biomarker for clinical prognostic predictions and for neuroprotective trials aimed at delaying or preventing dementia in patients with RBD. In addition, the team conducted a retrospective cohort study to evaluate factors associated with sleep-related injury (SRI) and persistent SRI (pSRI) in patients with RBD. The data revealed that SRI is prevalent in RBD, occurring in 83% of patients, while 18% experienced pSRI despite intensive treatment, highlighting the critical importance of bedside safety. Moreover, depression, alcohol consumption, and increased muscle activity were identified as risk factors for SRI. In contrast, frequent nightmares, adult-onset sleepwalking, and restless leg syndrome were associated with pSRI. These results emphasise the need for systematic clinical screening and targeted interventions for at-risk patients.

The research accomplishments of the team have received significant international recognition. Bei was invited to give a lecture titled "Gut Microbiota: A Missing Link in REM Sleep Behaviour Disorder and Synucleinopathy." at the Asian Society of Sleep Medicine (ASSM) interim meeting in Tokyo in October 2024, and a lecture titled "Epidemiology of narcolepsy - current status and reflections" at the 4th Asian Narcolepsy and Hypersomnia Society (ANHS) Meeting in Beijing in November 2024. In addition, the team is collaborating closely with international researchers and study groups. Bei is working with Matteo Cesari and Ambra Stefani from the Medical University of Innsbruck on a special issue in the *Journal of Sleep Research* titled "REM sleep behaviour disorder - is screening possible?" (In preparation). Also, Shi Tang is collaborating with Jean-François Gagnon from Université du Québec à Montréal for a large-scale neuroimaging study in patients with RBD and identify two distinct biotypes of RBD that may suggest different neurodegenerative progression (under review by *npj Parkinson's Disease*), and Siyi Gong found that participants with long COVID are at an increased risk for experiencing prodromal PD symptoms, with the emergence or worsening of post-infection RBD symptoms further heightening this risk. This manuscript is being prepared in collaboration with the International COVID-19 Sleep Study (ICOSS) and is under review by *Movement Disorders*.

Research and Scholarship

Research Awards and Recognitions

Name	Details	
	Award	Organisation
Yuhua Yang	Travel Grant (for poster) Winner	The International REM Sleep Behaviour Disorder Study Group, Oxford, UK 2024
Sudan Zhu	The Chinese University of Hong Kong Vice-Chancellor's Scholarship	Graduate School, The Chinese University of Hong Kong

Reviewers of Journal / Conference

Name	Details	
	Role	Journal / Conference
Bei Huang	Reviewer	Nature Communications
		Cell Reports Medicine
Shi Tang	Reviewer	Molecular Psychiatry

Grants and Consultancies

Name	Project Title	Funding Source	Start Date (dd/mm/yyyy)	End Date (dd/mm/yyyy)	Amount (HK$)
Bei Huang	Colonic Dysfunction and Gut Microbiome Dysbiosis at Prodromal Alpha-synucleinopathy – Towards a Better Understanding of Aetiology and Pathogenesis	Health Bureau – Health and Medical Research Fund	01/08/2024	31/01/2027	1,436,900
	Alterations of Nasal Microbiome Across Early Parkinson's Disease, REM Sleep Behaviour Disorder and Their First-Degree Relatives	The Chinese University of Hong Kong Research Committee – Direct Grant	30/06/2024	29/06/2025	150,000
	Multi-modal Approaches to Determine Digital Clinical Phenotyping, Novel Proteomic Biomarkers, and Microbiota-host Responses of REM Sleep Behavior Disorder, a Prodromal Stage of Alpha-synucleinopathy Neurodegeneration, in a Prospective Family Cohort	Research Grants Council – Collaborative Research Fund	01/06/2022	30/06/2026	7,214,620
	Altered Impulsivity in the Progression of Early Synucleinopathies: A 3-year Prospective Follow-up Study	Health Bureau – Health and Medical Research Fund	14/06/2024	30/11/2026	1,472,870

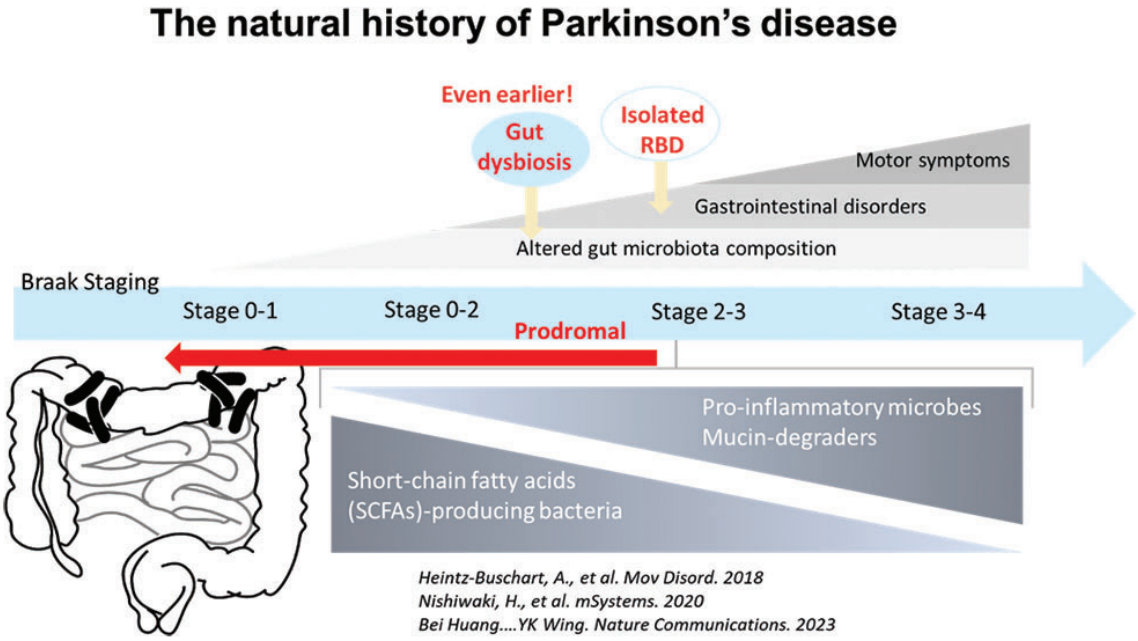
Publications

A. Journal Papers

1. Yau CN, Hung JTS, Campbell RAA, Wong TCY, Huang B, Wong BTY, Chow NKN, Zhang L, Tsoi EPL, Tan Y, Li JJX, Wing YK, Lai HM. INSIHGT: An accessible multi-scale, multi-modal 3D spatial biology platform. *Nature Communications*. 2024;15(1):10888. doi:10.1038/s41467-024-55248-0.
2. Wang J, Huang B, Zhou L, Tang S, Feng H, Chan JWY, Chau SWH, Zhang J, Li SX, Mok V, Wing YK, Liu Y. Visuospatial dysfunction predicts dementia-first phenoconversion in isolated REM sleep behaviour disorder. *Journal of Neurology, Neurosurgery and Psychiatry*. Published online December 16, 2024. doi:10.1136/jnnp-2024-333865. (Epub ahead of print)
3. Yang Y, Wang J, Zhou L, Liu Y, Tang S, Gong S, Li N, He Z, Ni J, Chan JWY, Chau SWH, Wing YK, Huang B. Sleep related injury and its correlates in isolated rapid eye movement sleep behaviour disorder. *Sleep Medicine*. 2025;126:9-18. doi:10.1016/j.sleep.2024.11.032. (Epub ahead of print)

B. Conference Papers

1. Huang B, Yang Y, Zhou L, Wang J, Tang S, Gong S, Liu Y, Chan JWY, Chau SWH, Chen Z, Wing YK. Gut metagenomes of patients with REM sleep behaviour disorder: A 3-year longitudinal study. In: International RBD Study Group (IRBDSG) meeting 2024, June 19-20.
2. Yang Y, Huang B, Zhou L, Tang S, Liu Y, Chan JWY, Chau SWH, Wang J, Wing YK. Gut microbiota in major depressive disorders with and without rapid eye movement behaviour disorder: Tracing a subtype of depression with underlying neurodegeneration. In: International RBD Study Group (IRBDSG) meeting 2024, June 19-20, Oxford, UK.
3. Huang B, Chau SWH, Liu Y, Chan JWY, Wang J, Ma SL, Zhang J, Chen Z, Zhou L, Wing YK. Gut microbiome dysbiosis across prodromal and early stages of Parkinson's disease. In: Health Research Symposium 2024, Nov 26 2024, Hong Kong.



PD-like gut dysbiosis occurs at the prodromal stages of Parkinson's disease (PD) when REM sleep behaviour disorder (RBD develops and starts to emerge in the younger first-degree relatives of patients with RBD (RBD-FDR) subjects.

Source: A presentation slide showcasing research area by Bei Huang



Neuroscience and Neurotechnology

Computational Neuroscience

神經科學及神經技術

PRINCIPAL INVESTIGATOR | **Petrina Lau**

TEAM MEMBERS | Sabrina Perrenoud, Jacky Hung, Haoming Zhao

Research Progress Summary

This year has been a significant period of transition as **Petrina Lau** relocated back to Hong Kong and focused on establishing her own research team while continuing to manage ongoing projects at University College London. Since joining the Department of Psychiatry, Petrina has been invited to deliver several public presentations to diverse audiences, including clinicians, students, and neuroscientists. She also participated in notable scientific conferences, such as the Computational Cognitive Neuroscience Conference, where she expanded her professional network and kept abreast of the latest developments in the field.

A major focus this year has been building and strengthening collaborations both locally and internationally. Locally, Petrina has partnered with the Microbiome I-Center (MagIC) to investigate gut-brain interactions. In collaboration with Sandra Chan and with the support of the HATCH Foundation, Petrina's team is initiating projects to study the biological

mechanisms underlying autism spectrum disorders (ASD) and other mental illnesses. Additionally, she is working with clinician Oscar Wong, to utilise electronic health records and interview notes to stratify ASD patients into refined subgroups for targeted research.

Internationally, she is actively establishing herself as part of the next generation of researchers within global neuroscience collaborations, such as the International Brain Laboratory. These efforts aim to foster interdisciplinary and cross-institutional partnerships that align with her research interests and contribute to advancing the field.

Through these initiatives, she aims to make meaningful contributions to academic knowledge and practical applications, particularly in understanding and addressing neuropsychiatric disorders. She looks forward to leveraging these collaborations and activities to drive impactful research and knowledge transfer.

Research and Scholarship

Research Awards and Recognitions

Name	Details	
	Award	Organisation
Petrina Lau	Starting Aware Fair & Equitable Labs Young Investigator Award	University College London, UK

Fellowships

Name	Details	
	Fellowship	Organisation
Petrina Lau	Research Fellow	International Brain Laboratory

Reviewers of Journal / Conference

Name	Details	
	Role	Journal / Conference
Petrina Lau	Reviewer	Asia-Pacific Psychiatry

Publications

A. Journal Papers

1. Noel JP, Balzani E, Acerbi L, Benson J, International Brain Laboratory, Savin C, Angelaki D. A common computational and neural anomaly across mouse models of autism. *bioRxiv.* 2024. doi:10.1101/2024.05.08.5932320. (Epub ahead of print)



The illustration represents the aspirations of Petrina Lau's research team. A figure stands on a ladder, engaging with colourful interlocking gears using both a wrench and a magnifying glass, symbolising the dual focus of their work: understanding and repairing brain function. The ladder and magnifying glass extending beyond a drawn boundary signify their determination to push the frontiers of scientific discovery. Their ultimate aim is to develop interventions to address neurological and psychiatric pathologies while also advancing their understanding of human brain function and cognition. The investigator's tools — the wrench and magnifying glass — symbolise the balance between exploration and repair, reflecting their aim to create translational approaches that bridge fundamental neuroscience research with clinical applications.

Even in an emotionally stable state, as shown by the profile of the human head, the brain exhibits dynamic neural circuit interactions — both within itself and with other parts of the body. These interactions extend to external stimuli, such as internal stressors and environmental factors. The interlocking gears represent the dynamic and interconnected nature of brain activity and mental processes, while the straps extending from the head highlight the brain's connections to the rest of the body. One of their research areas is the gut-brain interaction, reflecting this holistic approach. The different sizes of the gears emphasise their commitment to multiscale research, spanning molecular mechanisms to systemic interactions.

The use of gears, borrowed from engineering, underscores the importance of cross-disciplinary research in their lab. The artistic design highlights precision, mechanics, and the interplay between biology and engineering, reflecting their efforts to integrate systems neuroscience, computational modelling, molecular, and genetic tools. Together, these approaches aim to enhance their understanding of biological systems and drive the development of therapeutic interventions. This illustration encapsulates their mission to study the brain as an integral part of a larger, interconnected system and to bridge the divide between fundamental research and clinical practice.

Source: Petrina Lau



Reproduction and Development
生殖與發育研究

PRINCIPAL INVESTIGATOR | **Ronald Wang**

TEAM MEMBERS | Judy Zhang, Max Wang, Tat San Lau, Nina Chu, Maran Leung, Yi Song, Kennes Hung, Lai Kwan Lam, Bekalu Kassie Alemu, Alemu Degu Ayele, Getnet Gedefaw Azeze, Iris Chen, Qingyang Chen, Junshang Dai, Olena Getsko, Yang Ding, Helen Gong, Meilan Mo, Yue Shi, Yifan Tu, Jinjiang Wang, Hanbin Wu, Feng Xiong, Qianhan Xu, Kemin Yan, Ruqun Zheng, Xu Zheng, Michelle Yeung

Research Progress Summary

Ronald Wang and his team from the Department of Obstetrics & Gynaecology (O&G) focus on the field of reproduction and development. The team cover a wide spectrum of clinical, basic and genetic studies of female and male reproduction, and embryo and fetal development in humans and mice. The team has many intradepartmental (TY Leung in fetal medicine and prenatal diagnosis; Liona Poon in maternal medicine; Jacqueline Chung in assisted reproductive technology), interdepartmental within the Faculty of Medicine (Simon Lam in neonatology; Ronald Ma in diabetes; Huating Wang, Kathy Chan, Tong Leung, Anna Tsan in stem cells; Alisa Shum in developmental biology), intrainstitutional with Faculty of Sciences (KM Kwan in developmental biology; Martin Tsui in environmental pollutants), interuniversity (The University of Hong Kong, Ernest Ng and Raymond Li in Obstetrics & Gynaecology; and Hong Kong Polytechnic University, Thomas Leung and Bill Chan in drug development), many other regional, national and international research collaboration in the field.

Ronald has worked on many research projects. He received a total of over HK$111 million in research grants and owned 4 patents. He has published over 308 ISI articles in many acclaimed journals including *JAMA, Annals of Internal Medicine, Nature Cell Biology, Nature Communications, Genes & Development, Cell Research, Advanced Science, Proceedings of the National Academy of Sciences, Human Reproduction Update, Angiogenesis, Journal of Biological Chemistry, Free Radical Biology and Medicine, Molecular Human Reproduction, Human Reproduction,* and *Fertility and Sterility*. His success in O&G research has earned him multiple local and international scholarships and awards.

Research and Scholarship

Research Awards and Recognitions

Name	Details	
	Award	Organisation
Ronald Wang Gene Man Sze Wan Hung Kit Ying Chan Tao Zhang Liona Poon	Silicon Valley International Invention & Innovation Festival – SVIIF 2024 Gold Medal	Silicon Valley International Invention & Innovation Festival
Ronald Wang Gene Man Kit Ying Chan Tao Zhang Liona Poon	Silver Medal	International Exhibition of Inventions Geneva 2024
Ronald Wang Max Wang Yongkang Yang Qin Li Jiaming Wu Liona Poon Tin Chiu Li	Gold Medal	International Exhibition of Inventions Geneva 2024
Ronald Wang Gene Man Sze Wan Hung Kit Ying Chan Tao Zhang Yiwei Zhao	Silver Medal	International Invention Fair in the Middle East 2024

Fellowships

Name	Details	
	Fellowship	Organisation
Ronald Wang	Member	Center for Tissue Regeneration and Engineering, The Hong Kong University of Science and Technology
	Professor (Visiting)	Innovation Center of Yangtze River Delta Zhejiang University, Hangzhou
	Professor (Visiting)	Anhui Province Maternity & Child Health Hospital, Hefei
	Director	The Chinese University of Hong Kong – Sichuan University Joint Laboratory for Reproductive Medicine

Academic Editorships

Name	Details	
	Role	Journal
Ronald Wang	Editorial Board	Best Practice & Research Clinical Obstetrics & Gynaecology
		Clinical Endocrinology
	Associate Editor	Cell Press: Heliyon, section Clincial Resaerch
	Deputy Editor	Fertility & Reproduction

Reviewers of Journal / Conference

Name	Details	
	Role	Journal / Conference
Ronald Wang	Reviewer	British Journal of Obstetrics and Gynaecology
		Journal of Integrative Medicine
		Journal of Nutritional Biochemistry
		Animal Models and Experimental Medicine
		World Journal of Traditional Chinese Medicine
		Planta Medica
		Gynecological Endocrinology
		Phytomedicine
		Fertility and Sterility
		British Medical Journal Open
		Human Reproduction Open
		Reproductive BioMedicine Online
		Clinical and Translational Medicine
		Journal of Assisted Reproduction and Genetics
		IEEE Journal of Biomedical and Health Informatics
		Complementary Therapies in Medicine
		Journal of Complementary and Integrative Medicine
		Frontiers in Endocrinology
		BBA - Molecular Basis of Disease
		Antioxidants and Redox Signaling
		Human Reproduction

Grants and Consultancies

Name	Project Title	Funding Source	Start Date (dd/mm/yyyy)	End Date (dd/mm/yyyy)	Amount (HK$)
Ronald Wang	Compilation and Research of Traditional Chinese Medicine Literature on Gynecological Pain by Artificial Intelligence	Chinese Medicine Development Fund – Chinese Medicine Applied Studies and Research Funding Scheme	01/10/2024	31/05/2026	1,903,300
	Non-invasive, Real Time and High Resolution Enodmetrium Imaging by Optical Coherence Tomography (OCT) for Prediction of Pregnancy Outcomes in Infertility Women	Innovation and Technology Commission – Innovation and Technology Fund Public Sector Trial Scheme	01/09/2024	31/08/2026	1,490,995.70
	Unravelling the Enigma of Endometrioma-related Infertility: Integrating Single-nucleus and Spatial Transcriptomic Analysis of Ovarian Tissues From A Novel Endometrioma Model	The Chinese University of Hong Kong Research Committee – Direct Grant	01/06/2024	31/05/2025	50,000
	The Metagenomic Microbiome Profile of Breast Milk and Its Correlation with Neonatal Transcutaneous Bilirubin Level Among Pregnant Women Supplemented with Probiotics: An Interventional Observational Study	The Obstetrical and Gynaecological Society of Hong Kong – Hong Kong Obstetrical and Gynaecological Trust Fund	01/01/2024	31/12/2024	40,000
	Development of A Scalable Method for The Prediction of Preeclampsia Based on Circulating Cell-free RNA	The Obstetrical and Gynaecological Society of Hong Kong – Hong Kong Obstetrical and Gynaecological Trust Fund	30/06/2023	29/06/2024	50,000

Grants and Consultancies

Name	Project Title	Funding Source	Start Date (dd/mm/yyyy)	End Date (dd/mm/yyyy)	Amount (HK$)
Ronald Wang	Chinese Medicines for Endometriosis: Pharmaceutical Efficacy, Targets and Mechanisms	The Chinese University of Hong Kong – Strategic Seed Funding for Collaborative Research Scheme	01/09/2022	31/08/2024	300,000
	Stem Cell-niche Interactions in Tissue Maintenance and Engineering	Research Grants Council – Theme-based Research Scheme	01/01/2022	31/12/2026	66,438,000
	Disease Mechanism and Integrated Preventive Strategy of Preterm Preeclampsia Project 3: Multiomics and System Biology to Screen Biomarkers and Potential Target for Preeclampsia	Ministry of Science and Technology	01/12/2021	30/11/2025	854,415
	Epithelium Caveolin and Its Calcium Signaling Pathway in Endometrium of Recurrent Miscarriage	Research Grants Council – General Research Fund	01/09/2021	29/02/2024	775,732
	First Trimester Prediction and Prevention Preeclampsia	The Chinese University of Hong Kong – Strategic Impact Enhancement Fund	01/06/2024	31/05/2027	500,000
	Targeting Selenium for the Management of PCOS	The Obstetrical and Gynaecological Society of Hong Kong – Hong Kong Obstetrical and Gynaecological Trust Fund	01/01/2024	31/12/2024	40,000
	Research on Delivery-associated Circulating RNA Transcripts for Predicting a Successful Induction of Labour	Innovation and Technology Commission – Innovation and Technology Support Programme	01/10/2023	30/09/2025	989,305

Grants and Consultancies

Name	Project Title	Funding Source	Start Date (dd/mm/yyyy)	End Date (dd/mm/yyyy)	Amount (HK$)
Ronald Wang	中藥加味桂枝茯苓丸治療更年期綜合徵的臨床試驗研究和抗炎、全身體表溫度分佈影響的機理探討	Chinese Medicine Development Fund	01/06/2023	31/05/2025	1,941,885
	Phenotypic Characterization and Prediction Value of Endometrial NK Cell Subsets During the Window of Implantation in Women with Repeated Implantation Failure	Health Bureau – Health and Medical Research Fund	01/01/2023	31/12/2025	792,210
	PKM2/miRNA-122-5p/LncRNA-NEAT1 as New Signaling Pathway Mediating Autophage of Stromal Cells in Endometriosis. PKM2/miRNA-122-5p/LncRNA-NEAT1	National Natural Science Foundation of China	01/01/2023	31/12/2026	352,408
	Therapeutic Role of Mesenchymal Stem Cell-derived Exosomes in Premature Ovarian Failure	Innovation and Technology Commission – Innovation and Technology Fund	01/08/2022	31/07/2024	2,074,784
	Delineating the Role of Retrotransposons in Placenta Development and Disease	Research Grants Council – General Research Fund	01/01/2022	31/12/2024	1,277,532
	Studying the Functional Mechanism of YY1 in the Regulation of Glucose Metabolism in Pancreatic Beta Cells through O-GlcNAcylation	Research Grants Council – General Research Fund	01/01/2022	31/12/2024	1,325,732

Grants and Consultancies

Name	Project Title	Funding Source	Start Date (dd/mm/yyyy)	End Date (dd/mm/yyyy)	Amount (HK$)
Ronald Wang	Disease Mechanism and Integrated Preventive Strategy of Preterm Preeclampsia Project 4: Development of Drug Delivery System and New Application of Old Drug for Prevention and Treatment of Preeclampsia	Ministry of Science and Technology	01/12/2021	30/11/2025	6,941,415
	Use of Buscopan in Patients Undergoing IVF/ICSI Treatment with High and Low Uterine Contraction Frequency Prior to Embryo Transfer: A Prospective Double-blinded Randomized Controlled Trial	Health Bureau – Health and Medical Research Fund	15/09/2021	14/09/2024	1,083,551

Publications

A. Journal Papers

1. Li Y, Hung SW, Zheng X, Ding Y, Zhang T, Tan Z, Zhang R, Lin Y, Song Y, Wang Y, Wang CC. Melatonin inhibits endometriosis growth via specific binding and inhibition of EGFR phosphorylation. *Journal of Pineal Research*. 2024;76(8):e70022. doi:10.1111/jpi.70022.
2. Liu BHM, Liu M, Lin Y, Long X, Hung SW, Gaponova A, Ren F, Zhavoronkov A, Pun FW, Wang CC. Utilising AI for the identification and validation of novel therapeutic targets and repurposed drugs for endometriosis. *Advanced Science*. 2025;12(5):2406565. doi:10.1002/advs.202406565. (Epub ahead of print)
3. Huang JS, Gao C, Xiao WQ, Zhang XY, Zhong XW, Qin YQ, Lu MS, Zhang CH, Yang K, Liang JM, Wang CC, Ma RCW, He JR, Qiu X. Association of childhood obesity with pubertal development in boys: A systematic review and meta-analysis. *Obesity Reviews*. 2025;26(3):e13869. doi:10.1111/obr.13869. (Review) (Epub ahead of print)
4. Tam CHT, Wang Y, Wang CC, Yuen LY, Lim CKP, Leng J, Wu L, Ng ACW, Hou Y, Tsoi KY, Wang H, Ozaki R, Li AM, Wang Q, Chan JCN, Ye YC, Tam WH, Yang X, Ma RCW. Identification and potential clinical utility of common genetic variants in gestational diabetes among Chinese pregnant women. *Diabetes & Metabolism Journal*. 2024;49(1):128-143. doi:10.4093/dmj.2024.0139. (Epub ahead of print)
5. Chen L, Chan LKY, Wong SCY, Li JJX, Chung JPW, Wang CC, Li M, Zhang T. Measurement of four uterine NK cell subtypes using multiplexed fluorescent immunohistochemical staining in women with repeated implantation failure. *Journal of Visualized Experiments (JoVE)*. 2024;(212):e67284. doi:10.3791/67284.
6. Li X, Yi Y, Ren Y, Zhang Y, Wang CC, Liu C, Liu S, Zhan X, Yu X, Liang R. Zishen Qingre Lishi Huayu recipe may ameliorate the symptoms of PCOS model rats via alleviating systemic and ovarian inflammation. *American Journal of Reproductive Immunology*. 2024;92(2):e13918. doi:10.1111/aji.13918.

7. Alemu BK, Wang CC, Li L, Zhu Z, Li Q, Wang Y. Effect of preconception antibiotics exposure on female reproductive health and pregnancy outcomes: A systematic review and meta-analysis. *eClinicalMedicine*. 2024;78:102935. doi:10.1016/j.eclinm.2024.102935. (Review)

8. Alemu BK, Wondimagegn LY, Bazezew Y, Liyeh TM, Muluneh AA, Mihretie GN, Sema A, Endalifer ML, Azeze GG, Woldeamanuel GG, Tlaye KG, Lee WF, Wang Y, Wang CC. Breast milk application as a natural method for umbilical cord care: A community-label 3-arm pilot clinical trial. *Maternal-Fetal Medicine*. 2024;6(4):203-210. doi:10.1097/fm9.0000000000000243.

9. Alemu BK, Wu L, Azeze GG, Lau SL, Wang Y, Wang CC. Microbiota-targeted interventions and clinical implications for maternal-offspring health: An umbrella review of systematic reviews and meta-analyses of randomised controlled trials. *Journal of Global Health*. 2024;14:04177. doi:10.7189/jogh.14.04177. (Review)

10. Azeze GG, Wu L, Alemu BK, Lee WF, Fung LWY, Cheung ECW, Zhang T, Wang CC. Proteomics approach to discovering non-invasive diagnostic biomarkers and understanding the pathogenesis of endometriosis: A systematic review and meta-analysis. *Journal of Translational Medicine*. 2024;22(1):1-19. doi:10.1186/s12967-024-05474-3. (Review)

11. Yi BJ, Wang CC, Li XW, Xu YR, Ma XY, Jian PA, Talukder M, Li XN, Li JL. Lycopene protects against atrazine-induced kidney STING-dependent PANoptosis through stabilizing mtDNA via interaction with Sam50/PHB1. *Journal of Agricultural and Food Chemistry*. 2024;72(26):14956-14966. doi:10.1021/acs.jafc.4c02820.

12. Liang B, Dong R, Hung SW, Li Y, Lin Y, Wu L, Zhang T, Man GCW, Xu H, Chung JPW, Wang CC. Unique anti-angiogenic effects, pharmacological targets and therapeutic mechanisms of Chinese herbal medicines for endometriosis. *Genes & Diseases*. 2024;11(5):101166. doi:10.1016/j.gendis.2023.101166. (Editorial)

13. Azeze GG, Wu L, Alemu BK, Wang CC, Zhang T. Changes in the number and activity of natural killer cells and its clinical association with endometriosis: Systematic review and meta-analysis. *F&S Reviews*. 2024;5(2):100072. doi:10.1016/j.xfnr.2024.100072. (Review)

14. Hu H, Ma J, Peng Y, Feng R, Luo C, Zhang M, Tao Z, Chen L, Zhang T, Chen W, Yin Q, Zhai J, Chen J, Yin A, Wang CC, Zhong M. Thrombospondin-1 regulates trophoblast necroptosis via NEDD4-mediated ubiquitination of TAK1 in preeclampsia. *Advanced Science*. 2024;11(21):2309002. doi:10.1002/advs.202309002.

15. Tan Z, Yeung TC, Ding Y, Wang CC. Establishment of an experimental mouse model of endometrioma to study its related infertility. *Journal of Visualized Experiments*. 2024;2024(206):e66240. doi:10.3791/66240.

16. Xie H, Zhang A, Li J, Mou X, He T, Yeung TC, Lau CBS, Zuo Z, Li P, Kennelly EJ, Leung PC, Tang Y, Fan X, Wang CC, Li L. Cycasin derivative: A potential embryotoxic component of *Atractylodes macrocephala* rhizome for limb malformation. *Toxicology Research*. 2024;13(2). doi:10.1093/toxres/tfae057.

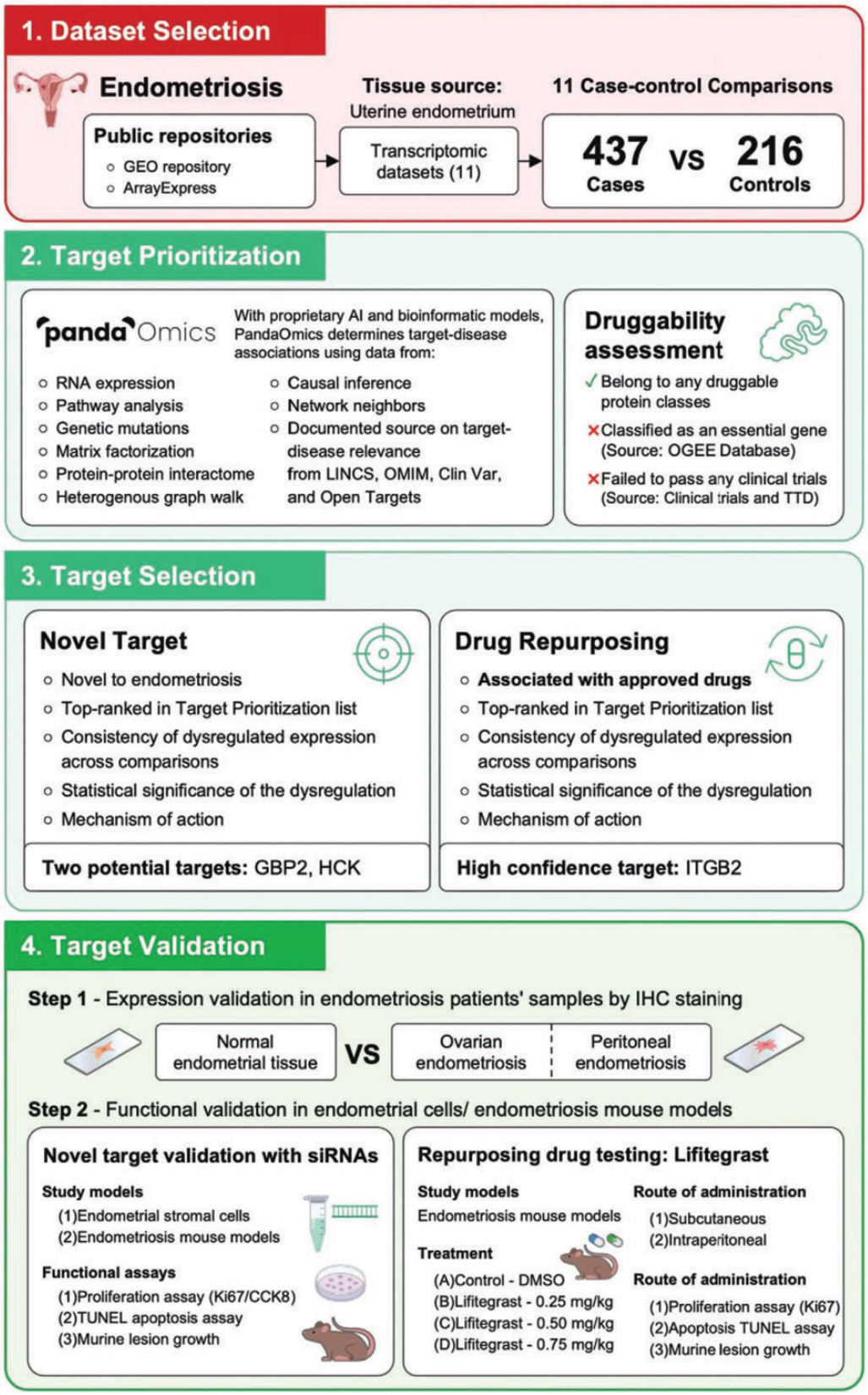
17. Li XW, Guo K, Wang CC, Yang Y, Li W, Talukder M, Li XN, Li JL. The Nrf2/ARE pathway as a potential target to ameliorate atrazine-induced endocrine disruption in granulosa cells. *Poultry Science*. 2024;103(6):103730. doi:10.1016/j.psj.2024.103730.

18. Man GCW, Zheng X, Hung SW, Chan LKY, Zhang T, Chen X, Chu KO, Huen ICY, Lui DWY, Wong AD, Wang CC. Antiviral effects and mechanisms of green tea catechins on influenza: A perception on combating symptoms from COVID-19. *Current Topics in Medicinal Chemistry*. 2023;24(1):60-73. doi:10.2174/0115680266251803230925075508. (Review)

19. Hung SW, Gaetani M, Li Y, Tan Z, Zheng X, Zhang R, Ding Y, Man GCW, Zhang T, Song Y, Wang Y, Chung JPW, Chan TH, Zubarev RA, Wang CC. Distinct molecular targets of ProEGCG from EGCG and superior inhibition of angiogenesis signaling pathways for treatment of endometriosis. *Journal of Pharmaceutical Analysis*. 2024;14(1):100-114. doi:10.1016/j.jpha.2023.09.005.

B. Book Chapter

1. Song Y, Liu Y, Xu Q, Leung KT, Chan LKY, Chung JPW, Wang CC, Chen X, Zhang T, Man GCW. Isolation of myeloid-derived suppressor cells (MDSC) from endometriotic mice model and their immunomodulatory functions. *Methods in Cell Biology*. 2024;184:33-57. doi:10.1016/bs.mcb.2023.04.004.



Identifying and validating therapeutic targets and repurposing drugs for endometriosis using artificial intelligence.

Source: Liu BHM, Liu M, Lin Y, Long X, Hung SW, Gaponova A, Ren F, Zhavoronkov A, Pun FW, Wang CC. Utilising AI for the identification and validation of novel therapeutic targets and repurposed drugs for endometriosis. Advanced Science. 2025;12(5):2406565. doi:10.1002/advs.202406565.



Reproduction and Development

Gestational Microbiome; Endocrinology

生殖與發育研究

PRINCIPAL INVESTIGATOR | **Max Wang**

TEAM MEMBERS | Lai Kwan Lam, Jie Bai, Bekalu Kassie Alemu, Ruqun Zheng, Yue Shi

Research Progress Summary

In the past year, **Max Wang's** research has focused on advancing maternal and neonatal health through innovative approaches such as biomarker discovery, microbiome-targeted therapy, and wearable technologies.

His work on soluble PD-L1 as a biomarker for miscarriage earned a U.S. patent (US Serial No. 63/518.903) and was awarded a Gold Medal at the 2024 Geneva International Invention Awards. For fetal health, they have published 3 meta-analysis in *J Glob Health* (2024), *eClinicalMedicine* (2024), and *AJOG Maternal-Fetal Medicine* (2023) to uncover the importance of probiotic in pregnancy outcomes. They also initiated a randomised double-blind placebo-controlled clinical trial to evaluate the effect of probiotic supplements to the mother during pregnancy on neonatal hyperbilirubinemia (POPS trial, NCT06087874). In addition, they have collaborated and accessed a retrospective data analysis from the largest cohort (n=3542 mother-infants pairs) database in Canada, Canadian Healthy Infants Longitudinal Development (CHILD) Cohort and a Hong Kong local prospective birth cohort SMARTGenHK (n=120, NCT03785093). This project seeks to redefine neonatal care by promoting evidence-based microbiome interventions.

Max has delivered over 20 invited presentations at international and national conferences, including IEEE BioCAS 2024, where he co-chaired sessions on wearable health technologies. These engagements have allowed him to share his findings with a broader audience while fostering collaborations with experts worldwide. His team has also presented research at forums such as the Asia-Pacific Maternal-Fetal Medicine Symposium, where their work on the microbiome and neonatal outcomes received significant attention.

He has established strong partnerships with prestigious institutions such as the Karolinska Institute (Sweden), the National University of Singapore, and the University of Alberta. Domestically, he collaborates with hospitals and universities across China, including the Maternal and Child Health Hospital of Guangxi Zhuang Autonomous Region and Guangzhou University of Chinese Medicine. These collaborations have facilitated the exchange of expertise and resources, strengthening the impact of his research.

Research and Scholarship

Research Awards and Recognitions

Name	Details	
	Award	Organisation
Max Wang	Reception for Innovation & Technology Awards 2024	Hong Kong Innovation and Technology Commission
	Golden Medal of 49th International Exhibition of Inventions Geneva (IEIG)	World Intellectual Property Organization and the International Federation of Inventors' Associations

Fellowships

Name	Details	
	Fellowship	Organisation
Max Wang	Health and Medical Research Fellowship	Health Bureau, the Government of the Hong Kong Special Administrative Region

Academic Editorships

Name	Details	
	Role	Journal
Max Wang	Guest-editor	Biomedicines Special Issue (2024)

Reviewers of Journal / Conference

Name	Details	
	Role	Journal / Conference
Max Wang	Reviewer	Nature Communication
		Diabetes Care
		Gut Microbes
		American Journal of Obstetrics and Gynecology
		Journal of Translational Medicine

Grants and Consultancies

Name	Project Title	Funding Source	Start Date (dd/mm/yyyy)	End Date (dd/mm/yyyy)	Amount (HK$)
Max Wang	Faculty Postdoctoral Fellowship Scheme (FPFS) 2023/24	The Chinese University of Hong Kong, Faculty of Medicine – Faculty Postdoctoral Fellowship Scheme	01/11/2024	31/10/2025	250,000
	Explore the Therapeutic Effects of Xylaria Nigripes in Metabolic Disorders	浙江佐力藥業股份有限公司	01/06/2024	30/06/2026	53,396
	International Joint Supervision of PhD Students Scheme with Karolinska Institute	The Chinese University of Hong Kong	31/08/2024	30/08/2027	648,000
	Internationlisation Faculty Mobility Scheme (Outbound) in National University of Singapore	The Chinese University of Hong Kong	29/05/2024	05/06/2024	20,000
	Next Generation Preeclampsia Screening and Management	The Chinese University of Hong Kong – Strategic Impact Enhancement Fund	08/05/2024	07/05/2026	500,000

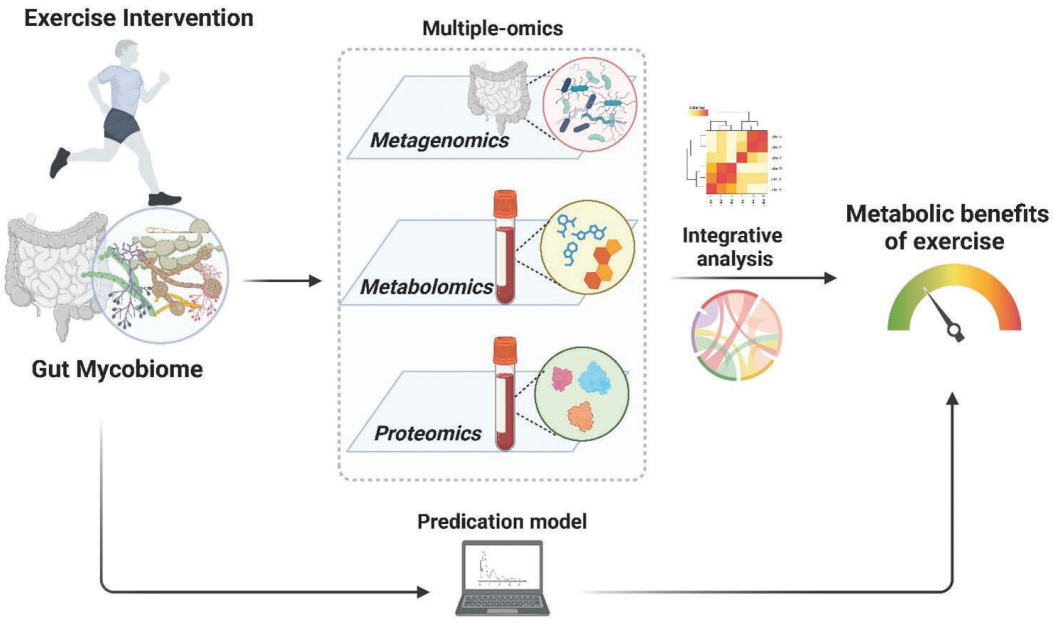
Publications

A. Journal Papers

1. Alemu BK, Wang CC, Li L, Zhu Z, Li Q, Wang Y. Effect of preconception antibiotics exposure on female reproductive health and pregnancy outcomes: A systematic review and meta-analysis. *eClinicalMedicine*. 2024;78. doi:10.1016/j.eclinm.2024.102935. (Review)
2. Alemu BK, Wu L, Azeze GG, Lau SL, Wang Y, Wang CC. Microbiota-targeted interventions and clinical implications for maternal-offspring health: An umbrella review of systematic reviews and meta-analyses of randomised controlled trials. *Journal of global health*. 2024;14:04177. doi:10.7189/jogh.14.04177. (Review)
3. Alemu BK, Lee MW, Leung MBW, Lee WF, Wang Y, Wang CC, Lau SL. Preventive effect of prenatal maternal oral probiotic supplementation on neonatal jaundice (POPS study): A protocol for the randomised double-blind placebo-controlled clinical trial. *BMJ Open*. 2024;14(6). doi:10.1136/bmjopen-2023-083641.

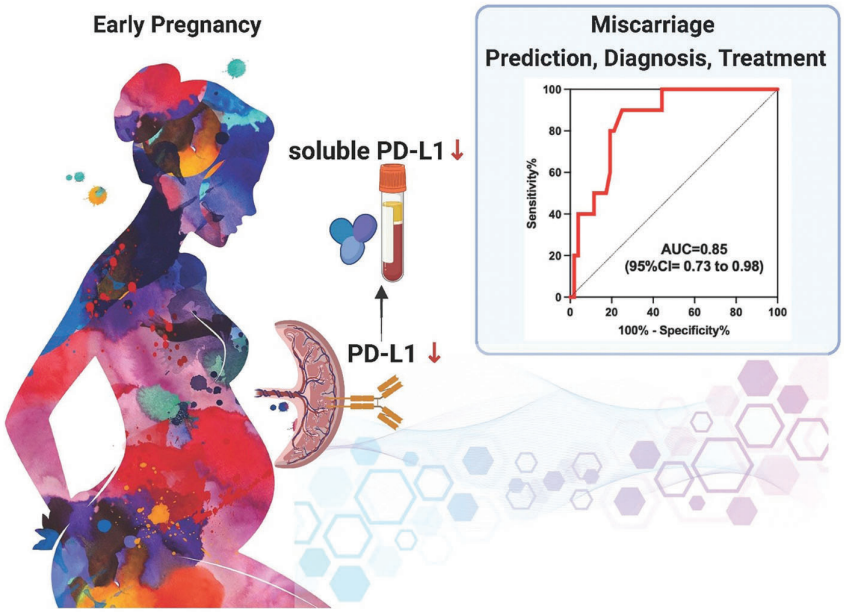
B. Conference Papers

1. Li Q, Wu H, Hu Q, Sze S, Guo X, Wang Y. Leveraging ringconn smart ring for monitoring women's menstrual health: A pilot study. *Biomedical Circuits and Systems Conference*. Published online 2024. doi:10.1109/biocas61083.2024.10798339.



This integrative multi-omics study suggest that intense exercise training significantly remodels the human fungal microbiome composition. Changes in gut fungal composition are associated with the metabolic benefits of exercise, indicating gut mycobiome is a possible molecular transducer of exercise.

Source: Wang Y, Chen J, Ni Y, Liu Y, Gao X, Tse MA, Panagiotou G, Xu A. Exercise-changed gut mycobiome as a potential contributor to metabolic benefits in diabetes prevention: An integrative multi-omics study. Gut Microbes. 2024;16(1):2416928. doi:10.1080/19490976.2024.2416928.



Reduced circulating sPD-L1 level and downregulated placental PD-L1 expression in miscarriage indicate that dysfunction in PD-L1 signals is a potential underlying mechanism for pregnancy loss. Their findings further extend the importance of the PD-L1 axis in pregnancy maintenance in early pregnancy.

Source: Li Q, Wu C, Wu J, Poon LC, Wang C, Guo X, Song L, Wang X, Zhang Q, Ye Z, Yang Y, Lu J, Zhang T, Ye D, Wang Y. Serum soluble PD-L1 level is decreased in early fetal loss and associated with placental dysfunction. Human Reproduction. 2023: 2128-2136. (Conference paper)



Stem Cells and Tissue Regeneration

Stem Cell and Vascular Regeneration

幹細胞及組織再生研究

PRINCIPAL INVESTIGATOR | **Kathy Lui**

TEAM MEMBERS | Jinhai Lin, Wenchu Ye, Zhangjing Ma, Wentao Gao, Panhong Liang, Lei Cui, Hang Qu, Cheng Kiu Ho, Jiali Lin, Jitao Liu , Yangfeng Hou, Denise Ma, Binglin Lai, Anna Chan, Gallen Xie

Research Progress Summary

During the past year, **Kathy Lui** and her team have been dedicated to uncovering the molecular mechanisms driving the progression of cardiovascular diseases, with particular emphasis on the causes of hypertension and atherosclerosis by targeting vascular smooth muscle cells. The below two research projects exemplify their efforts:

Molecular mechanisms underlying blood pressure control

Recent genome-wide association studies (GWAS) analyses involving over one million individuals have identified YY1 as a new locus associated with blood pressure traits (Evangelous et al., *Nature Genetics*, 2018); however, no functional studies have previously confirmed that YY1 directly controls vasoreactivity and blood pressure. The principal function of vascular smooth muscle cells (VSMCs) is contraction, yet how VSMCs respond to environmental cues to regulate their contractile function remains largely unexplored. This gap hinders their understanding of the epigenetic mechanisms controlling vascular tone, arterial stiffness, and blood pressure, all of which contribute to hypertension and

cardiovascular diseases. In a study currently under revision (Ye et al., *Cardiovascular Research*), they demonstrate that vascular contraction and blood pressure are significantly reduced in VSMC-specific YY1 knockout mice. Notably, YY1 does not regulate VSMC proliferation, survival, calcium entry, or membrane polarisation. Instead, integrative analyses of multiomics datasets identified *Mettl3* as a putative downstream target of YY1. Consistent with this finding, VSMC-specific *Mettl3* knockout mice exhibited impaired vascular contraction and reduced blood pressure, similar to the phenotypes observed in YY1 knockout mice. Further analyses showed that Mettl3-mediated m^6A mRNA methylation stabilises the transcripts of key genes involved in the contractile function of VSMCs. Importantly, AAV-mediated, VSMC-specific *Mettl3* gene delivery restored vascular contractility in *YY1*-deficient mice, functionally confirming *Mettl3* as a direct downstream effector of YY1. Additionally, both VSMC-specific YY1 and Mettl3 knockout mice displayed a delayed onset of hypertension, highlighting the physiological relevance of this pathway. Their research shows that YY1 maintains vascular contraction and blood pressure by stabilising mRNA transcripts through the activation of Mettl3 in VSMCs. These findings provide a novel epigenetic mechanism underpinning VSMC-mediated vasoconstriction through the YY1/Mettl3 regulatory axis. Moreover, their research establishes the YY1/Mettl3 axis as a clinically relevant target for managing blood pressure and mitigating hypertension under both normal and pathological conditions.

Furthermore, the team has been invited to contribute an editorial highlighting the hidden roles of different T cell subsets in the progression of cardiovascular diseases (Hou et al., *Cardiovascular Research*, 2024). This editorial will provide an opportunity to explore emerging research on how distinct T cell populations influence cardiovascular pathology, shedding light on their contributions to inflammation, vascular remodeling, and disease progression. By examining these underappreciated roles, they aim to offer new perspectives and identify potential therapeutic targets for cardiovascular diseases.

Research Output and International Recognition

In the past year, they have secured funding from the Croucher Foundation to establish a Joint Laboratory on Cardiovascular Sciences in collaboration with Bin Zhou at the Chinese Academy of Sciences. This Joint Laboratory will focus on developing cutting-edge approaches to address unresolved questions in cardiovascular biology. In addition, they have also obtained the National Natural Science Foundation of China (NSFC) - Research Grants Council (RGC) joint research grant to investigate the role of m^1A in regulatory T cell metabolism and its impact on heart repair and regeneration. This project represents a collaborative effort between the Chinese University of Hong Kong and Shanghai Jiaotong University, aiming to advance their understanding of how RNA modifications influence immune regulation and cardiac recovery.

In terms of serving the scientific community globally, Kathy continues to serve as an Editorial Board Member for *Circulation Research* (American Heart Association) and *Cardiovascular Research* (European Society of Cardiology). She also helps in reviewing international grants under the Sir Henry Dale Fellowship for the Wellcome Trust of the U.K.; the Spark Funding Scheme for the Swiss National Science Foundation; the New Talent Programme for the Dutch Research Council; the Seed Fund for UK Dunhill Medical Trust; the UK NC3R Grant; China's NSFC General Programme, NSFC Focused Research Scheme; RGC General Research Fund as well as Macau University's General Research Grant. In terms of building an international reputation, she has been invited to give lectures in person. She has given talks at the Seeon Angiogenesis Meeting in Seeon-Seebruck, Germany; Keystone Symposium on Cardiovascular Epigenetics and Gene Regulation in Hannover, Germany; 3rd Asia Pacific Vascular Biology Organization conference in Guangzhou; Great Wall International Congress of Cardiology (GW-ICC) in Beijing; 7th National Congress of Developmental Biology in Zhengzhou; and 16th Chinese Society for Immunology Annual Meeting in Hangzhou, China. Additionally, Kathy's team has also successfully organised the 1st Sub-Conference of the Young Academy of Sciences Summit on Stem Cells and Regeneration, and the Croucher Symposium on Vascular Sciences in Hong Kong, fostering international collaboration and discussion among leading researchers in the field. Overall, they have made significant strides in their research initiatives and collaborations, positioning themselves at the forefront of cardiovascular science locally, regionally and globally. They will continue to contribute to Science and serve their scientific community in 2025.

Research and Scholarship

Research Awards and Recognitions

Name	Details	
	Award	Organisation
Wentao Gao	Best Poster Award	Croucher Symposium on Vascular Sciences: From Basic to Therapeutic Discovery
Wenchu Ye		

Academic Editorships

Name	Details	
	Role	Journal
Kathy Lui	Editorial Board Member	Circulation Research (American Heart Association)
		Cardiovascular Research (European Society of Cardiology)
		Immunology Letters (Journal for the European Federation of Immunology Societies)
	Review Editor	Frontiers in Immunology

Reviewers of Journal / Conference

Name	Details	
	Role	Journal / Conference
Kathy Lui	Journal Reviewer	Nature Cardiovascular Research
		Nature Communications
		European Heart Journal
		Circulation Research
		Cardiovascular Research
		Science China Life Science
	Abstract Reviewer	International Society for Stem Cell Research (ISSCR) Annual Meeting

Grants and Consultancies

Name	Project Title	Funding Source	Start Date (dd/mm/yyyy)	End Date (dd/mm/yyyy)	Amount (HK$)
Kathy Lui	Why Cannot the Adult Mammalian Heart Regenerate Itself: A Treg Perspective	CAS - Croucher Joint Laboratories Scheme	01/12/2024	30/11/2027	3,750,000

Grants and Consultancies

Name	Project Title	Funding Source	Start Date (dd/mm/yyyy)	End Date (dd/mm/yyyy)	Amount (HK$)
Kathy Lui	Intercepting the Mitochondrial-to-Nuclear Communication for Treatment of Vascular Inflammation and Atherosclerosis	Research Grants Council – Young Collaborative Research Grant	01/06/2024	31/05/2027	3,661,367
	Single-Cell Multi-Omics Study of Atherosclerotic Vascular Disease: Narrowing the Gap Between Bench and Bedside	Research Grants Council – Theme-based Research Scheme	01/01/2024	31/12/2031	55,510,000
	Development of Therapeutic CRISPR-Cas Enzymes for Gene Therapy	Research Grants Council – Young Collaborative Research Grant	30/06/2023	29/06/2026	4,691,202
	Molecular Mechanisms Underlying T-cell Regulation of Vascular Disease, Repair and Regeneration	Research Grants Council – Research Fellowship Scheme	01/01/2023	31/12/2027	5,155,380
	Application of Nucleotide-modified mRNA (modRNA) for Treatment of Fabry Disease: A Preclinical and Translational Study	Innovation and Technology Commission – Innovation Technology Fund	01/02/2023	31/07/2024	1,399,550
	Studying the Functional Mechanism of YY1 in the Regulation of Glucose Metabolism in Pancreatic Beta Cells through O-GlcNAcylation	Research Grants Council – General Research Fund	01/01/2022	31/12/2024	1,325,732
	Aging, Skeletal Degeneration and Regeneration	Research Grants Council – Areas of Excellence (AoE) Scheme	01/05/2021	30/04/2029	70,680,000
	Unraveling the Impact of Hyperglycemia on Human Second Heart Field Development	Croucher Foundation – Croucher Innovation Awards	01/01/2017	31/12/2024	5,000,000

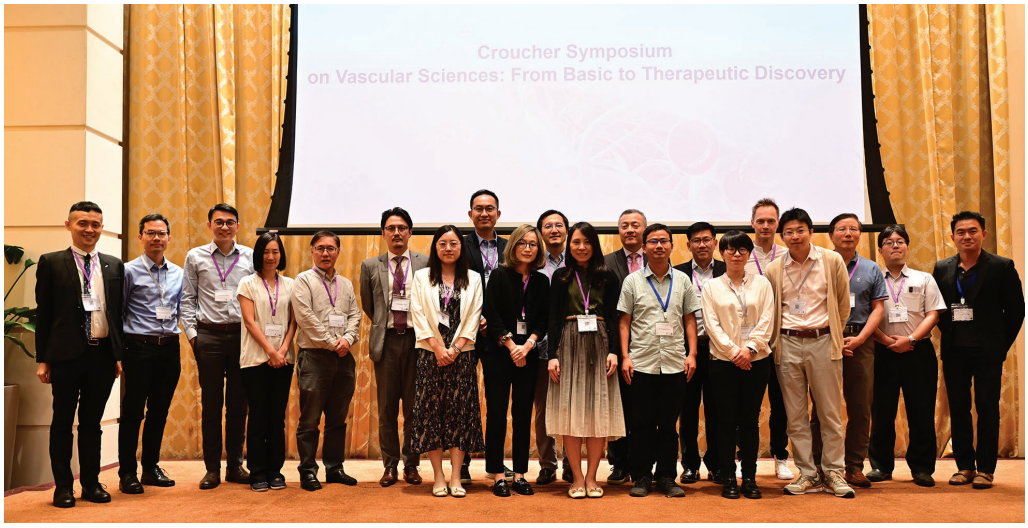
Grants and Consultancies

Name	Project Title	Funding Source	Start Date (dd/mm/yyyy)	End Date (dd/mm/yyyy)	Amount (HK$)
Kathy Lui	Studying the Role of m6A RNA Modification in Vascular Diseases and Regeneration	National Natural Science Foundation of China – Research Fund	01/01/2021	31/12/2024	RMB 550,000

Publications

A. Journal Papers

1. Ma Z, Sugimura R, Lui KO. The role of m^{6}A mRNA modification in normal and malignant hematopoiesis. *Journal of Leukocyte Biology*. 2024;115(1):100-115. doi:10.1093/jleuko/qiad061. (Review)
2. Yang KY, Liao J, Ma Z, Tse HF, Lu L, Graca L, Lui KO. Single-cell transcriptomics of Treg reveals hallmarks and trajectories of immunological aging. *Journal of Leukocyte Biology*. 2024;115(1):19-35. doi:10.1093/jleuko/qiad104.
3. Lui KO, Ma Z, Dimmeler S. SARS-CoV-2 induced vascular endothelial dysfunction: Direct or indirect effects? *Cardiovascular Research*. 2024;120(1):34-43. doi:10.1093/cvr/cvad191. (Review)
4. He L, Chen Q, Wang L, Pu Y, Huang J, Cheng CK, Luo JY, Kang L, Lin X, Xiang L, Fang L, He B, Xia Y, Lui KO, Pan Y, Liu J, Zhang CL, Huang Y. Activation of Nrf2 inhibits atherosclerosis in *ApoE*$^{-/-}$ mice through suppressing endothelial cell inflammation and lipid peroxidation. *Redox Biology*. 2024;74(June):103229. doi:10.1016/j.redox.2024.103229.
5. Zhang MJ, Lui KO, Zhou B. Application of new lineage tracing techniques in cardiovascular development and physiology. *Circulation Research*. 2024;134(4):445-458. doi:10.1161/circresaha.123.323179. (Review)
6. Wang E, Han X, Wang H, Lui KO, Zhou B, Wang L. Smooth muscle cell-specific genetic targeting by Myh11-driven Cre(ER) knockin mice. *Science China-Life Sciences*. 2024;67(10):2280-2282. doi:10.1007/s11427-023-2546-3. (Letter)
7. Hou Y, Gao W, Lui KO. A hidden role of Th17 cells in doxorubicin-induced cardiac ferroptosis. *Cardiovascular Research*. 2024;120(16):1989-1991. doi:10.1093/cvr/cvae226. (Editorial)
8. Li H, Zhang S, Huang X, Zhang Z, Liu K, Wang QD, Chen AF, Lui KO, Sun K, Zhou B. Genetic recording of transient endothelial activation in distinct alveolar capillary cells during pulmonary fibrosis. *Cell Discovery*. 2024;10(1):1-3. doi:10.1038/s41421-024-00745-1. (Letter)



Croucher Symposium on Vascular Sciences.

Source: Kathy Lui



Keystone Symposium on Cardiovascular Epigenetics.

Source: Kathy Lui



YASHK conference on Stem Cells and Regenerative Medicine.

Source: The Hong Kong Young Academy of Sciences



Stem Cells and Tissue Regeneration

幹細胞及組織再生研究

PRINCIPAL INVESTIGATOR | **Wayne Lee**

TEAM MEMBERS | Belle Wang, Jessica Lo, Allen Hsiao, Tsz Lam Yiu, Jenny Chen, Bing Bing Xu, Gen Tang, Jeffrey Hui, Wen Lin Tian

Research Progress Summary

By investigating samples collected from osteoarthritis (OA) patients undergoing knee replacement surgery and a destabilisation of the medial meniscus (DMM)-induced mouse OA model, **Wayne Lee** and his team demonstrated that long noncoding RNA H19 was highly expressed in subchondral bone osteocytes. In transgenic mice, H19 deficiency in osteocytes increased resistance to DMM-induced OA progression and subchondral bone remodelling. Furthermore, cellular experiments showed that H19 appears to enhance osteocyte cell response to mechanical stimulation through PI3K/AKT/GSK3 signal activation, which was partly attributed to protein phosphatase 2A inhibition. To illustrate its translational potential, antisense oligonucleotide (ASO)-loaded magnetic metal–organic frameworks (MMOFs) were used to silence H19 in subchondral bone osteocytes in the mouse OA model. MMOFs were employed to facilitate more precise delivery of the anti-H19 ASO to the subchondral bone during treatment. This proof-of-concept approach effectively mitigated OA progression. The MMOF-based system could have significant translational potential for OA clinical applications by targeting subchondral bone osteocytes.

Research Collaborations

Wayne Lee currently serves as the Co-Director of Joint Scoliosis Research Centre of The Chinese University of Hong Kong (CUHK) and Nanjing University (JSRC), established in 2006 by Jack Cheng and Yong Qiu. The JRSC aims to 1) strengthen collaboration in spine-related research, education, and clinical practise between Mainland China and Hong Kong, and 2) leverage the strengths of both regions to enhance their global academic and clinical reputation. In 2024, JSRC members published several studies using AI to improve the diagnosis and prediction of adolescent idiopathic scoliosis (AIS). These include using unsupervised machine learning to identify bone phenotypes acquired by HR-pQCT linked to curve progression (10.1093/jbmr/zjae083), deep learning to predict curve progression (10.3390/diagnostics14121263), and a conditional generative adversarial network for radiation-free evaluation of scoliosis (10.1016/j.eclinm.2024.102779).

Research and Scholarship

Research Awards and Recognitions

Name	Details	
	Award	Organisation
Adam Lau	Best Paper Award on Clinical Assessments and Diagnoses of Spinal Deformities	The International Research Society of Spinal Deformities
	Best Paediatric Orthopaedic Free Paper	The Hong Kong Orthopaedic Association
	AR Hodgson Award for Best Clinical Paper	
Gen Tang	Best Paper Award on Basic Sciences of Spinal Deformities	The International Research Society of Spinal Deformities
Florence Pang	Orthopaedic Basic Science Award	The Hong Kong Orthopaedic Association

Academic Editorships

Name	Details	
	Role	Journal
Wayne Lee	Youth Committee of Editorial Board	Journal of Orthopaedic Translation

Reviewers of Journal / Conference

Name	Details	
	Role	Journal / Conference
Wayne Lee	Reviewer	Advanced Materials
		Biomaterials
		Journal of Orthopaedic Translation

Grants and Consultancies

Name	Project Title	Funding Source	Start Date (dd/mm/yyyy)	End Date (dd/mm/yyyy)	Amount (HK$)
Wayne Lee	Identifying Novel Cell Subpopulation and Therapeutic Target for Adolescent Idiopathic Scoliosis through Combined Single-nucleus and Spatial Transcriptomics	Research Grants Council – General Research Fund	01/01/2024	31/12/2026	1,500,000
	Enhancing Cell Therapy Efficacy by High-efficiency Quantitative Mitochondrial Transfer Technique	The Chinese University of Hong Kong Research Committee – Strategic Seed Funding for Collaborative Research Scheme	01/11/2023	31/10/2025	500,000
	Can Honokiol, a Sirt3 Activator, Enhance the Effect of Vitamin D on Age-related Bone and Muscle Loss?	Health Bureau – Health and Medical Research Fund	01/08/2023	31/07/2025	1,131,368
	Exploring Bone Tissue Architecture Using Spatial Transcriptomics	The Chinese University of Hong Kong Research Committee – Direct Grants	30/06/2023	29/6/2025	50,000
	lncRNA H19 Modulates Osteoarthritis Development via Subchondral BoneRemodeling and Osteocyte Responses to Mechanical Stimulation?	Research Grants Council – Early Career Scheme	01/08/2022	31/07/2025	1,222,904
	Decellularized Scaffolds for Bone and Cartilage Regeneration	Innovation and Technology Commission – Innovation and Technology Fund	01/08/2021	31/01/2024	1,040,750
	Is Vitamin D Playing a Role in the Pathogenesis of AIS?	The American Society for Bone and Mineral Research – ASBMR Rising Star Award	01/10/2020	30/09/2025	466,800

Grants and Consultancies

Name	Project Title	Funding Source	Start Date (dd/mm/yyyy)	End Date (dd/mm/yyyy)	Amount (HK$)
Wayne Lee	Bone Aging and Osteocyte Biology	The Chinese University of Hong Kong Earmarked Budget – Improvement on Competitiveness in Hiring New Faculties – Start up Fund	01/08/2020	31/07/2025	1,106,667
	For the Acquisition and Maintenance of MARS Preclinical Spectral CT System	University Grant Committee – Research Matching Grant Scheme	22/05/2019	30/06/2025	2,001,104
	Mechanomics of Stem Cells Based on Deformation Cytometry and Droplet Microfluidics	The Chinese University of Hong Kong Research Committee – Strategic Seed Funding for Collaborative Research Scheme	01/11/2023	31/10/2025	500,000
	Study of the Effects of Soy Exposure in Early Life on Bone Development and Gut Microbiota	Health Bureau – Health and Medical Research Fund	01/09/2022	31/08/2025	1,470,120
	Clinical Trials of Innovative Strategies for Musculoskeletal Regeneration	Innovation and Technology Commission – InnoHK Fund	01/03/2022	28/02/2027	12,837,000
	Enhancing the Therapeutic Effect of Bracing for Adolescent Idiopathic Scoliosis with a Hybrid Bracing Protocol: A Randomized Controlled Trial	Research Grants Council – General Research Fund	01/01/2022	31/12/2024	977,708
	Validation of a Novel Clinical Prognostic Model in Facilitating the Implementation of Risk Stratification Approach for Triaging Scoliosis Clinic Workflow during COVID-19 Pandemic	Health Bureau – Health and Medical Research Fund	1/10/2021	30/9/2024	1,174,472

Grants and Consultancies

Name	Project Title	Funding Source	Start Date (dd/mm/yyyy)	End Date (dd/mm/yyyy)	Amount (HK$)
Wayne Lee	Aging, Skeletal Degeneration and Regeneration	Research Grants Council – Areas of Excellence Scheme	01/05/2021	30/04/2029	70,688,000

Publications

A. Journal Papers

1. Wang R, Mehrjou B, Dehghan-Banian D, Wang BYH, Li Q, Deng S, Liu C, Zhang Z, Zhu Y, Wang H, Li D, Lu X, Cheng JCY, Ong MTY, Chan HF, Li G, Chu PK, Lee WYW. Targeting long noncoding RNA H19 in subchondral bone osteocytes and the alleviation of cartilage degradation in osteoarthritis. *Arthritis and Rheumatology*. 2025;0(0):1-15. doi:10.1002/art.43028. (Epub ahead of print)
2. Yang GK, Chen H, Cheng KL, Tang MF, Wang Y, Hung LHA, Cheng CYJ, Mak KLK, Lee YWW. Potential interaction between WNT16 and vitamin D on bone qualities in adolescent idiopathic scoliosis patients and healthy controls. *Biomedicines*. 2024;12(1). doi:10.3390/biomedicines12010250.
3. Yang KG, Lee WYW, Hung ALH, Kumar A, Chui ECS, Hung VWY, Cheng JCY, Lam TP, Lau AYC. Distinguishing risk of curve progression in adolescent idiopathic scoliosis with bone microarchitecture phenotyping: A 6-year longitudinal study. *Journal of Bone and Mineral Research*. 2024;39(7):956-966. doi:10.1093/jbmr/zjae083.
4. Yu WX, Poon CCW, Zhou LP, Wong KY, Cao SS, Lam CY, Lee WYW, Wong MS. Oleanolic acid exerts bone anabolic effects via activation of osteoblastic 25-hydroxyvitamin D 1-alpha hydroxylase. *Biomedicine and Pharmacotherapy*. 2024;173:116402. doi:10.1016/j.biopha.2024.116402.
5. Zhang X, Yang B, Feng L, Xu X, Wang C, Lee WYW, Wang M, Lu X, Qin L, Lin S, Bian L, Li G. Augmenting osteoporotic bone regeneration through a hydrogel-based rejuvenating microenvironment. *Bioactive Materials*. 2024;41(April):440-454. doi:10.1016/j.bioactmat.2024.07.036.

B. Conference Papers

1. Cheng JKH, He BY, Kwan CK, Lau AYC, Yang GP, Hung ALH, Lee WYW, Cheng JCY, Lam TP. Online mindfulness intervention to enhance psychosocial well-being for adolescent idiopathic scoliosis (AIS) – A pilot randomized single-blinded controlled trial. International Research Society of Spinal Deformities Scientific Meeting 2024; 2024 Jun 21-23; Hong Kong.
2. Hsiao WT, Lee CW, Lee WYW. AGE beaker ameliorates diet-induced hyperglycemia and muscle atrophy through modulating metabolic memory in muscle. ADA's 84th Scientific Sessions; 2024 June 21-24, 2024; Orlando, US.
3. Hung ALH, Yang GP, Lau AYC, Lee WYW, Kumar A, Kwan CK, Lam TP, Cheng JCY. Utility of a novel thumb model for prognostication in Adolescent idiopathic scoliosis (AIS) to aid clinic triaging and treatment strategy recommendation at first clinic visit: A longitudinal study on 1088 subjects at peripubertal period till skeletal maturity. The 44th Annual Congress of The Hong Kong Orthopaedic Association (HKOA 2024); 2024 Nov 2-3; Hong Kong.
4. Kwan CK, Lau AYC, Yang GP, Hung ALH, Lee WYW, Chu WCW, Lai KL, Lee TY, Zheng YP, Cheng JCY, Lam TP. Could the novel ultrasound curve angle (UCA) measurement reduce unnecessary X-ray exposure for screening scoliosis among schoolchildren? The 44th Annual Congress of The Hong Kong Orthopaedic Association (HKOA 2024); 2024 Nov 2-3; Hong Kong.

5. Lam TP, Yang GP, Lee WYW, Lau AYC, Hung ALH, Kwan CK, Tang NLS, Cheng JCY. Preventing curve progression to bracing threshold in early adolescent idiopathic scoliosis (AIS) using Calcium plus Vitamin D supplementation - An initiated randomized double-blinded placebo-controlled trial. ASBMR 2024 Annual Meeting 2024 Sep 27-30, 2024; Toronto, Canada.
6. Lam TP, Yang GP, Lee WYW, Lau AYC, Hung ALH, Kwan CK, Tang NLS, Cheng JCY. Preventing curve progression to bracing threshold in early adolescent idiopathic scoliosis (AIS) using Calcium plus Vitamin D supplementation - An initiated randomized double-blinded placebo-controlled trial. XVIth Congress of the International Society of Bone Morphometry (ISBM 2024); 2024 Sept 30 - Oct 3, 2024; Toronto, Canada.
7. Lau AYC, Lam TP, Yang GP, Lee WYW, Hung ALH, Kwan CK, Hung VWY, Wan CWR, Kumar A, Cheng JCY. Preventing curve progression and the need for bracing in early diagnosed adolescent idiopathic scoliosis with 3-year Calcium plus Vitamin D supplementation – A randomized double-blinded placebo-controlled trial. The 44th Annual Congress of The Hong Kong Orthopaedic Association (HKOA 2024); 2024 Nov 2-3; Hong Kong.
8. Lau AYC, Yang G, Hung AL, Lee WYW, Arnubrat K, Wan RC, Lam TP, Cheng JCY. Early prediction of curve progression to surgical threshold in adolescent idiopathic scoliosis with bone microarchitecture phenotyping – A step closer to precision medicine. Asia Pacific Spine Society (APSS) 7th Annual Meeting 2024; 2024 Jun 13-16; Hong Kong.
9. Lau AYC, Yang GP, Hung ALH, Hung VWY, Lee WYW, Lam TP, Cheng JCY. Could bone qualities be one of the factors affecting spine flexibility in adolescent idiopathic scoliosis? ASBMR 2024 Annual Meeting 2024 Sep 27-30, 2024; Toronto, Canada.
10. Lau AYC, Yang GP, Hung ALH, Kwan CK, Ng KWB, Hung VWY, Lee WYW, Chu WCW, Cheng JCY, Lam TP. Could bone qualities be one of the important factors affecting curve flexibility, spine morphology and surgical outcome of patients with severe adolescent idiopathic scoliosis? – A retrospective study with average 6 years longitudinal follow up. The 44th Annual Congress of The Hong Kong Orthopaedic Association (HKOA 2024); 2024 Nov 2-3; Hong Kong.
11. Lau AYC, Yang GP, Hung ALH, Lee WYW, Chu WCW, Lai KKL, Chung TWH, Lee TTY, Zhong YP, Cheng JCY, Lam TP. Could ultrasound curve angle (UCA) measurement reduce unnecessary X-ray exposure for screening scoliosis among schoolchildren? – A study of 509 skeletally immature female subjects. International Research Society of Spinal Deformities Scientific Meeting 2024; 2024 Jun 21-23; Hong Kong.
12. Lau AYC, Yang GP, Lee WYW, Hung ALH, Hung VWY, Lam TP, Cheng JCY. A correlation study of bone qualities and spine flexibility in adolescent idiopathic scoliosis. The 23rd Chinese Medical Association Orthopaedic Academic Conference and the 16th COA International Congress of Chinese Orthopaedic Association (COA 2024); 2024 Dec 4-8; Wuhan, China.
13. Lee WYW, Lo HTJ, Yiu TL, Lu F, Mok KW, Wong MS. Exploring the novel role of extra-renal CYP27B1 in age-related muscle loss. ASBMR 2024 Pre-Meeting Symposium: Energy Metabolism in Skeletal Development and Disease 2024 Sep 26, 2024; Toronto, Canada.
14. Lee WYW, Lo HTJ, Yiu TL, Lu F, Mok KW, Wong MS. Exploring the novel role of extra-renal CYP27B1 in age-related muscle loss. ASBMR 2024 Annual Meeting 2024 Sep 27-30, 2024; Toronto, Canada.
15. Lee WYW, Tang G, Yang GP, Lau AYC, Lam TP, Cheng JCY, Zhang Z, Chen HX. Lower CYP27B1 expression in osteocytes increases the risk of curve progression in a new mouse model of scoliosis. ASBMR 2024 Pre-Meeting Symposium: Energy Metabolism in Skeletal Development and Disease 2024 Sep 26, 2024; Toronto, Canada.
16. Lee WYW, Tang G, Yang GP, Lau AYC, Lam TP, Cheng JCY, Zhang Z, Chen HX. Lower CYP27B1 expression in osteocytes increases the risk of curve progression in a new mouse model of scoliosis. ASBMR 2024 Annual Meeting 2024 Sep 27-30, 2024; Toronto, Canada.
17. Lee WYW, Wang R, Mehrjou B, DehghanBanian D, Ong MTY, Chan HF, Chu PK. Novel role of lncRNA H19 in osteoarthritis subchondral bone remodeling and treatment. The 23rd Chinese Medical Association Orthopaedic Academic Conference and the 16th COA International Congress of Chinese Orthopaedic Association (COA 2024); 2024 Dec 4-8; Wuhan, China

18. Lee WYW, Zhang Z, Hu Z, Tian W, Tang Z, Chang L, Tang G, Li J, Chui CS, Liu Z, Lau AYC, Qiu Y, Cheng JCY, Chen H, Zhu Z. A new mouse model of spinal deformity with consistent curve type for scoliosis research. The 23rd Chinese Medical Association Orthopaedic Academic Conference and the 16th COA International Congress of Chinese Orthopaedic Association (COA 2024); 2024 Dec 4-8; Wuhan, China

19. Lo JHT, Pang FOS, Yiu TL, Ong MTY, Mok DKW, Wong MS, Lee WYW. Is vitamin D good for muscle? A preclinical study elucidating the vital role of CYP27B1 in muscle mitochondrial function. The 44th Annual Congress of The Hong Kong Orthopaedic Association (HKOA 2024); 2024 Nov 2-3; Hong Kong.

20. Sheng A, Kwan CK, Lau AYC, Yang GP, Hung ALH, Lee WYW, Kumar A, Zhang Z, Wan RC, Cheng JCY, Lam TP. Role of sagittal plane alignment on the etiopathogenesis of frontal plane deformity in idiopathic scoliosis – A prospective longitudinal study. International Research Society of Spinal Deformities Scientific Meeting 2024; 2024 Jun 21-23; Hong Kong.

21. Tang G, Chen HX, Yang GP, Lau AYC, Lam TP, Zhu ZZ, Qiu Y, Cheng JCY, Lee WYW. A pilot single cell RNA sequencing study suggested that conditioned asymmetric osteogenic differentiation through mTOR pathway in adolescent idiopathic scoliosis (AIS). International Research Society of Spinal Deformities Scientific Meeting 2024; 2024 Jun 21-23; Hong Kong.

22. Wan RCL, Lee WYW. Non-pharmacological treatments of postpolio syndrome: A systematic review. The 20th Asia Pacific Multidisciplinary Meeting for Nervous System Diseases [BRAIN 2024]; 2024 January 27-28; Hong Kong.

23. Wang RL, Mehrjou B, Dehghanbaniani D, Ong MTY, Chan HF, Li G, Chu PK, Lee WYW. Novel role of lncRNA H19 in osteoarthritis subchondral bone remodeling and treatment. Orthopaedic Research Society (ORS); 2024 Feb 2-6; Long Beach, California, USA.

24. Yang GP, Lau AYC, Hung VWY, Hung ALH, Cheng JCY, Kwan CK, Lam TP, Lee WYW. A three-year longitudinal cohort study on the changes in bone microarchitecture phenotype trajectory during peripubertal growth in girls with adolescent idiopathic scoliosis. ASBMR 2024 Annual Meeting 2024 Sep 27-30, 2024; Toronto, Canada.

25. Yang GP, Lau AYC, Lee WYW, Hung ALH, Cheng JCY, Lam TP. Early detection of progressive adolescent idiopathic scoliosis by unsupervised machine learning clustered bone microarchitecture phenotype: A 3-year prospective longitudinal study. International Research Society of Spinal Deformities Scientific Meeting 2024; 2024 Jun 21-23; Hong Kong.

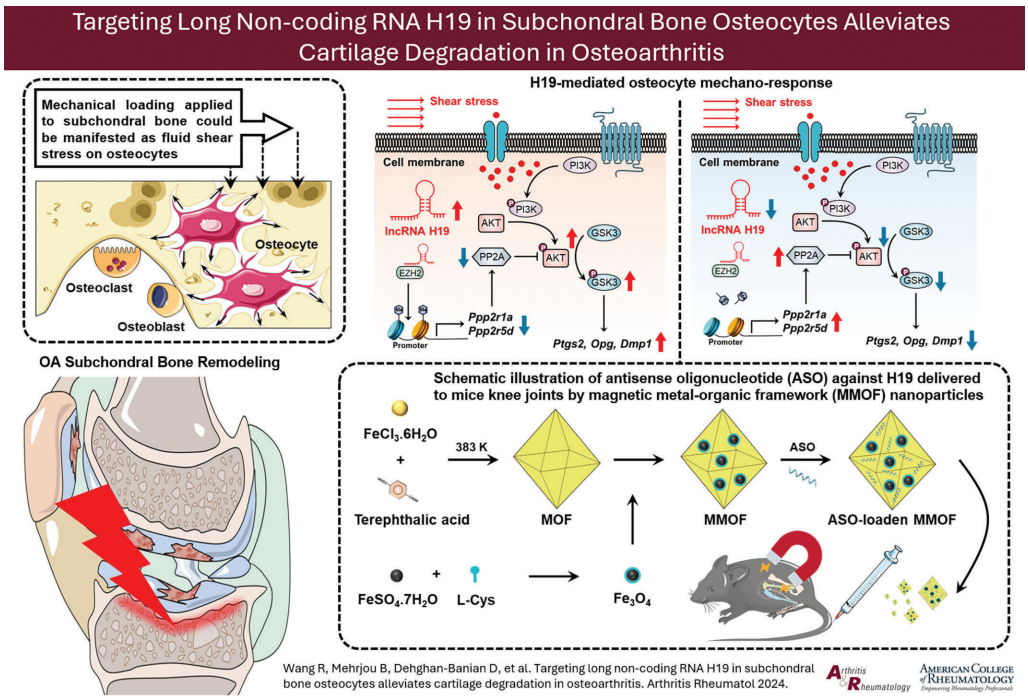
26. Yang GP, Lau AYC, Lee WYW, Hung ALH, Cheng JCY, Lam TP. Early detection of progressive adolescent idiopathic scoliosis by unsupervised machine learning clustered bone microarchitecture phenotypes: A 3-year prospective longitudinal study. 59th SRS Annual Meeting (Scoliosis Research Society) 2024 Sep 10-14, 2024; Barcelona, Spain.

27. Yang GP, Lee WYW, Hung ALH, Kwan CK, Hung VWY, Cheng JCY, Lam TP, Lau AYC. A three-year longitudinal cohort study on the peripubertal changes in bone qualities and microarchitecture phenotype trajectory and its clinical implications in girls with adolescent idiopathic scoliosis. The 44th Annual Congress of The Hong Kong Orthopaedic Association (HKOA 2024); 2024 Nov 2-3; Hong Kong.

28. Zhang Z, Lau AYC, Wong YJ, Yang GP, Hung ALH, Cheng JCY, Mok DKW, Lee WYW. What's next after GWAS? Insight from a preclinical translational study on the role of LBX1 on curve progression with a new validated mouse model of scoliosis. The 44th Annual Congress of The Hong Kong Orthopaedic Association (HKOA 2024); 2024 Nov 2-3; Hong Kong.

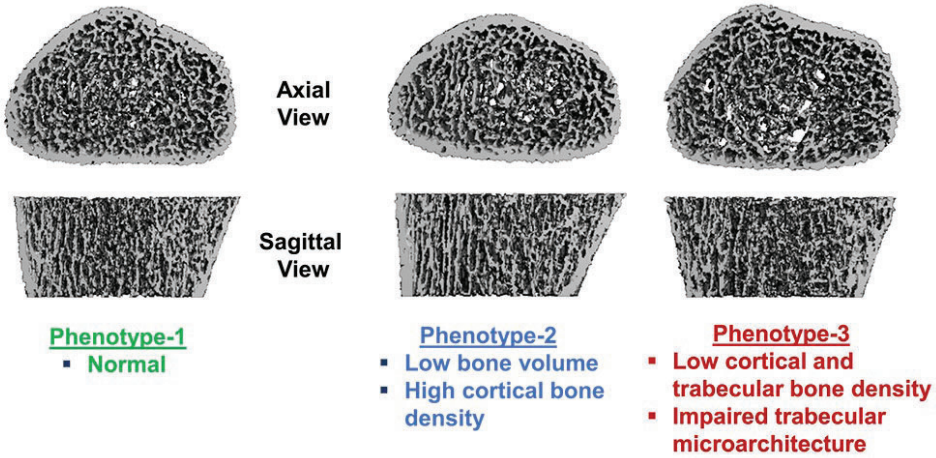
29. Zhang Z, Wang Y, Li MH, Chu KLS, Chan CO, Lau AYC, Hung ALH, Cheng JCY, Mok DKW, Lee WYW. LBX1 modulates muscle function and curve progression in adolescent idiopathic scoliosis. Orthopaedic Research Society (ORS) 2024; 2024 Feb 2-6; Long Beach, California, USA.

30. Zhang Z, Wang YJ, Yang GP, Chui CS, Lau AYC, Hung ALH, Zhu ZZ, Qiu Y, Cheng JCY, Lee WYW. Developing a mouse model of structural scoliosis with special 3D printed thoracic restrainer to study the role of candidate genes on curve progression and their potential as therapeutic target. International Research Society of Spinal Deformities Scientific Meeting 2024; 2024 Jun 21-23; Hong Kong.



Graphical Abstract illustrating the new evidence that the elevated H19 expression in osteocytes may contribute to aberrant subchondral bone remodelling and OA progression. H19 appears to be required for the osteocyte response to mechanical stimulation, and targeting H19 represents a new promising approach for OA treatment. Their study is highlighted in the "Clinical Connections" feature of Arthritis & Rheumatology.

Source: Wang R, Mehrjou B, Dehghan-Banian D, Wang BYH, Li Q, Deng S, Liu C, Zhang Z, Zhu Y, Wang H, Li D, Lu X, Cheng JCY, Ong MTY, Chan HF, Li G, Chu PK, Lee WYW. Targeting long noncoding RNA H19 in subchondral bone osteocytes and the alleviation of cartilage degradation in osteoarthritis. Arthritis and Rheumatology. 2025;0(0):1-15. doi:10.1002/art.43028. (Epub ahead of print)



Low bone mineral density and impaired bone quality have been shown to be important prognostic factors for curve progression in adolescent idiopathic scoliosis (AIS). We utilized unsupervised machine learning to cluster bone microarchitecture phenotypes on HR-pQCT parameters in girls with AIS. Three distinct bone microarchitecture phenotypes could be differentiated at peripubertal peak height velocity in AIS. Amongst, phenotype 3 had significantly higher risk of curve progression to surgical threshold at skeletal maturity.

Source: Yang KG, Lee WYW, Hung ALH, Kumar A, Chui ECS, Hung VWY, Cheng JCY, Lam TP, Lau AYC. Distinguishing risk of curve progression in adolescent idiopathic scoliosis with bone microarchitecture phenotyping: A 6-year longitudinal study. Journal of Bone and Mineral Research. 2024;39(7):956-966. doi:10.1093/jbmr/zjae083



Stem Cells and Tissue Regeneration

Immunomodulation for Musculoskeletal Regeneration

幹細胞及組織再生研究

PRINCIPAL INVESTIGATOR | **Ning Zhang**

TEAM MEMBERS | Tao Huang, Hei Yuet Wong, Baoqi Li, Ming Yi, Mei Shuen Chan

Research Progress Summary

Accelerating the Delayed Healing of the Sarco-osteoporosis Fracture by Immunisation Approaches

Osteoporosis and sarcopenia are geriatric syndromes due to the noticeable changes in the properties of bone and muscle in the elderly. They further impair and delay the healing process, resulting in a delayed union or non-union. TGF-β1 produced by age-associated callus senescent cells is reported to inhibit fracture healing in aged mice. It is also an inhibitor of myoblast proliferation for muscle development. Inhibiting TGF-β1 pathways will be a promising way to accelerate delayed fracture healing in the presence of osteoporosis and sarcopenia. Immunisation could be an easier, safer, and more efficient way with predictable and controlled effects. In this project, the research team led by **Ning Zhang** will test the effect and efficacy of immunisation against TGF-β1 on suppressing excessive TGF-β1 bioactivity and accelerating delayed fracture healing in their established mouse model with co-existing osteoporosis and sarcopenia.

Journal Paper:
Zhang N, Zhai L, Wong RMY, Cui C, Law SW, Chow SKH, Goodman SB, Cheung WH. Harnessing immunomodulation to combat sarcopenia: Current insights and possible approaches. *Immunity and Ageing*. 2024;21(1). doi:10.1186/S12979-024-00458-9.

Enhancing Mesenchymal Stem Cell Therapy on Long Bone Defects Healing

Bone defects and structural bone loss pose significant challenges in orthopaedics, particularly in cases involving advanced age or large defect sizes, which often result in delayed union or nonunion. Stem cell therapies offer promising strategies for tissue regeneration, addressing the limitations in quality and quantity associated with standard autologous bone grafting. However, their application is constrained by the need for pre-implantation manipulation and still requires substantial improvements to achieve clinical outcomes comparable to bone graft transplantation. Their previous studies have highlighted the crucial role of niche cells surrounding stem cell implantation. Modulating this microenvironment could further optimise bone regeneration. Whole-body vibration (WBV) has shown its ability to modulate niche cells, including macrophages, thereby offering the potential to enhance the local microenvironment. This project aims to improve bone healing by combining WBV with MSC-based therapy, providing insights into the differential dynamics of MSCs and the niche cell microenvironment and offering a robust solution for effective healing of the delayed union or nonunion of long bone defects.

Academic Conference:
Zhang N, et al. Cellular Profiles and Dynamics of Cell-based Therapy for Nonunion of Long Bone Critical-size Defects. *The 16th Chinese Orthopaedic Association (COA) International Academic Conference*. 2024 Dec 4-8, Wuhan, China. Oral presentation.

Research and Scholarship

Research Awards and Recognitions

Name	Details	
	Award	Organisation
Ning Zhang	Silver Medal, Artificial Intelligence Assisted Orthopaedic Prosthesis Design and Surgical Planning System	Silicon Valley International Invention Festival. Santa Clara, California, USA. July 26-28, 2024

Academic Editorships

Name	Details	
	Role	Journal
Ning Zhang	Guest Editor	Bioengineering
		Frontiers in Medicine

Reviewers of Journal / Conference

Name	Details	
	Role	Journal / Conference
Ning Zhang	Reviewer	Biomedical Materials
	Judge	1st BMEMat – Advanced Materials Joint Symposium
	Reviewer and Commentator	16th Annual Congress of Chinese Orthopaedic Association

Grants and Consultancies

Name	Project Title	Funding Source	Start Date (dd/mm/yyyy)	End Date (dd/mm/yyyy)	Amount (HK$)
Ning Zhang	Dissecting the Therapeutic Mechanism of An Effective Combination Treatment Targeting Neuromuscular Junction Degeneration and Myosteatosis to Combat Sarcopenia	Research Grants Council – Collaborative Research Fund	01/06/2022	31/05/2025	4,772,807
	Accelerating the Delayed Fracture Healing by Immunization Against TGF-β1 in A Sarco-osteoporosis Mouse Model	The Chinese University of Hong Kong Research Committee – Direct Grants	30/06/2023	29/06/2024	150,000
	Enhancing Mesenchymal Stem Cell Therapy on Critical-sized Bone Defects Healing via Biomechanical Stimulation	The Chinese University of Hong Kong Research Committee – Direct Grants	30/06/2024	29/06/2025	150,000

Publications

A. Journal Papers

1. Wang Y, Nan X, Sun H, Shi Y, Miao J, Li Y, Han X, Zhang N, Wang H, Ren N, Zhao X, Liu B. From insects to mammals! Tissue accumulation and transgenerational transfer of micro/nano-plastics through the food chain. *Journal of Hazardous Materials*. 2024;480. doi:10.1016/j.jhazmat.2024.136424.
2. Cheng KY-K, Chow SK-H, Hung VW-Y, Tsang ZT-L, Yip BH-K, Wong RMY, Zhang N, Qin L, Law S-W, Cheung W-H. Identification of osteosarcopenia by high-resolution peripheral quantitative computed tomography. *Journal of personalized medicine*. 2024;14(9):935. doi:10.3390/jpm14090935.
3. Zhang N, Zhai L, Wong RMY, Cui C, Law SW, Chow SKH, Goodman SB, Cheung WH. Harnessing immunomodulation to combat sarcopenia: Current insights and possible approaches. *Immunity and Ageing*. 2024;21(1). doi:10.1186/s12979-024-00458-9. (Review)
4. Lin W, Chow SKH, Cui C, Liu C, Wang Q, Chai S, Wong RMY, Zhang N, Cheung WH. Wnt/β-catenin signaling pathway as an important mediator in muscle and bone crosstalk: A systematic review. *Journal of Orthopaedic Translation*. 2024;47:63-73. doi:10.1016/j.jot.2024.06.003. (Review)
5. Wang Q, Cui C, Zhang N, Lin W, Chai S, Chow SKH, Wong RMY, Hu Y, Law SW, Cheung WH. Effects of physical exercise on neuromuscular junction degeneration during ageing: A systematic review. *Journal of Orthopaedic Translation*. 2024;46:91-102. doi:10.1016/j.jot.2024.03.007. (Review)



Biomaterial, Chemical Biology and Drug Translational Research

Innovative Orthopaedic Biomaterial and Drug Translational Research

生物材料、化學生物學與藥物轉譯研究

PRINCIPAL INVESTIGATOR

Ling Qin

TEAM MEMBERS

Jiankun Xu, Wenxue Tong, Yu-sheng Hsueh, Lizhen Zheng, Liang Chang, Shunxiang Xu, Yuantao Zhang, Haozhi Zhang, Shi'an Zhang, Naping Xiong, Zhenkang Wen, Hongwei Shao, Zheyu Jin, Qida Zhang, Qing Lu, Weiyang Liu, Zhengming Shan, Qinyu Tian, Fanchu Zeng, Ningze Zhang, Chengjun Li, Kaixu Yu, Jingliang Kang, Zhinan Mao, Jiaxin Guo, Tongzhou Liang, Xin Chen, Yuanming An, Lei Lei, Haozhi Zhang

Research Progress Summary

Translational research achievements:

According to the study plan of the Areas of Excellence (AoE) project, to push forward the Class III medical device registration of magnesium-based orthopaedical implants at the National Medical Products Administration (NMPA), *Medical Magnesium Ltd. (Hong Kong)* and *Huamei Med Tech (Shenzhen) Ltd.* were established by the team this year and related patents were transferred out from The Chinese University of Hong Kong. Throughout the year, the team

led by **Ling Qin** made progress in product and packaging design, document preparation, and product testing. The production schedule and clinical trial plan were finalised in collaboration with the Original Equipment Manufacturer (OEM) and the third-party Contract Research Organization (CRO).

During the reporting period, translational research projects of Ling's team were exhibited in multiple international and national invention exhibitions. The invention of regenerative improvers (innovative magnesium-containing products) was awarded the gold medal, and magnesium-based orthopaedic implants and hybrid implants for complex bone disorders treatment were awarded the silver medal at the International Exhibition of Inventions Geneva 2024. The invention of Mag Med (a start-up established by Ling's team) solutions to boost endogenous regeneration (innovative magnesium-containing products) gained a silver medal at the Silicon Valley International Invention Festival (SVIIF) 2024. Two inventions (regenerative bio-enhancers, targeting AAV and other vehicles for gene therapy 2.0) won silver awards at the 4th Asia Exhibition of Innovations and Inventions Hong Kong (2024).

Academic research achievements:
Ling's team is now working on more than 10 scientific programs, including projects of Areas of Excellence (AOE), National Natural Science Foundation of China/Research Grant Council Joint Research Scheme (NSFC-RGC), Research Grants Council-General Research Fund (RGC), etc. In 2024, Ling's team published 42 peer-reviewed papers, 15 of them with impact factors over 10, including 2 papers featured as cover stories. Representative original research articles were published in (i) *Materials Today* (magnesium hybrid column for preventing a hip collapse in steroid-associated osteonecrosis); (ii) *Advanced Materials* (3D printed MgO2/PLGA scaffold as a bone substitute for postsurgical osteosarcoma treatment, also is featured as cover story); (iii) (magnesium nanocomposite hydrogel enhance mandible regeneration); (iv) *Advanced Functional Materials* (magnesium silicate sprays enhance the repair of burn-skin wound and appendages regeneration); (v) *Bioactive materials* (manganese dioxide incorporated scaffold promotes osteogenic-angiogenic coupling for refractory bone defect by remodelling osteo-regenerative microenvironment); (vi) (osteoporotic bone regeneration through a hydrogel-based microenvironment) and (vii) *The Journal of Clinical Investigation* (excess glucocorticoids inhibit murine bone turnover). Two representative review articles were published in *Theranostics* (role of Piezo1 in the musculoskeletal system and disease, also featured as cover story) and *Journal of Orthopaedic Translation* (animal models and potential mechanisms).

Meanwhile, the research advances of Ling's team were presented at multiple international and local academic conferences, including Orthopaedic Research Society Annual Meeting 2024 (ORS, Feb, US); The 5th International Chinese Musculoskeletal Research Conference (ICMRC, Jun, China); the Hong Kong Orthopaedic Association 44th Annual Congress(HKOA, Nov, HK); 11th WACBE World Congress on Bioengineering (Aug, HK) and the 2024 Joint Symposium of Pre-MRN and AoE (Nov, HK). Team members have received 3 oral or poster presentation awards during the conferences and have been selected as judges for BMEMat-Advanced Materials Joint Symposium presentation awards.

Ling, as the Editor-in-Chief of the *Journal of Orthopaedic Translation (JOT)*, has played a pivotal role in fostering the journal's academic influence through a series of impactful academic initiatives and rigorous editorial standards. In 2024, the number of submissions of JOT, reached 1454, marking a 54% increase from the previous year and setting a new record. The acceptance rate remained stable at around 9.2% compared to the previous year. In terms of impact, the 2023 CiteScore (released in early June 2024) reached 11.8, showing a 27% increase from the previous year (2022 CiteScore). The 2023 Impact Factor (announced in late June 2024) stood at 5.9, ranking JOT fourth among 136 orthopaedic journals. According to the latest Journal Citation Reports by the Chinese Academy of Sciences for 2023, JOT is classified in Q1 for both the Medicine and Orthopaedics sections. Furthermore, the establishment of the JOT Young Editorial Board in mid-2024 has injected youthful energy into the development of JOT. Meanwhile, in early August, the JOT Orthopaedic Translational Excellence Award ceremony was successfully held in Shanghai. To further enhance their journal impact, the editorial office participated in various domestic and international conferences throughout the year for promotion, such as WACBE and COA.

National and International Collaboration Achievements:
The Translational European Asian Network (TEA-NET), established in December 2023, comprises two branches: TEA-NET Asia and TEA-NET Europe. With Ling serving as the Executive Director of TEA-NET Asia, the initiative continues to attract new members from various scientific disciplines and institutions in 2024. During the year, the TEA-NET Aisa hosted

a two-day exchange program for its European partners with a delegation of leaders and scholars from Semmelweis University, Academia Europaea, and the National Academy of Scientist Education of Hungary visited The Chinese University of Hong Kong on 16 and 17 May; and also co-organised the 2024 Joint Symposium of Pre-MRN & AoE in Hong Kong. The initiative also offers various exchange programs, successfully supporting three young scientists from CUHK and one young scientist from Semmelweis University in advanced scientific research. By fostering collaborations between medicine and engineering scientists from Asia and Europe, the initiative continues to strengthen academic partnerships, and cross-discipline cooperation and drive ongoing translational medicine projects and grant applications.

In November 2024, Rocky S. Tuan and Ling co-hosted the 2024 Joint Symposium of Pre-MRN (Musculoskeletal Regeneration Research Network) & AoE in Hong Kong. Subsequently, Ling and Zhiyu Zhou (Sun Yat-Sen University) convened the MRN Symposium in Shenzhen. Participants also toured the InnoHK R&D Centres (Health@INNOHK, AIR@INNOHK) and Shenzhen-Hong Kong Innovation and Technology Co-operation Zone in the Loop (SZ I&T Zone, 河套深港科技創新合作區深圳園區). These symposiums brought together leading global experts in musculoskeletal research. The events fostered collaboration, establishing a task force focused on translating cutting-edge research into clinical applications.

In December 2024, the Centre for Translational Medicine Research and Development, the Shenzhen Institute of Advanced Technology Chinese Academy of Science (SIAT) marked its 15th anniversary by hosting the Shenzhen-Hong Kong Translational Medical Research and Development Summit Forum. Ling, as the Centre Director, facilitated closer academic ties between CUHK, SIAT, and the TEA-NET, highlighted by an agreement signing ceremony during the forum.

Research and Scholarship

Research Awards and Recognitions

Name	Details	
	Award	Organisation
Ling Qin Jiankun Xu Patrick Yung Haozhi Zhang Michael Ong Lei Lei Zhenkang Wen Yuanming An Xin Chen Bingyang Dai Yuantao Zhang Jiaxin Guo	2024 Special Edition of the Geneva International Exhibition of Inventions (Gold Medal)	International Exhibition of Inventions Geneva 2024
Ling Qin Jiankun Xu Wenxue Tong Yuantao Zhang Michael Ong Ronald Wong Qida Zhang Qing Lu	2024 Special Edition of the Geneva International Exhibition of Inventions (Silver Medal)	International Exhibition of Inventions Geneva 2024
Ling Qin Wenxue Tong Jiankun Xu Ronald Wong Haiyue Zu Liangbin Zhou	2024 Special Edition of the Geneva International Exhibition of Inventions (Silver Medal)	International Exhibition of Inventions Geneva 2024

Research Awards and Recognitions

Name	Details	
	Award	Organisation
Ling Qin Jiankun Xu Patrick Yung Haozhi Zhang Wenxue Tong Michael Ong	Silicon Valley International Invention Festival (SVIIF) 2024 Silver Medal	United Inventors Association, International Federation of Inventors' Association, the World Intellectual Property Organization
Ling Qin Jiankun Xu Patrick Yung Michael Ong Haozhi Zhang Bingyang Dai Lei Lei Yuantao Zhang Yuanming An Xin Chen Zhenkang Wen Zhengming Shan	The 4th Asia exhibition of Innovations and Inventions Hong Kong (2024) Silver Award, Adult Group	The Hong Kong Exporters' Association and Palexpo in Geneva
Wenxue Tong Qiuli Qi Naping Xiong	The 4th Asia exhibition of Innovations and Inventions Hong Kong (2024) Silver Award, Adult Group	The Hong Kong Exporters' Association and Palexpo in Geneva
許建坤	中華醫學會第二十三屆骨科學術會議暨第十六屆 COA 學術大會骨科基礎青年學者比賽第三名	中華醫學會骨科學分會
秦嶺 許建坤 張昊智 容樹恆 王佳力 羅穎 朱嘉德	第二十八屆全國發明展覽會．「一帶一路」暨金磚國家技能發展與技術創新競賽銀獎	中國發明協會，金磚國家技能發展與技術創新競賽組委會，「一帶一路」暨金磚國家技能發展國際聯盟
張昊智 代冰洋 張元濤 安苑銘 陳鑫 雷蕾 溫鎮康 單政銘	中國國際大學生創新大賽（2024）銅獎	香港新一代文化協會
秦嶺 容樹恒 許建坤 張昊智 溫鎮康	中大創業大賽（2024）亞軍	香港中文大學校友傳承基金
Yuantao Zhang Naping Xiong	TEA-NET Visiting Research Fellowship in Translational Medicine	Translational European-Asian Network
Yuantao Zhang Naping Xiong	XXIII. Meeting of Nobel Laureates and Talented Students	National Academy of Scientist Education (Hungary)

Research Awards and Recognitions

Name	Details	
	Award	Organisation
Yuantao Zhang	The 5th International Chinese Musculoskeletal Research Conference Traveling Award	International Chinese Musculoskeletal Research Society
Naping Xiong	Cancer 2024-Cancer Immunotherapy, Oral Presentation Award	The Chinese University of Hong Kong

Fellowships

Name	Details	
	Fellowship	Organisation
Ling Qin	Membership	Academia Europaea
	Fellow	American Institute of Medical and Biological Engineering
		American Society for Bone and Mineral Research
		International Combined Orthopaedic Research Society
		International Union of Societies for Biomaterials Science and Engineering
Jiankun Xu	Committee Member	Guangdong Precision Medicine Application Association – Osteosarcoma Group
		Hip Joint Group of the Fourth Committee of the Joint Surgery Branch of the Guangdong Medical Association
	Lifetime Member	International Chinese Musculoskeletal Research Society

Academic Editorships

Name	Details	
	Role	Journal
Ling Qin	Editor in Chief	Journal of Orthopaedic Translation
	Editorial Board Member	Journal of Bone and Mineral Research
		International Journal of Sports Medicine
		Journal of Musculoskeletal and Neuronal Interactions
		eCM (Switzerland)
Jiankun Xu	Editorial Board Member	Journal of Orthopaedic Translation
	Guest Associate Member	Frontiers in Immunology
		Frontiers in Pharmacology

Reviewers of Journal / Conference

Name	Details	
	Role	Journal / Conference
Ling Qin	Reviewer	Advanced Materials
		Advanced Functional Materials
		Proceedings of the National Academy of Sciences
		Biomaterials
		Bioactive Materials
Jiankun Xu	Reviewer	Chemical Engineering Journal
		Journal of Orthopaedic Translation
		Bioactive Materials
		Biomaterials
		Metabolism
	Judge for Selecting Best Oral Presentation	1st BMEMat-Advanced Materials Joint Symposium
	Judge for Selecting Best Poster Presentation	1st BMEMat-Advanced Materials Joint Symposium
	Organization Committee Member	Joint Symposium of Pre-musculoskeletal Regeneration Network and Areas of Excellence Progress
	Co-chair	Shenzhen-Hong Kong Translational Medicine Research and Development Forum
Wenxue Tong	Reviewer	Advanced Functional Materials
		Journal of Orthopaedic Translation
		Advanced Science
		Arthritis Research & Therapy
		Materials Today Bio
	Judge for Selecting Best Oral Presentation	1st BMEMat-Advanced Materials Joint Symposium
	Judge for Selecting Best Poster Presentation	1st BMEMat-Advanced Materials Joint Symposium
	Organization Committee Member	Europe-Asia Joining to Nurture Translational Medical Talents. Translational European Asian Network
		Joint Symposium of Pre-musculoskeletal Regeneration Network and Areas of Excellence Progress
		Shenzhen-Hong Kong Translational Medicine Research and Development Forum
Yu-sheng Hsueh	Reviewer	Frontiers in Pharmacology, Switzerland
Lizhen Zheng	Reviewer	Materials & Design
		BMC Musculoskeletal Disorders
		Journal of Orthopaedic Translation

Reviewers of Journal / Conference

Name	Details	
	Role	Journal / Conference
Lizhen Zheng	Reviewer	Materials & Design
		Journal of Pharmaceutical Analysis
		Bone & Joint Research
		Expert Opinion on Therapeutic Targets
		Chinese Journal of Traumatology
Liang Chang	Reviewer	Journal of Orthopaedic Translation
		Neuroscience Bulletin
		Advanced Materials
Yuantao Zhang	Reviewer	Journal of Orthopaedic Translation
Shi'an Zhang	Reviewer	Journal of Orthopaedic Translation
Naping Xiong	Reviewer	中國骨科雜誌
		Journal of Magnesium and Alloys
Chengjun Li	Reviewer	Journal of Orthopaedic Translation
Ning-Ze Zhang	Reviewer	Journal of Magnesium and Alloys
		Advanced Materials Interfaces
		Journal of Orthopaedic Translation
		Frontiers in Bioengineering and Biotechnology
		ACS Applied Materials & Interfaces
Tongzhou Liang	Reviewer	Journal of Orthopedic Surgery and Research
		Stem Cell Research & Therapy
		BMC Musculoskeletal Disorders
Jiaxin Guo	Reviewer	Bioactive Materials
		Journal of Orthopaedic Translation

Grants and Consultancies

Name	Project Title	Funding Source	Start Date (dd/mm/yyyy)	End Date (dd/mm/yyyy)	Amount (HK$)
Ling Qin	Aging, Skeletal Degeneration and Regeneration	Research Grants Council – Areas of Excellence Scheme	01/05/2021	30/04/2029	70,680,000

Grants and Consultancies

Name	Project Title	Funding Source	Start Date (dd/mm/yyyy)	End Date (dd/mm/yyyy)	Amount (HK$)
Ling Qin	The Joint Laboratory for Biomaterials of SIAT-HKU-CUHK	Co-funding Mechanism for Joint Laboratories with the Chinese Academy of Sciences Funding Scheme (JLFS) 2024/25	01/10/2024	30/09/2029	3,750,000
	Magnesium-based Biodegradable Implants as Innovative Class III Medical Devices: From Implant Design, Biosafety, Efficacy to Clinical Translation	Research Grants Council – Research Impact Fund	01/04/2024	31/03/2028	4,000,000
	Translation of Magnesium-based Implants as Innovative Class III Medical Devices for Clinical Use: Preclincial Activities and Commercialization Plan	The Chinese University of Hong Kong, Faculty of Medicine – Passion for Perfection Scheme	01/04/2024	31/03/2028	7,481,920
	Magnesium Activated Progenitor Cells in Synovial Fluid to Regenerate Articular Cartilage	Research Grants Council – General Research Fund	01/01/2022	31/12/2024	1,174,492
	Identification of a Central to Sympathetic Neural Circuit in Magnesium-promote Bone Regeneration using Retrograde Tracing and Single-cell RNA-seq	Research Grants Council – General Research Fund	01/01/2022	31/12/2024	1,126,379
	Differential Roles of CGRP in Osteoarthritic Pain and Pathology	National Natural Science Foundation of China/Research Grant Council Joint Research Scheme	01/01/2022	31/12/2025	1,185,561

Grants and Consultancies

Name	Project Title	Funding Source	Start Date (dd/mm/yyyy)	End Date (dd/mm/yyyy)	Amount (HK$)
Ling Qin	R&D of Magnesium Oxide Nanoparticles Encapsulating Hydrogel for Enhancing Bone Regeneration in Bisphosphonates (BPs)-Induced Delayed Healing of Mandible Defect	The Chinese University of Hong Kong Research Committee – Direct Grant (High-impact Scheme)	30/06/2024	29/06/2025	50,000
Jiankun Xu	Fibroblasts as a Novel Therapeutic Target for Enhancing the Healing of Challenging Bone Fractures	Health Bureau – Health and Medical Research Fund	01/08/2021	31/07/2024	1,499,980
	Mag Med Biotech Limited	Innovation and Technology Commission – Technology Start-up Support Scheme for Universities	01/04/2024	31/03/2026	590,000
	Research and Development of Magnesium-incorporated Bioartificial Ligament	The Chinese University of Hong Kong – Knowledge Transfer Project Fund	01/04/2024	31/03/2026	398,000
	Magnesium-containing Core-shell Subunits for Enhancing Tendon-Bone Junction Healing	The Chinese University of Hong Kong – Ideabooster Fund	28/06/2024	30/06/2025	125,000
	Unbiased and Panoramic Exploration on The Novel Mechanisms of Innervated Tendon-bone Interface Healing	The Chinese University of Hong Kong Research Committee – Direct Grant (High-impact Scheme)	30/06/2024	29/06/2025	50,000
	Role of Piezo1 in Tendon Healing	The Chinese University of Hong Kong Research Committee – Direct Grant	30/06/2023	29/06/2024	30,000

Grants and Consultancies

Name	Project Title	Funding Source	Start Date (dd/mm/yyyy)	End Date (dd/mm/yyyy)	Amount (HK$)
Wenxue Tong	Prevention and Treatment of Osteoarthritis by Screening a Novel Cartilage-Targeting Adeno-associated Virus: A Gene Therapy Approach	Health Bureau – Health and Medical Research Fund	01/07/2022	30/06/2025	1,424,920
Shunxiang Xu	Mechanically and Biochemically Active Dressing Promotes Diabetic Skin Wound Healing	The Chinese University of Hong Kong – Ideabooster Fund	28/06/2024	31/12/2025	150,000

Publications

A. Journal Papers

1. Yan Y, Mi B, Zhang J, Zhang Y, Lin N, Ding C, Qin L, Chen W. Application characteristics and clinical effectiveness of clinical finding staging in guiding non-surgical treatment of knee osteoarthritis involving 92 medical institutions. *Journal of Orthopaedic Surgery and Research*. 2024;19(1). doi:10.1186/s13018-024-05374-8.
2. Zhang NZ, Wang C, Ran TF, Zeng FC, Wang M, Qin L, Cheng CK. Intervertebral osteointegration and biomechanical performance of bioactive lithium disilicate glass-ceramic scaffold fabricated by digital light processing. *Ceramics International*. Published online December 15, 2024. doi:10.1016/j.ceramint.2024.10.218. (Epub ahead of print)
3. Zhang H, Chen X, Ong MTY, Lei L, Zheng L, Dai B, Tong W, Fu BSC, Xu J, Yung PSH, Qin L. Current advances of artificial ligaments for anterior cruciate ligament reconstruction: From biocompatibility to bioactivity. *Engineering*. Published online November 29, 2024. doi:10.1016/j.eng.2024.10.018. (Review, Epub ahead of print)
4. Zhang NZ, Shui YY, Zhang Q Da, Zhang YT, Su J, Qin L, Cheng CK. Failure analysis and design improvement of retrieved plates from revision surgery. *Journal of Orthopaedic Translation*. 2024;49:1-10. doi:10.1016/j.jot.2024.08.011.
5. Qin L. Understanding pathophysiology and injury mechanisms is the foundation for invention/innovation and clinical translation in orthopaedics. *Journal of Orthopaedic Translation*. 2024;47:A1-A2. doi:10.1016/j.jot.2024.07.003. (Editorial)
6. Zheng L, Zhang R, Chen X, Luo Y, Du W, Zhu Y, Ruan YC, Xu J, Wang J, Qin L. Chronic kidney disease: A contraindication for using biodegradable magnesium or its alloys as potential orthopedic implants? *Biomedical Materials (Bristol)*. 2024;19(4). doi:10.1088/1748-605x/ad5241.
7. Zheng L, An Y, Tong W, Chen Z, Wang Y, Zhang H, Zhang S, Chen X, Liu W, Wang X, Xu J, Qin L. Canonical pathways for validating steroid-associated osteonecrosis in mice. *Bone*. 2024;183. doi:10.1016/j.bone.2024.117094.
8. Li X, Liang T, Dai B, Chang L, Zhang Y, Hu S, Guo J, Xu S, Zheng L, Yao H, Lian H, Nie Y, Li Y, He X, Yao Z, Tong W, Wang X, Chow DHK, Xu J, Qin L. Excess glucocorticoids inhibit murine bone turnover via modulating the immunometabolism of the skeletal microenvironment. *Journal of Clinical Investigation*. 2024;134(10). doi:10.1172/jci166795.

9. Zhou L, Ho KWK, Zheng L, Xu J, Chen Z, Ye X, Zou L, Li Y, Chang L, Shao H, Li X, Long J, Nie Y, Stoddart MJ, Lai Y, Qin L. A rabbit osteochondral defect (OCD) model for evaluation of tissue engineered implants on their biosafety and efficacy in osteochondral repair. *Frontiers in Bioengineering and Biotechnology*. 2024;12. doi:10.3389/fbioe.2024.1352023.

10. Zhang NZ, Zhang M, Tang HY, Qin L, Cheng CK. P2O5 enhances the bioactivity of lithium silicate glass ceramics via promoting phase transformation and forming Li3PO4. *Ceramics International*. 2024;50(8):13308-13317. doi:10.1016/j.ceramint.2024.01.243.

11. Liao Z, Umar M, Huang X, Qin L, Xiao G, Chen Y, Tong L, Chen D. Transient receptor potential vanilloid 1: A potential therapeutic target for the treatment of osteoarthritis and rheumatoid arthritis. *Cell Proliferation*. 2024;57(3). doi:10.1111/cpr.13569. (Review)

12. Xu S, Zhang Y, Dai B, Rao J, Deng F, Zhang S, Shao H, Li X, Jin Z, Liang T, Yang Y, Li Y, Chen Z, Tong W, Xu J, Ning C, Qin L. Green-prepared magnesium silicate sprays enhance the repair of burn-skin wound and appendages regeneration in rats and minipigs. *Advanced Functional Materials*. 2024;34(9). doi:10.1002/adfm.202307439.

13. Zhou L, Wu AC, Hegyi P, Wen C, Qin L. ChatGPT for scientific writing — The coexistence of opportunities and challenges. *Journal of Orthopaedic Translation*. 2024;44:A1-A3. doi:10.1016/j.jot.2024.01.005. (Editorial)

14. Guo J, Yao H, Chang L, Zhu W, Zhang Y, Li X, Yang B, Dai B, Chen X, Lei L, Chen Z, Li Y, Zheng L, Liu W, Tong W, Su Y, Qin L, Xu J. Magnesium nanocomposite hydrogel reverses the pathologies to enhance mandible regeneration. *Advanced Materials*. Published online January 15, 2024. doi:10.1002/adma.202312920. (Epub ahead of print)

15. Suen PK, Zheng L, Yang Q qing, Mak WS, Pak WY, Mo KY, Chan ML, Liu Q quan, Qin L, Sun SSM. Lysine-rich rice partially enhanced the growth and development of skeletal system with better skeletal microarchitecture in young rats. *Nutrition Research*. 2024;121:67-81. doi:10.1016/j.nutres.2023.11.005.

16. He X, Li Y, Miao H, Xu J, Ong MTY, Wang C, Zheng L, Wang J, Huang L, Zu H, Yao Z, Mi J, Dai B, Li X, Yung PSH, Yuan G, Qin L. High formability Mg-Zn-Gd wire facilitates ACL reconstruction via its swift degradation to accelerate intra-tunnel endochondral ossification. *Journal of Magnesium and Alloys*. 2024;12(1):295-315. doi:10.1016/j.jma.2022.12.006.

17. Zhang X, Yang B, Feng L, Xu X, Wang C, Lee YW, Wang M, Lu X, Qin L, Lin S, Bian L, Li G. Augmenting osteoporotic bone regeneration through a hydrogel-based rejuvenating microenvironment. *Bioactive Materials*. 2024;41:440-454. doi:10.1016/j.bioactmat.2024.07.036.

18. Yang J, Chen C, Zhang H, Chen B, Xiao K, Tang Y, Meng K, Qin L, Chen P. Serum metabolomics and 16s rRNA amplicon sequencing reveal the role of puerarin in alleviating bone loss aggravated by antidiabetic agent pioglitazone in type 2 diabetic mice. *Journal of Ethnopharmacology*. 2025;340. doi:10.1016/j.jep.2024.119128. (Epub ahead of print)

19. An Y, Zhang H, Zhang S, Zhang Y, Zheng L, Chen X, Tong W, Xu J, Qin L. Degradation products of magnesium implant synergistically enhance bone regeneration: Unraveling the roles of hydrogen gas and alkaline environment. *Bioactive Materials*. 2025;46:331-346. doi:10.1016/j.bioactmat.2024.12.020. (Epub ahead of print)

20. Jin Z, Chen Z, Liang T, Liu W, Shan Z, Tan D, Chen J, Hu J, Qin L, Xu J. Accelerated fracture healing accompanied with traumatic brain injury: a review of clinical studies, animal models and potential mechanisms. *Journal of Orthopaedic Translation*. 2025;50:71-84. doi:10.1016/j.jot.2024.10.008. (Review)

B. Conference Papers

1. Zhenkang Wen, Hao Yao, Lei Lei, Jiankun Xu, Ling Qin. Inhibition of Piezo1 optimizes the niche for hyaline cartilage regeneration. In: *The 5th International Chinese Musculoskeletal Research Conference (ICMRC 2024)*. China. 2024, Jun 1-2.

2. Zhenkang Wen. Inhibition of Piezo1 optimizes the niche for hyaline cartilage regeneration. In: *Symposium on Ray Wu Memorial Fund & International Conference on Regenerative Medicine and Health*. China. 2024, Oct 24-25.

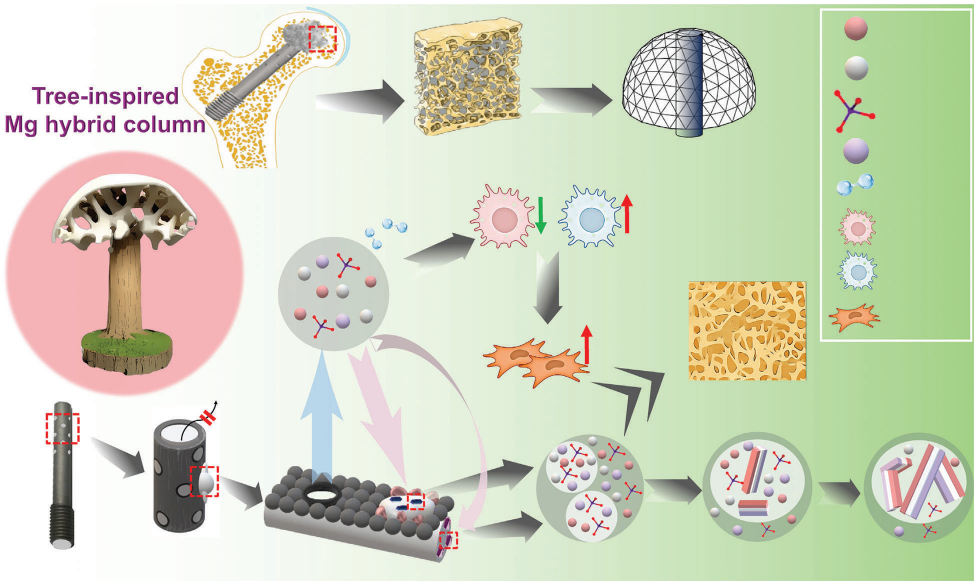
3. Zhenkang Wen. Inhibition of Piezo1 optimizes the niche for hyaline cartilage regeneration. In: *The Hong Kong Orthopaedic Association 44th Annual Congress*. Hong Kong. 2024, Nov 2-3.
4. Haozhi Zhang, Jiankun Xu, Michael Tim-yun Ong, Bruma Sai-chuen Fu, Patrick Shu-hang Yung, Ling Qin. A novel magnesium- and recombinant spidroin- incorporated bioartificial ligament. In: *The Hong Kong Orthopaedic Association 44th Annual Congress*. Hong Kong. 2024, Nov 2-3.
5. Liang Chang, Nianye Zheng, Jiaxin Guo, Hao Yao, Yuantao Zhang, Wenxue Tong, Bingyang Dai, Xu Li, Hongtao Xu, Yuanming An, Jiankun Xu, Ling Qin. Magnesium-containing Implant Modulates the Characteristics of Distinct Mesenchymal Progenitors to Inhibit Fracture Callus Fibrosis in Long-term Bisphosphonate-pretreated Rats. In: *Orthopaedic Research Society 2024 Annual Meeting*. Long Beach, California. 2024, Feb 2-6.
6. Ning-Ze Zhang, Cheng-Kung Cheng, Jiankun Xu, Ling Qin. Failure analysis and design improvement based on retrieved plates from revision surgery. In: *The 5th International Chinese Musculoskeletal Research Conference (ICMRC 2024)*. China. 2024, Jun 1-2.
7. Ning-Ze Zhang, Wenxue Tong, Cheng-Kung Cheng, Ling Qin. Intervertebral osteointegration and biomechanical performance of bioactive lithium silicate glass-ceramic scaffold fabricated by digital light processing. In: *11th WACBE World Congress on Bioengineering*. Hong Kong. 2024, Aug 4-7.
8. Haozhi Zhang. Mag Med Bioartificial Ligament: the Next Generation Solution for ACL Reconstruction. In: *The 2024 Joint Symposium of Pre-MRN and AoE*. Hong Kong. 2024, Nov 23-24.
9. Tongzhou Liang, Jiankun Xu, Ling Qin. Systemic Supplementation of Magnesium Attenuates Bone Loss via Acting on Central Nervous System. In: *Orthopaedic Research Society 2024 Annual Meeting*. Long Beach, California. 2024, Feb 2-6.
10. Jiaxin Guo, Tongzhou Liang, Hao Yao, Liang Chang, Yuxiong Su, Jiankun Xu, Ling Qin. Magnesium Nanocomposite Hydrogels Demonstrating Controllable Gelation and Tissue Integration Accelerate Necrotic Bone Regeneration. In: *Orthopaedic Research Society 2024 Annual Meeting*. Long Beach, California. 2024, Feb 2-6.

C. Patents

1. Title: 骨內植物
   Inventors: 秦嶺，祖海越，許建坤，黃文楊，趙德偉
   Patent Application No.: 202210740381.1
   Date: 19 March 2024

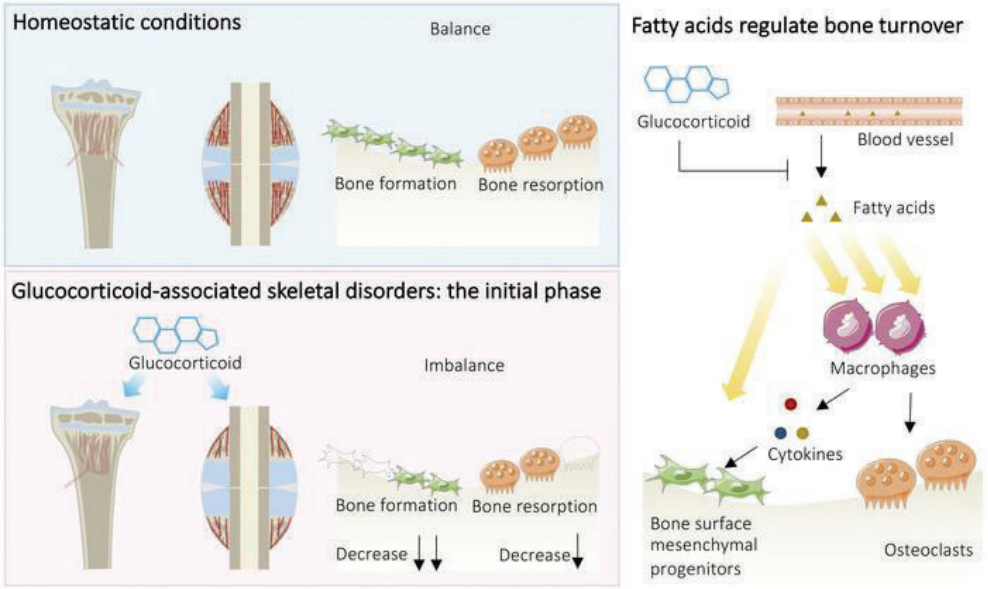
D. Others

1. Hsuen YS, Qin L. HK needs independent regulatory body for medical product review. China Daily. https://www.chinadailyhk.com/hk/article/587301.



Schematic illustration of tree-inspired Mg hybrid column for treating SAON by optimising mechanical load distribution, controlling degradation rate and promoting biomineralisation in the bipedal hip joint.

Source: Ling Qin and his team



The graphic abstract summarise the impact of excess glucocorticoids on murine bone turnover through the modulation of macrophage-mediated immunometabolism in the skeletal microenvironment.

Source: Ling Qin and his team



Biomaterial, Chemical Biology and Drug Translational Research

Chemical Biology and Drug Discovery

生物材料、化學生物學與藥物轉譯研究

PRINCIPAL INVESTIGATOR | **Billy Ng**

TEAM MEMBERS | Stephan Scheeff, Chanin Sillapachaiyaporn, Yuanpei Li, Bowen Ma, Khadija Shahed Khan, Yao Qin, Josefina Xeque Amada, Tongyang Xu, Zhihao Guo, Richard Lo, Yunpeng Huang, Jiajun Wu, Haixing Xu, Wenjing Wang, Koey Yu

Research Progress Summary

Billy Ng and his research team focus on using synthetic chemistry, chemical biology and medicinal chemistry to study the molecular mechanisms of diseases to develop new safe drugs for the treatment of various dreadful diseases, including cancers, infectious and neurodegenerative diseases.

Research and Development of New Drugs Based on Natural Products Brings New Hope for the Treatment of Neurodegenerative Diseases

The chemical active ingredient "bilobalide" in ginkgo leaves has potential brain-protecting effects, but due to its complex chemical structure and easy decomposition in the human body, it is difficult to develop into a drug. The team has developed a new chemical molecule editing technology that can finely modify the molecular structure

of bilobalide, thereby altering the pharmacology of bilobalide and providing new hope for the treatment of neurodegenerative diseases such as Alzheimer's disease. The findings have been published in *JACS Au*, an international peer-reviewed scientific journal (*JACS Au* July 2024).

Targeted Protein O-GlcNAcylation Using Bifunctional Small Molecules for Therapy

Billy Ng led the team to develop the first bifunctional small molecule that can achieve specific protein glycosylation modification, named OGTACs. They used OGTACs to develop a series of new antiviral, anti-cancer and neurodegenerative disease therapeutics. Protein O-linked β-*N*-acetylglucosamine modification (O-GlcNAcylation) plays a crucial role in regulating essential cellular processes. The disruption of the homeostasis of O-GlcNAcylation has been linked to various human diseases, including cancer, diabetes, and neurodegeneration. However, there are limited chemical tools for protein- and site-specific O-GlcNAc modification, rendering the precise study of the O-GlcNAcylation challenging. To address this, the team has developed heterobifunctional small molecules, named O-GlcNAcylation TArgeting Chimeras (OGTACs), which enable protein-specific O-GlcNAcylation in living cells. Overall, the OGTACs represent a promising approach for inducing protein-specific O-GlcNAcylation, thus enabling functional dissection and offering new directions for O-GlcNAc-targeting therapeutic development. This research has been published in an international chemistry journal – *Journal of the American Chemical Society (JACS* April 2024).

Research and Scholarship

Research Awards and Recognitions

Name	Details	
	Award	Organisation
Haixing Xu	The Chinese University of Hong Kong Vice-Chancellor's Ph.D. Scholarship	The Chinese University of Hong Kong
Yunpeng Huang		

Academic Editorships

Name	Details	
	Role	Journal
Billy Ng	Editorial Board Member	Frontiers in Chemistry

Reviewers of Journal / Conference

Name	Details	
	Role	Journal / Conference
Billy Ng	Reviewer	72nd Lindau Nobel Laureate Meeting
		Science Translational Medicine
		Nature Biotechnology
		Nature Structural & Molecular Biology
		Nature Chemical Biology
		Nature Communications
		Science Advances
		eLife

Reviewers of Journal / Conference

Name	Details	
	Role	Journal / Conference
Billy Ng	Reviewer	Journal of Biological Chemistry
		JCI Insight
		iScience
		Frontiers in Chemistry

Grants and Consultancies

Name	Project Title	Funding Source	Start Date (dd/mm/yyyy)	End Date (dd/mm/yyyy)	Amount (HK$)
Billy Ng	A Chemical Biology Approach to Probe Protein Glycosylation in Cancer	The Chinese University of Hong Kong – Faculty Innovation Award	01/10/2020	01/10/2025	2,500,000
	Exploring and Drugging the Cancer Glycome	Croucher Foundation	12/08/2019	12/08/2024	500,000
	Synthesis of Pseudo-natural Product Analogues of Bilobalide as Cardioprotective Agents	Research Grants Council – Early Career Scheme	01/01/2022	31/12/2024	491,303
	Development of Simeprevir Analogues as Anti-coronavirus Drugs	Health Bureau – Health and Medical Research Fund	01/09/2022	31/08/2025	1,500,000
	Design and Synthesis of Novel Carbocyclic Nucleoside Analogues as Antiviral Agents	Research Grants Council – General Research Fund	01/01/2023	31/12/2025	464,000
	Bilobalide Analogues as Analgesics for Neuropathic Pain	The Chinese University of Hong Kong Peter Hung Pain Research Institute – Peter Hung Pain Research Institute Fund	01/10/2022	30/09/2025	1,750,000
	Targeted Protein O-GlcNAcylation Using Small Molecules	The Chinese University of Hong Kong Research Committee – Direct Grant	30/06/2023	29/06/2024	30,000

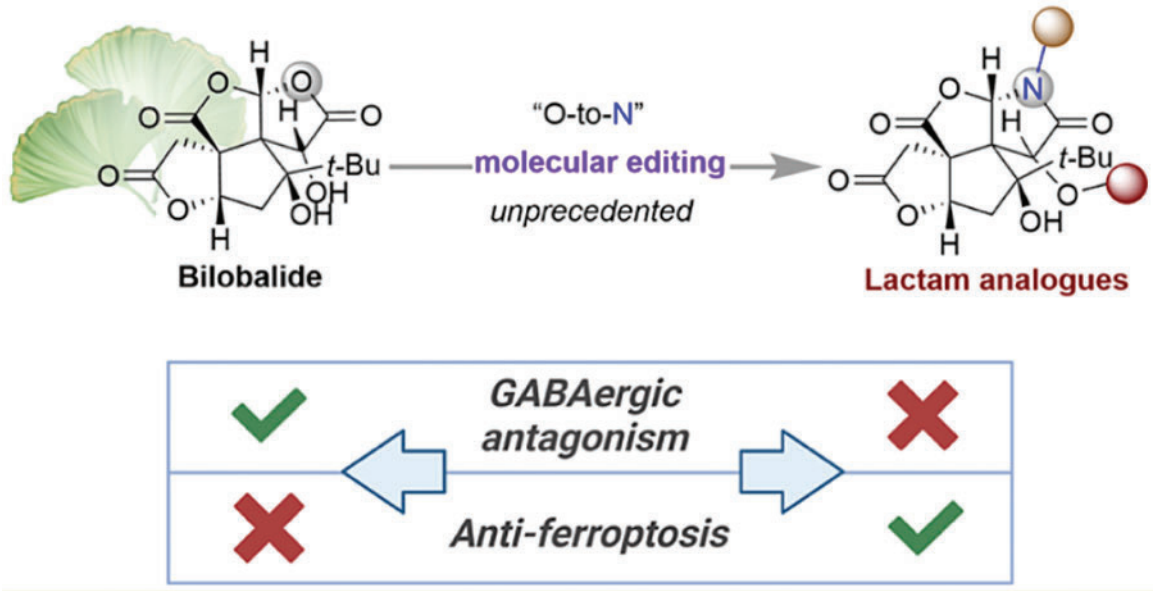
Grants and Consultancies

Name	Project Title	Funding Source	Start Date (dd/mm/yyyy)	End Date (dd/mm/yyyy)	Amount (HK$)
Billy Ng	Terpene Trilactone Derivatives as Therapeutics Against Ageing-Related Neurodegenerative Diseases	The Chinese University of Hong Kong – Strategic Seed Funding for Collaborative Research Scheme	31/10/2023	31/10/2025	300,000
	Design of Carbobicyclic Nucleosides for Influenza	Bill & Melinda Gates Foundation	23/08/2023	30/09/2024	2,035,500
	Development of Carbobicyclic Nucleosides as Novel Antivirals	Innovation and Technology Commission – Innovation and Technology Fund	01/03/2024	13/08/2025	1,399,550

Publications

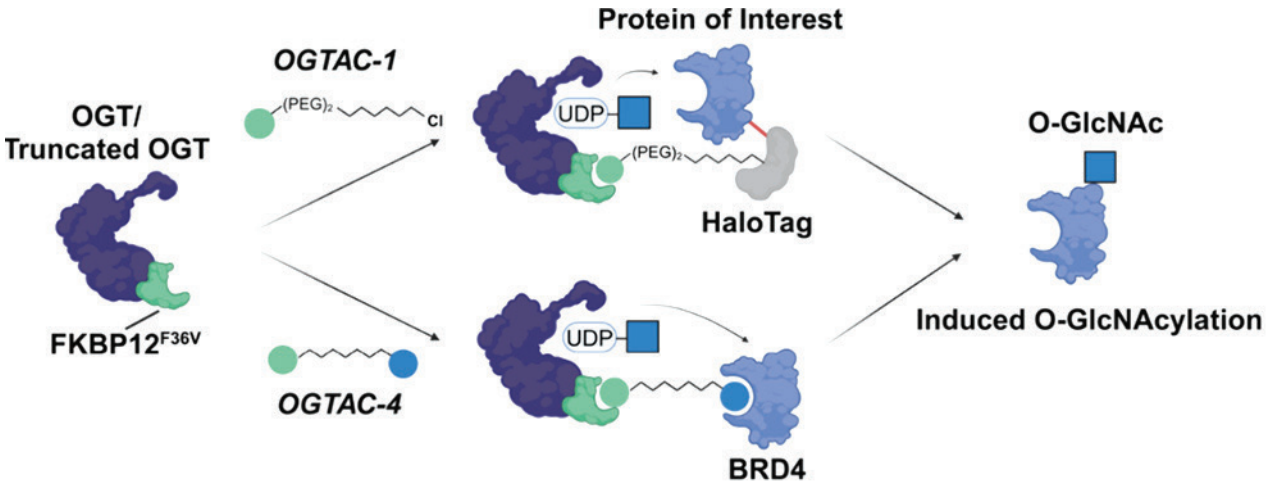
A. Journal Papers

1. Jiang X, He X, Wong J, Scheeff S, Hau SCK, Wong TH, Qin Y, Fan CH, Ma B, Chung NL, Huang J, Zhao J, Yan Y, Xiao M, Song X, Hui TKC, Zuo Z, Wu WKK, Ko H, Chow KHM, Ng BWL. Lactone-to-lactam editing alters the pharmacology of bilobalide. *JACS Au*. Published online September 23, 2024. doi:10.1021/jacsau.4c00416.
2. Ma B, Khan KS, Xu T, Amada JX, Guo Z, Huang Y, Yan Y, Lam H, Cheng ASL, Ng BWL. Targeted protein O-GlcNAcylation using bifunctional small molecules. *Journal of the American Chemical Society*. 2024;146(14):9779-9789. doi:10.1021/jacs.3c14380.
3. Wang F, Li Y, Yang Z, Cao W, Liu Y, Zhao L, Zhang T, Zhao C, Yu J, Yu J, Zhou J, Zhang X, Li PP, Han M, Feng S, Ng BWL, Hu ZW, Jiang E, Li K, Cui B. Targeting IL-17A enhances imatinib efficacy in Philadelphia chromosome-positive B-cell acute lymphoblastic leukemia. *Nature Communications*. 2024;15(1). doi:10.1038/s41467-023-44270-3.
4. Chen B, Yin Z, Ng BWL, Wang DM, Tuan RS, Bise R, Ker DFE. Label-free live cell recognition and tracking for biological discoveries and translational applications. *npj Imaging*. 2024;2(1):1-26. doi:10.1038/s44303-024-00046-y.



Precise transformations of natural products (NPs) can fine-tune their physicochemical properties while preserving inherently complex and evolutionarily optimised parent scaffolds.

Source: Jiang X, He X, Wong J, Scheeff S, Hau SCK, Wong TH, Qin Y, Fan CH, Ma B, Chung NL, Huang J, Zhao J, Yan Y, Xiao M, Song X, Hui TKC, Zuo Z, Wu WKK, Ko H, Chow KHM, Ng BWL. Lactone-to-lactam editing alters the pharmacology of bilobalide. JACS Au. Published online September 23, 2024. doi:10.1021/jacsau.4c00416.



O-GlcNAcylation TArgeting Chimeras (OGTACs) which enable protein-specific O-GlcNAcylation in living cells.

Source: Ma B, Khan KS, Xu T, Amada JX, Guo Z, Huang Y, Yan Y, Lam H, Cheng ASL, Ng BWL. Targeted protein O-GlcNAcylation using bifunctional small molecules. Journal of the American Chemical Society. 2024;146(14):9779-9789. doi:10.1021/jacs.3c14380.



Biomaterial, Chemical Biology and Drug Translational Research

Sarcopenia, Osteoporosis, Osteoporotic Fracture

生物材料、化學生物學與藥物轉譯研究

PRINCIPAL INVESTIGATOR | **Louis Cheung**

TEAM MEMBERS | Can Cui, Chaoran Liu, Yee Ling Au, Wujian Lin, Qianjin Wang, Senlin Chai, Ranyang Tao, Abudureheman Maihemuti, Yejin Zhang, Moldir Shyngys

Research Progress Summary

Projects as PI

1. Title: Dissecting the therapeutic mechanism of an effective combination treatment targeting neuromuscular junction degeneration and myosteatosis to combat sarcopenia.

This ongoing project led by **Louis Cheung** and his research team aims to investigate the pathogenesis of sarcopenia in terms of myosteatosis and neuromuscular junction (NMJ) degeneration in animal model and clinical settings, and explore the underlying mechanisms of the combined treatment of vibration therapy and HMB supplementation on attenuating myosteatosis and NMJ degeneration in sarcopenia.

Summary: The progress highlighted the changes in skeletal muscle during aging in the sarcopenic SAMP8 mouse model, focusing on several pathogenic factors such as NMJ degeneration, mitochondrial dysfunction, and fat

infiltration. The team observed that these changes typically began at 6 months of age, while sarcopenia onset occurred at 8 months, suggesting that these changes may precede the onset of sarcopenia. Combined treatment positively affects sarcopenia by improving NMJ function, mitochondrial health, and reducing fat infiltration through the activation of the Wnt10b mechanism. In the clinical part, by comparing the NMJ function of non-sarcopenic and sarcopenic subjects using SFEMG, the team found a significantly increased jitter value in sarcopenic patients, indicating impaired NMJ transmission. The randomised controlled trial has recruited 181 participants, randomised them into 5 groups and completed the 3-month treatments and assessments: CTL (n=21), HMB (n=40), VT (n=42), HMB+VT (n=30) and HMB+EXE (n=48). The HMB group exhibited the highest adjusted mean handgrip strength (M_{adj} (adjusted mean) = 17.0; 95%CI = 16.3, 17.7), significantly outperforming the control group (M_{adj} = 14.6; 95%CI = 13.5, 15.7) (p=0.005).

Academic Conferences:

- Lin WJ, Wang QJ, Cui C, Chai SL, Wong RMY, Zhang N; Chow SKH; Cheung WH. The role of Wnt10b in sarcopenia muscle and myoblast myogenic function. ORS 2024 Annual Meeting, Long Beach, California, February 2-6 2024.
- Wang QJ, Cui C, Lin WJ, Cheung WH. Intervention study of low-magnitude, high-frequency vibration and β-hydroxy-β-methylbutyrate treatment on sarcopenia: Neuromuscular junction and mitochondria dysfunction. 10th CUHK International Symposium on Stem Cell Biology & Regenerative Medicine, 3rd Guangdong-Hong Kong-Macao Greater Bay Area International Conference on Regenerative Medicine. Hong Kong. April 8-9, 2024.
- Cui C, Qi SC, Cai FR, Chan MS, Wong MY, Zhang, Hu Y, Cheung WH. Introducing a new high accuracy electrodiagnosis method in HK: Single fiber electrophysiology (SFEMG) for monitoring neuromuscular degeneration of sarcopenia. The 11th WACBE World Congress on Bioengineering, August 04-07, Hong Kong.
- Lin WJ, Wang QJ, Cui C, Chai SL, Wong MY, Zhang N, Chow KH, Cheung WH. The role of Wnt10b in sarcopenic muscle and myoblast myogenic function. The 5th Annual Academic Conference of the Physical Therapy Professional Committee of the Chinese Association of Rehabilitation Medicine. Shang Hai, China. June 13-16 2024.
- Wang QJ, Cui C, Lin WJ, Chai SL, Wong MY, Zhang N, Cheung WH. **震動聯合** HMB **治療對肌少症中神經肌肉接頭退變的影響** The 16th Annual Congress of Chinese Orthopaedic Association. Wuhan, China. December 04-08, 2024.
- Cui C, Qi SC, Cai FR, Chan MS, Wong MY, Zhang, Hu Y, Cheung WH. Investigating Neuromuscular Degeneration in Sarcopenia: Insights from Single Fiber Electrophysiology and Multichannel Surface Electromyography. The 16th Annual Congress of Chinese Orthopaedic Association. Wuhan, China. December 04-08, 2024.

Journal Papers:

- Lin WJ, Chow SKH, Cui C, Liu C, Wang Q, Chai S, Wong RMY, Zhang N, Cheung WH. Wnt/β-catenin signaling pathway as an important mediator in muscle and bone crosstalk: A systematic review. *J Orthop Translat*. 2024 Jun 20; 47:63-73. DOI: 10.1016/j.jot.2024.06.003.
- Wang Q, Cui C, Zhang N, Lin W, Chai S, Chow SK, Wong RMY, Hu Y, Law SW, Cheung WH. Effects of physical exercise on neuromuscular junction degeneration during ageing: A systematic review. *J Orthop Translat*. 2024 May 23; 46:91-102. DOI: 10.1016/j.jot.2024.03.007.
- Bao Z, Cui C, Liu C, Long Y, Wong RMY, Chai S, Qin L, Rubin C, Yip BHK, Xu Z, Jiang Q, Chow SH, Cheung WH (2024). Prevention of age-related neuromuscular junction degeneration in sarcopenia by low-magnitude high-frequency vibration. *Aging Cell*. 23, e14156. https://doi.org/10.1111/acel.14156.
- Li MCM, Cheng YK, Cui C, Chow SKH, Wong RMY, Kwok TC, Siu PM, Yang M, Tian M, Rubin C, Welch AA, Qin L, Law SW, Cheung WH. Biophysical and nutritional combination treatment for myosteatosis in patients with sarcopenia: A study protocol for single-blinded randomised controlled trial. *BMJ Open*. 14(1):e074858, 2024. DOI: 10.1136/bmjopen-2023-074858.
- Zhang N, Zhai L, Wong RMY, Cui C, Law SW, Chow SKH, Goodman S, Cheung WH. Harnessing immunomodulation to combat sarcopenia: Current insights and possible approaches. *Immun Ageing*. 21:55, 2024. DOI: 10.1186/s12979-024-00458-9
- Cheng KYK, Chow SKH, Hung VWY, Yip BHK, Wong RMY, Zhang N, Qin L, Law SW, Cheung WH. Identification of osteosarcopenia by high-resolution peripheral quantitative computed tomography (HR-pQCT). *J Pers Med*. 14(9):935, 2024. DOI: 10.3390/jpm14090935.
- Liu C, Wong PY, Wang Q, Wong HY, Huang T, Cui C, Zhang N, Cheung WH, Wong RMY. Short-chain fatty acids enhance muscle mass and function through the activation of mTOR signaling pathways in sarcopenic mice. *J Cachexia Sarcopenia Muscle*. 15(6):2387-2401, 2024. DOI: 10.1002/jcsm.13573.

Knowledge Transfer Activities:

- 16th Feb 2023 : **香港家庭計劃指導會馬鞍山婦女會**
- 28th Feb 2024 : **林護紀念松柏日間護理中心**
- 13th March 2024 : **香港家庭計劃指導會馬鞍山婦女會**

2. Title: Neuromuscular junction ageing: Retardation of its degeneration in sarcopenia by vibration treatment
This ongoing project aims to characterise the changes of NMJ morphology and functions in a normal-ageing animal model (C57BL/6 mice) compared with the SAMP8 model and investigate the effect of LMHFV treatment on NMJ.

Summary: The progress showed that natural aging causes statistic significant weight gain, decreased grip strength, and decreased TA muscle mass in C57BL6/J mice at 24 months. Degeneration of motor nerve terminal buttons and fragmentation of the AChR region of the postsynaptic membrane in the NMJ of 24-month-old mice. However, at 21 months of age, the number and area of intermyofibrillar mitochondria in C57BL6/J mice had changed significantly. This study reveals a significant reduction in muscle strength and TA muscle mass in 24-month-old C57BL6/J mice. Degeneration of the microstructure of NMJ terminal buttons and postsynaptic membrane, changes in mitophagy and changes in IMF mitochondrial morphology and function occur earlier.

Academic Conferences:

- Chai SL, Zhang N, Cui C, Wong RWY, Law SW, Cheung WH. Neuromuscular junction ageing: Retardation of its degeneration in sarcopenia by vibration treatment. The 44th Annual Congress of The Hong Kong Orthopaedic Association. Hong Kong. November 02-03, 2024.
- Chai S, Zhang N, Cui C, Wong RMY, Law SW, Cheung WH. The role of mitochondria in the aging neuromuscular junction system: A systematic review. The 43rd Annual Congress of Hong Kong Orthopaedic Association. Hong Kong. Nov 4-5, 2023.

Journal Papers:

- Long YF, Chow SKH, Cui C, Wong RMY, Zhang N, Qin L, Law SW, Cheung WH. Does exercise influence skeletal muscle by modulating mitochondrial functions via regulating MicroRNAs? A systematic review. *Ageing Res Rev*. 91:102048, 2023. DOI: 10.1016/j.arr.2023.102048.
- Chai SL, Zhang N, Cui C, Bao ZY, Wang QJ, Lin WJ, Wong RWY, Law SW, Schonmehl R, Brochhausen C, Cheung WH. Systematic review of mitochondrial dysfunction and oxidative stress in ageing: A focus on neuromuscular junctions. *Neural Regen Res*. (Invited for resubmission)

Achievement:
The team's vibration therapy is recommended by CDC (Centres for Disease Control and Prevention) of the United States to be an effective fall intervention for community dwelling older adult. Please refer to https://www.cdc.gov/falls/interventions/falls-compendium.html, page 94-95.

3. Title: RANKL inhibitor as an intervention to combat sarcopenia through modulating fat metabolism and mitochondrial functions

Summary: This project is still ongoing. The study aims to investigate the effects of an anti-RANKL treatment on sarcopenic skeletal muscle and explore the related mechanisms in mitochondria modulation and the polarisation status of macrophages. The anti-RANKL treatment protected against skeletal muscle dysfunctions by suppressing muscle inflammation and restoring mitochondria function, which may represent a novel therapeutic approach for sarcopenia.

Academic Conferences:

- Cheung WH, Cui C, Lin W, Chai S, Wang Q, Wong RMY, Zhang N. Anti-RANKL treatment attenuates sarcopenia via modulating mitochondria and macrophage infiltration. 2024 Annual Meeting of Orthopaedic Research Society. Long Beach, California, USA. Feb 2-6, 2024.
- Cui C, Long Y, Lin W, Chai S, Wong RMY, Zhang N, Cheung WH. Anti-RANKL treatment suppresses macrophage infiltration and attenuates mitochondria deterioration during sarcopenia. The 43rd Annual Congress of Hong Kong Orthopaedic Association. Hong Kong. Nov 4-5, 2023.

- Cui C, Long Y, Lin W, Liu C, Wong RMY, Zhang N, Cheung WH. Anti-RANKL treatment attenuates mitochondria deterioration and suppresses macrophage infiltration during sarcopenia. 16th International Conference on Sarcopenia, Cachexia & Wasting Disorders. Stockholm, Sweden. Jun 17-19, 2023.

Projects as Co-I

1. Title: Profiling age-related motoneuron loss and neuromuscular degeneration among osteosarcopenic patients in Hong Kong: A case-control study

Summary: This study aims to conduct a case-control study to utilise single fiber electromyography (SFEMG) and identify neurophysiological predictor variables that are of high diagnosed values of osteosarcopenia status in older adults in Hong Kong.

Academic Conference:

- Cui C, Qi SC, Cai FR, Chan MS, Wong MY, Zhang, Hu Y, Cheung WH. Introducing a new high accuracy electrodiagnosis method in HK: Single fiber electrophysiology (SFEMG) for monitoring neuromuscular degeneration of sarcopenia. The 11th WACBE World Congress on Bioengineering, August 04-07, Hong Kong.

Journal Paper:

- Qi SC, Li JP, Cui C, Cai FR, Hu XS, Feng L, He R, To MKT, Cheung JPY, Liu WH, Wong RMY, Cheung WH, Hu Y. Application of multi-channel surface EMG decomposition on neuromuscular function assessment. (Submitted and pending for result)

2. Title: Introducing a new high accuracy and early diagnosis method of sarcopenia in HK: Single fiber electrophysiology (SFEMG) for monitoring neuromuscular degeneration

Summary: This clinical study aims to investigate neurophysiological predictor variables of sarcopenia via electromyography.

Academic Conference:

- Cui C, Qi SC, Cai FR, Chan MS, Wong MY, Zhang, Hu Y, Cheung WH. Investigating neuromuscular degeneration in sarcopenia: Insights from single fiber electrophysiology and multichannel surface electromyography. The 16th Annual Congress of Chinese Orthopaedic Association. Wuhan, China. December 04-08, 2024.

Publicity:
Website created for this project: The team has created a link under the fall prevention campaign (www.no-fall.hk) to promote this program and raise awareness of sarcopenia: http://www.no-fall.hk/eosa/

3. Title: Relationship between gut microbiota with sarcopenia

Journal Paper:

- Liu C., Wong P. Y., Wang Q., Wong H. Y., Huang T., Cui C., Zhang N, Cheung WH, Wong RMY. (2024) Short-chain fatty acids enhance muscle mass and function through the activation of mTOR signalling pathways in sarcopenic mice. *Journal of Cachexia Sarcopenia Muscle*. 15(6):2387-2401, 2024. DOI: 10.1002/jcsm.13573.

4. Title: Effect of gold nanoparticles for alleviation of sarcopenia

Summary: This study aims to utilise anti-inflammatory AuNPs to reduce aging-associated inflammation and alleviate sarcopenia. This study is ongoing and pending for research outputs.

Research and Scholarship

Research Awards and Recognitions

Name	Details	
	Award	Organisation
Louis Cheung	Silver Medal Project Title: Artificial intelligence assisted orthopaedic prosthesis design and surgical planning system	Silicon Valley International Invention Festival
	Gold Medal Project Title: Deep learning method and system for bone health status evaluation and osteoporosis diagnosis	49th International Exhibition of Inventions Geneva
	Gold Medal Project Title: Ultrasound-based navigation system for minimally invasive fracture reduction	
	Gold Medal Project Title: Automated patient-specific prosthesis design system for bone defects	

Academic Editorships

Name	Details	
	Role	Journal
Louis Cheung	Section Editor	Journal of Orthopaedic Translation
		Journal of Clinical Medicine
	International Review Panel member	European Cells & Materials
	Associate Editor	BMC Musculoskeletal Disorders

Reviewers of Journal / Conference

Name	Details	
	Role	Journal / Conference
Louis Cheung	Reviewer (Trauma Section)	Annual Meeting of Orthopaedic Research Society
	Reviewer	Biennial Meeting of International Society of Fracture Repair
		Aging Cell
		Bone and Joint Research
		Journal of Bone and Mineral Research
		Biomaterials
		Chemical Engineering Journal
		Journal of Cachexia, Sarcopenia and Muscle

Grants and Consultancies

Name	Project Title	Funding Source	Start Date (dd/mm/yyyy)	End Date (dd/mm/yyyy)	Amount (HK$)
Louis Cheung	Unveiling a Novel Approach: Targeting RANKL for Sarcopenia Intervention	The Chinese University of Hong Kong – Strategic Seed Funding for Collaborative Research Scheme	31/12/2024	30/12/2026	500,000
	RANKL Inhibition to Combat Sarcopenia in Hip Fracture Patients: A Pragmatic, Randomized Double-Blind, Active-Controlled Trial	Research Grants Council – General Research Fund	01/01/2024	31/12/2026	1,531,620
	Mitochondrial Dysfunction as A Common Pathological Pathway of Osteoporosis and Sarcopenia: The Potential of RANKL Inhibitor for Dual Treatment	Research Grants Council – Germany/ Hong Kong Joint Research Scheme	01/01/2024	31/12/2025	64,000
	Validation of Three Best Performance HR-Pqct Parameters for Identifying High-risk Fragility Fracture Patients	Health Bureau – Health and Medical Research Fund	01/08/2023	31/07/2025	814,000
	Neuromuscular Junction Ageing: Retardation of its Degeneration in Sarcopenia by Vibration Treatment	Research Grants Council – General Research Fund	01/01/2023	30/06/2025	1,160,548
	Combating Ageing-associated Sarcopenia, Osteoporosis and Fragility Fracture: Vibration Treatment	The Chinese University of Hong Kong – Funding to Faculties for Impact Cases	01/04/2023	30/09/2025	650,000
	RANK-ligand Inhibition to Combat Sarcopenia with Underlying Osteoporosis: A Randomized, Double-blind, Double-dummy, Active-controlled Trial	Health Bureau – Health and Medical Research Fund	01/10/2023	30/09/2025	1,273,336

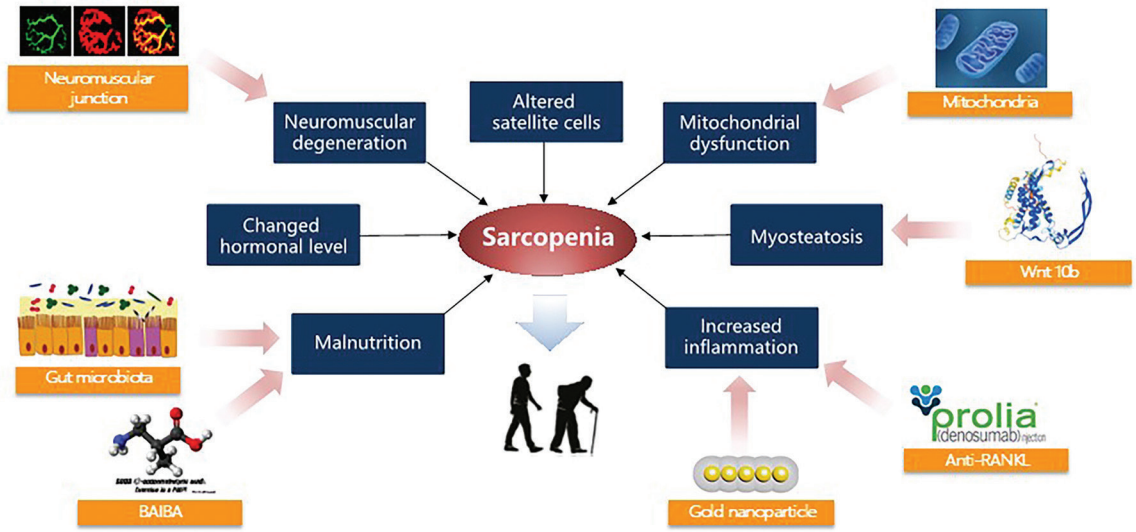
Grants and Consultancies

Name	Project Title	Funding Source	Start Date (dd/mm/yyyy)	End Date (dd/mm/yyyy)	Amount (HK$)
Louis Cheung	Dissecting the Therapeutic Mechanism of an Effective Combination Treatment Targeting Neuromuscular Junction Degeneration and Myosteatosis to Combat Sarcopenia	Research Grants Council – Collaborative Research Fund	01/06/2022	31/05/2025	4,772,807
	Dissecting the Therapeutic Mechanism of an Effective Combination Treatment Targeting Neuromuscular Junction Degeneration and Myosteatosis to Combat Sarcopenia	The Chinese University of Hong Kong – Group Research Scheme	01/06/2022	31/05/2025	500,000
	Artificial Intelligence Assisted Orthopaedic Prosthesis Design and Surgical Planning System	Innovation and Technology Commission – Guangdong-Hong Kong Technology Cooperation Funding Scheme	01/06/2022	31/05/2024	2,173,490
	Aging, Skeletal Degeneration and Regeneration	Research Grants Council – Areas of Excellence	01/05/2021	30/04/2029	70,680,000
Can Cui	Profiling Age-related Motoneuron Loss and Neuromuscular Degeneration among Osteosarcopenic Patients in Hong Kong: A Case-control Study	Health Bureau – Health and Medical Research Fund Research Fellowship Scheme	01/04/2024	31/03/2026	1,003,990
	Introducing A New High Accuracy and Early Diagnosis Method of Sarcopenia in HK: Single Fiber Electrophysiology (SFEMG) for Monitoring Neuromuscular Degeneration	The Chinese University of Hong Kong – IdeaBooster Fund	15/06/2023	14/06/2025	150,000

Publications

A. Journal Papers

1. Cheng KYK, Chow SKH, Hung VWY, Tsang ZTL, Yip BHK, Wong RMY, Zhang N, Qin L, Law SW, Cheung WH. Identification of osteosarcopenia by high-resolution peripheral quantitative computed tomography. *Journal of Personalized Medicine*. 2024;14(9):935. doi:10.3390/jpm14090935.
2. Zhang N, Zhai L, Wong RMY, Cui C, Law SW, Chow SKH, Goodman SB, Cheung WH. Harnessing immunomodulation to combat sarcopenia: Current insights and possible approaches. *Immunity & Ageing*. 2024;21(1):1-16. doi:10.1186/s12979-024-00458-9. (Review)
3. Lin W, Chow SKH, Cui C, Liu C, Wang Q, Chai S, Wong RMY, Zhang N, Cheung WH. Wnt/β-catenin signaling pathway as an important mediator in muscle and bone crosstalk: A systematic review. *Journal of Orthopaedic Translation*. 2024;47:63-73. doi:10.1016/j.jot.2024.06.003. (Review)
4. Wang Q, Cui C, Zhang N, Lin W, Chai S, Chow SKH, Wong RMY, Hu Y, Law SW, Cheung WH. Effects of physical exercise on neuromuscular junction degeneration during ageing: A systematic review. *Journal of Orthopaedic Translation*. 2024;46:91-102. doi:10.1016/j.jot.2024.03.007. (Review)
5. Bao Z, Cui C, Liu C, Long Y, Wong RMY, Chai S, Qin L, Rubin C, Yip BHK, Xu Z, Jiang Q, Chow SKH, Cheung WH. Prevention of age-related neuromuscular junction degeneration in sarcopenia by low-magnitude high-frequency vibration. *Aging Cell*. 2024;23(7):e14156. doi:10.1111/acel.14156.
6. Li MCM, Cheng YK, Cui C, Chow SKH, Wong RMY, Kwok TCY, Siu PM, Yang M, Tian M, Rubin C, Welch AA, Qin L, Law SW, Cheung WH. Biophysical and nutritional combination treatment for myosteatosis in patients with sarcopenia: A study protocol for single-blinded randomised controlled trial. *BMJ Open*. 2024;14(1):e074858. doi:10.1136/bmjopen-2023-074858.



A summary of Louis Cheung and his team's diverse research approaches to combat sarcopenia in the elderly.

Source: Louis Cheung and his team



Genomics and Bioinformatics
基因組學與生物訊息學

PRINCIPAL INVESTIGATOR | **Peiyong Jiang**

TEAM MEMBERS | Guanhua Zhu, Qing Zhu, Lu Ji, Wenlei Peng, Guanna Kang, Dongyan Xiong, Jinyue Bai, Rong Qiao, Xi Hu, Yuwei Shi, Siyuan Huang, Wing Sum Wong, Wenshuo Li, Ruilong Zhou, Zhenji Wang, Pengyuan Han, Lanqi Wu, Linjing Liu

Research Progress Summary

Peiyong Jiang and his team are dedicated to discovering new biological properties of cell-free DNA and developing diagnostic tools based on cfDNA fragmentomics. Their research has established a vital connection between histone modifications and cfDNA fragmentation patterns in plasma. They have also created a novel method to infer histone modifications through cfDNA fragmentomics. This innovative technique allows for the assessment of histone modifications in the placenta during pregnancy and aids in detecting cancer and hematological disorders, significantly boosting the diagnostic capabilities of liquid biopsy. The team filed a total of 28 patent applications across 11 patent families from 1 January 2024 to 31 December 2024.

Research and Scholarship

Fellowships

Name	Details	
	Fellowship	Organisation
Peiyong Jiang	Senior Member	National Academy of Inventors

Academic Editorships

Name	Details	
	Role	Journal
Peiyong Jiang	Editorial Board Member	Extracellular Vesicles and Circulating Nucleic Acids

Reviewers of Journal / Conference

Name	Details	
	Role	Journal / Conference
Peiyong Jiang	Reviewer	Advanced Science
		Cell Reports Medicine
		Genome Research

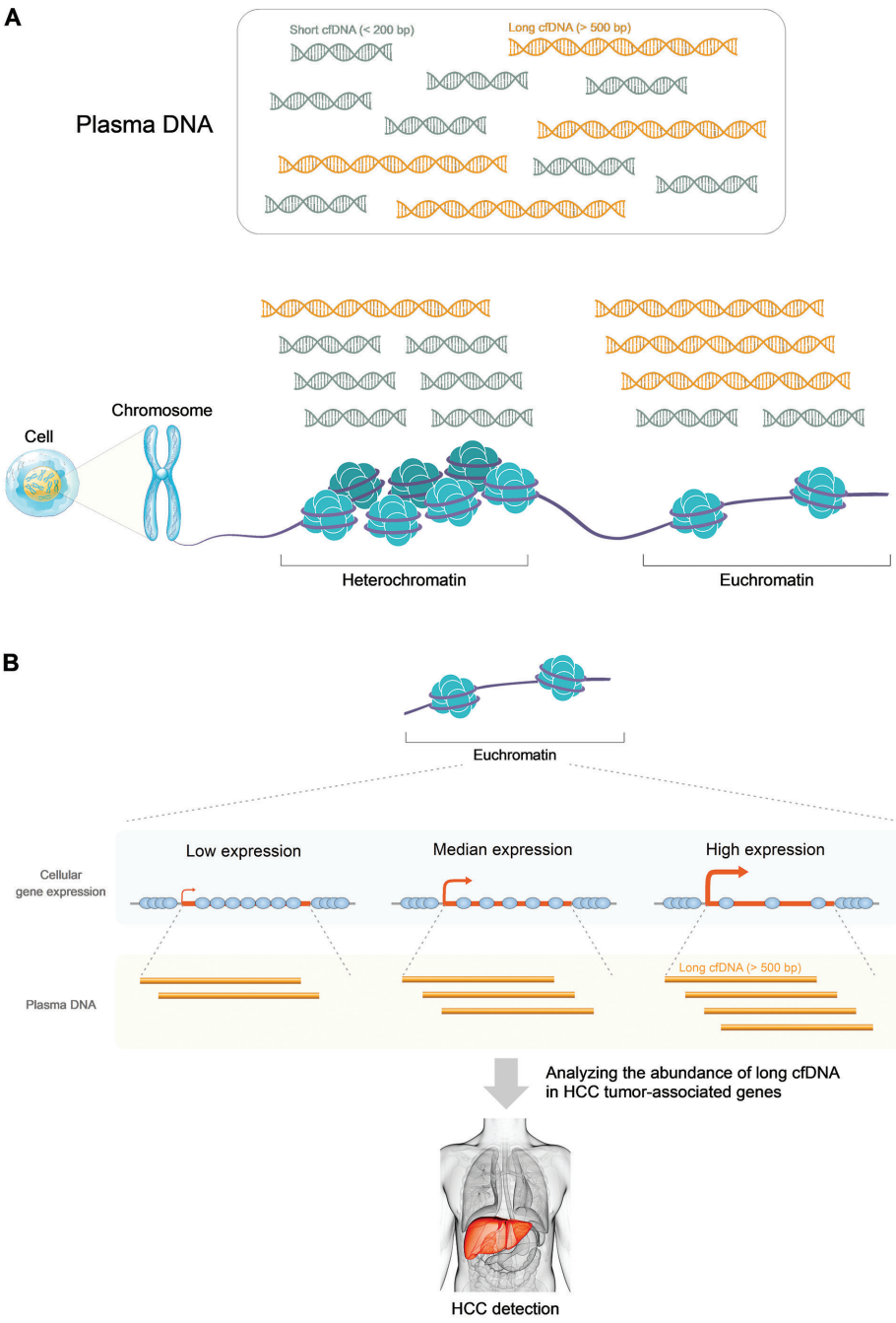
Grants and Consultancies

Name	Project Title	Funding Source	Start Date (dd/mm/yyyy)	End Date (dd/mm/yyyy)	Amount (HK$)
Peiyong Jiang	Centre for Novostics	Innovation and Technology Commission–InnoHK Scheme	01/05/2020	01/05/2025	Amount not to be disclosed

Publications

A. Journal Papers

1. Che H, Jiang P, Choy LYL, Cheng SH, Peng W, Chan RWY, Liu J, Zhou Q, Lam WKJ, Yu SCY, Lau SL, Leung TY, Wong J, Wong VWS, Wong GLH, Chan SL, Chan KCA, Lo YMD. Genomic origin, fragmentomics, and transcriptional properties of long cell-free DNA molecules in human plasma. *Genome Research.* 2024;34(2):189-200. doi:10.1101/gr.278556.123.
2. Lam WKJ, Bai J, Ma ML, Cheung YTT, Jiang P. Circulating tumour DNA analysis for early detection of lung cancer: A systematic review. *Annals of Translational Medicine.* 2024;12(4):64. doi:10.21037/atm-23-1572. (Review)
3. Lam WKJ, Gai W, Bai J, Tam THC, Cheung WF, Ji L, Tse IOL, Tsang AFC, Li MZJ, Jiang P, Law MF, Wong RSM, Chan KCA, Lo YMD. Differential detection of megakaryocytic and erythroid DNA in plasma in hematological disorders. *npj Genomic Medicine.* 2024;9(1):1-8. doi:10.1038/s41525-024-00423-x.
4. Zhu G, Jiang P, Li X, Peng W, Choy LYL, Yu SCY, Zhou Q, Ma ML, Kang G, Bai J, Qiao R, Deng CXS, Ding SC, Lam WKJ, Chan SL, Lau SL, Leung TY, Wong J, Chan KCA, Lo YMD. Methylation-associated nucleosomal patterns of cell-free DNA in cancer patients and pregnant women. *Clinical Chemistry.* 2024;70(11):1355-1365. doi:10.1093/clinchem/hvae118.
5. Bai J, Jiang P, Ji L, Lam WKJ, Zhou Q, Ma ML, Ding SC, Ramakrishnan S, Wan CW, Yang TC, Yukawa M, Chan RWY, Qiao R, Yu SCY, Choy LYL, Shi Y, Wang Z, Tam THC, Law MF, Wong RSM, Wong J, Chan SL, Wong GLH, Wong VWS, Chan KCA, Lo YMD. Histone modifications of circulating nucleosomes are associated with changes in cell-free DNA fragmentation patterns. *Proceedings of the National Academy of Sciences of the United States of America.* 2024;121(42). doi:10.1073/pnas.2404058121.

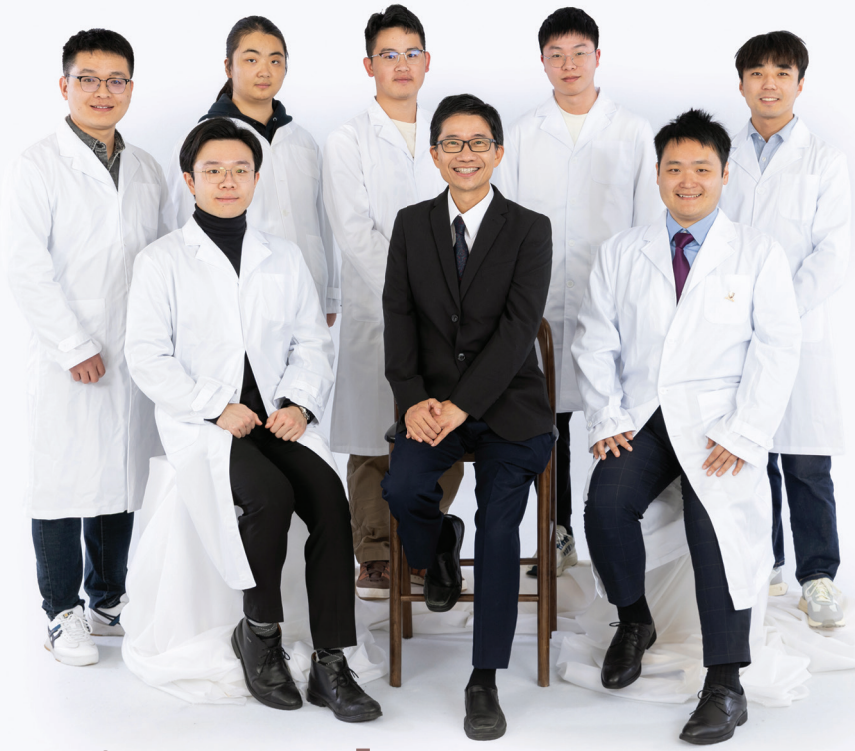


Genomic origin, fragmentomics, transcriptional properties of long cell-free DNA (cfDNA) molecules in human plasma.

(A) Plasma cfDNA is a mixture of short DNA molecules (< 200 bp) and long cfDNA molecules (> 500 bp). However, the biological properties of long cfDNA molecules (> 500 bp) remain largely unknown. To this end, we have investigated the origins of long cfDNA molecules from different genomic elements. Analysis of plasma cfDNA using long-read sequencing reveals an uneven distribution of long molecules from across the genome. Long cfDNA molecules show overrepresentation in euchromatic regions of the genome, in sharp contrast to short DNA molecules.

(B) We observe a strong positive correlation between the abundance of long molecules and mRNA gene expression levels. By analyzing the abundance of long cfDNA in HCC tumor-associated genes, we could differentiate patients with hepatocellular carcinoma (HCC) from non-HCC subjects.

Source: Che H, Jiang P, Choy LYL, Cheng SH, Peng W, Chan RWY, Liu J, Zhou Q, Lam WKJ, Yu SCY, Lau SL, Leung TY, Wong J, Wong VWS, Wong GLH, Chan SL, Chan KCA, Lo YMD. Genomic origin, fragmentomics, and transcriptional properties of long cell-free DNA molecules in human plasma. Genome Research. 2024;34(2):189-200. doi:10.1101/gr.278556.123.



Genomics and Bioinformatics

基因組學與生物訊息學

PRINCIPAL INVESTIGATOR | **Ken Sung**

TEAM MEMBERS | Anselm Au, Guangyi Chen, Sheng Cheng, Xingqian Li, Jingrou Li, Haohong Tu, Zilong Wang

Research Progress Summary

Ken Sung and his JC STEM Lab of Computational Genomics continue to focus on developing innovative bioinformatics algorithms to generate more efficient, accurate, and comprehensive genomes and variant catalogues. For instance, the team has developed a diploid genome assembly pipeline called hypo-assembler by leveraging Illumina short-read long-range technology and ONT long-read technology. This method can automatically generate highly accurate, continuous, and nearly complete diploid assemblies, and the results were published in *Nature Methods*. Additionally, the team utilised hidden split reads to identify more CNV variations in the repetitive regions of short reads, named SurVIndel2, which enables the generation of comprehensive variant catalogues. This achievement was published in *Nature Communications*.

Ken as the conference chair for

- International Conference on Bioinformatics and Biomedical Science 2024. Hong Kong, Guangdong, October 18 - 20, 2024.
- 24th International Workshop on Algorithms in Bioinformatics (WABI 2024). Royal Holloway, London, United Kingdom, September 2 - 4, 2024.

Ken as the programme committee for

- RECOMB-CG
- International Work-Conference on Bioinformatics and Biomedical Engineering
- IEEE International Conference on Bioinformatics and Biomedicine
- Asia & Pacific Bioinformatics Joint Conference

Research and Scholarship

Academic Editorships

Name	Details	
	Role	Journal
Ken Sung	Senior Editor	BMC Research Notes
	Associate Editor	Journal of Bioinformatics and Computational Biology
	Editor-in-Chief	Biomedical Informatics
	Steering Committee	International Workshop on Combinatorial Algorithms

Reviewers of Journal / Conference

Name	Details	
	Role	Journal / Conference
Ken Sung	Conference Chair	International Conference on Bioinformatics and Biomedical Science 2024
		WABI 2024
	Programme Committee	RECOMB-CG
		International Work-Conference on Bioinformatics and Biomedical Engineering
		IEEE International Conference on Bioinformatics and Biomedicine
		Asia & Pacific Bioinformatics Joint Conference

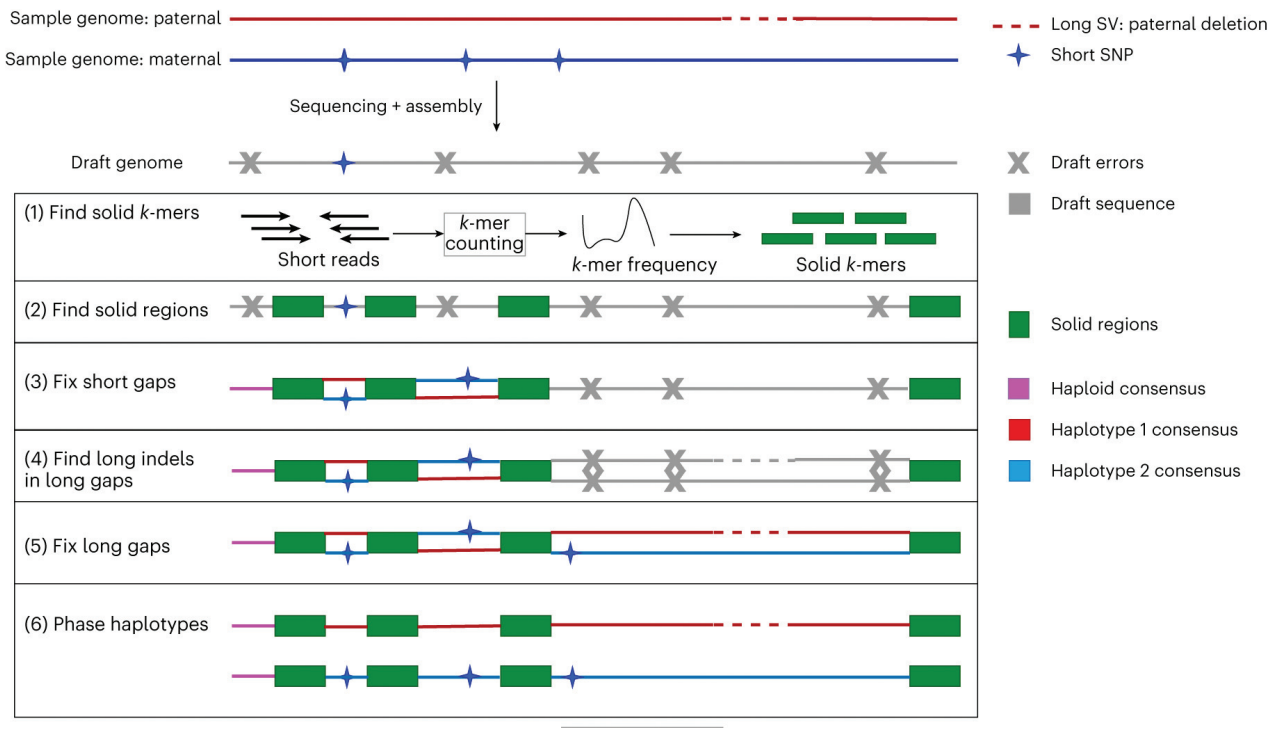
Grants and Consultancies

Name	Project Title	Funding Source	Start Date (dd/mm/yyyy)	End Date (dd/mm/yyyy)	Amount (HK$)
Ken Sung	JC STEM Lab of Computational Genomics	The Hong Kong Jockey Club Charities Trust	01/08/2023	31/07/2028	9,970,000

Publications

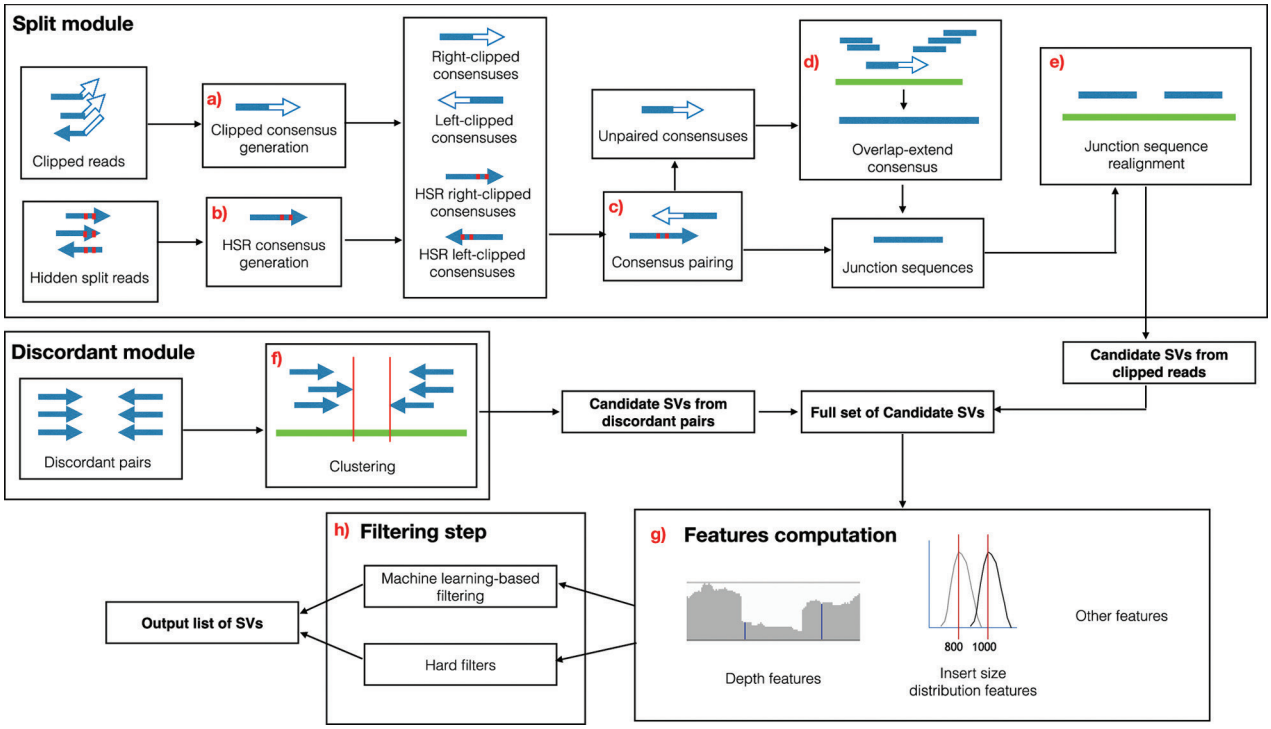
A. Journal Papers

1. Rajaby R, Sung WK. SurVIndel2: Improving copy number variant calling from next-generation sequencing using hidden split reads. *Nature Communications.* 2024;15(1):1-16. doi:10.1038/s41467-024-53087-7.
2. Darian JC, Kundu R, Rajaby R, Sung WK. Constructing telomere-to-telomere diploid genome by polishing haploid nanopore-based assembly. *Nature Methods.* 2024;21(4):574-583. doi:10.1038/s41592-023-02141-1.



Ken Sung and his JC STEM Lab of Computational Genomics briefly outline the six steps above, with additional details provided in the section 'Overview of the hypo-short and hypo-hybrid algorithms'. Step 1 employs *k*-mer counting to identify a list of *k*-mers that are expected to be unique and error-free in the sample genome, these are called solid *k*-mers. Step 2 uses the solid *k*-mers together with aligned short reads to find parts of the draft assembly that are unique, homozygous and error-free. These parts are called solid regions and their experiments showed that they are almost error-free in practice ('Overview of the hypo-short and hypo-hybrid algorithms'). Hence, their method will not polish them. The areas between adjacent solid regions are known as gaps. The team refers to gaps that are short enough to be covered by short reads as short gaps. Step 3 tries to replace each short gap with the consensus of short reads covering it. If the sample genome is diploid, they may identify two consensuses, each representing a haplotype.

Source: Darian JC, Kundu R, Rajaby R, Sung WK. Constructing telomere-to-telomere diploid genome by polishing haploid nanopore-based assembly. Nature Methods. 2024;21(4):574-583. doi:10.1038/s41592-023-02141-1.



It primarily identifies candidate copy number variants (CNV) by using split reads and hidden split reads. Step (a) piles up split reads into consensus sequences, and step (b) does the same with hidden split reads. Consensus sequences that potentially represent the same CNV are paired in step (c) to generate a junction sequence, which is a subsequence of the alternative allele containing a breakpoint of the CNV. Consensus sequences that could not be paired are extended into a junction sequence using the reads mapped close to or overlapping the reads forming the consensus sequence in step (d). Junction sequences are then realigned onto the reference genome to discover the actual CNV in step (e). Candidate CNVs that do not generate clipped reads are identified as clustering discordant pairs in step (f). In step (g), a series of features are calculated for each candidate CNV, mainly by (i) statistically testing the distribution of the read pairs surrounding the CNV and (ii) testing changes in read depth in the CNV region as well as its flanking regions. Finally, these features are used in step (h) to exclude the CNVs that are likely false positives by using a machine learning model or, if unavailable, hard filters.

Source: Rajaby R, Sung WK. SurVIndel2: Improving copy number variant calling from next-generation sequencing using hidden split reads. Nature Communications. 2024;15(1):1-16. doi:10.1038/s41467-024-53087-7.



Genomics and Bioinformatics

Cancer Subtyping, Translational Genomics and Bioinformatics

基因組學與生物訊息學

PRINCIPAL INVESTIGATOR | **Xin Wang**

TEAM MEMBERS | Heyang Cui, Hua Xue, Xining Li, Tingting Chen, Xinyue Chen, Yijuan Wang, Sitan Qiao, Yi Cao, Xiuping Nie, Xiang Li, Lingli He, Yi Shuai, Ziwei Wang, Yabin Chen, Tianli Luo, Yaling Huang, Xiangeng Wang, Ming Zhong, Tao Jiang, Hualiang Yao, Dengwang Chen, Yinghan Zhang

Research Progress Summary

AI-empowered colorectal cancer subtyping for precision oncology

Colorectal cancer (CRC) is a highly heterogeneous disease with respect to clinical outcomes and biological features, resulting in striking differences in disease progression and treatment response. To interrogate the complex heterogeneity of CRC, the team led by **Xin Wang** previously contributed to the identification of four consensus molecular subtypes (CMSs). Since its publication, CMS has been widely used as a robust classification system, setting a foundation for various preclinical and clinical studies. Despite the versatile clinical utilities, the application of CMS has been significantly limited by several key hurdles. The vast majority of research studies about CRC cannot benefit from the CMS classifier based on gene expression profiling, which is costly and time consuming. Moreover, it remains unclear whether the CMS taxonomy can be applied to Chinese CRC patients, who account for nearly a quarter of the total new incidence worldwide.

In the project funded by Research Grants Council - Collaborative Research Fund (Ref: C4024-22GF), they aim to leverage multi-modal deep learning of multi-omics profiles, radiology, and histopathology to discover CRC subtypes that are more biologically coherent and clinically relevant. To this end, they have assembled a strong multidisciplinary

team locally involving bioinformaticians, computer scientists, pathologists, radiologists, biologists, surgeons, and clinical oncologists, who have been actively contributing to the related fields. In addition, they have established strategic collaborations with the Sixth Affiliated Hospital and Cancer Center of Sun Yat-sen University, University of Amsterdam, and the SenseTime AI team, who provide long-term support of clinical resources, data, and cutting-edge technologies. Upon completion, the proposed study will contribute a more robust taxonomy to facilitate biomedical research and clinical applications, provide a versatile classification framework that is clinically translatable, and generate direct evidence of the prognostic and predictive values of CRC subtyping in multiple clinical applications. The accomplishment of the objectives will promote the clinical translation of CRC classification to facilitate precision oncology.

Pancreatic cancer early detection based on exosomal small non-coding RNAs

Pancreatic cancer is a highly aggressive malignancy with an increasing incidence worldwide. As the most prevalent histological subtype, pancreatic ductal adenocarcinoma (PDAC) accounts for more than 90% of cases of pancreatic cancer. Currently, the only potentially curative therapeutic option for PDAC is surgical excision for localised tumors. Unfortunately, only 15%-20% of patients present localised, resectable, and potentially curable cancers at diagnosis. Therefore, to allow timely intervention with preventive strategies or early surgery, it is imperative to identify PDAC in its early stages. In recent years, liquid biopsies have been put to the forefront of cancer diagnosis, due to the non-invasiveness, efficiency, precision, and feasibility of real-time implementation. Despite growing attention, no liquid biopsy is ready to be implemented in clinical routine for PDAC early detection due to unclear specificity, poor reproducibility, and a lack of rigorous clinical validations with a relatively large sample size.

In the project funded by Research Grants Council - Research Impact Fund (Ref: R4007-23), the team proposes to harness small non-coding RNAs (sncRNAs) in the circulating exosomes to develop novel biomarkers for early PDAC. Their underlying rationale is that multi-dimensional integration of exosome-based, tissue-specific microRNAs (miRNAs), PIWI-interacting RNAs (piRNAs), small nuclear RNAs (snRNAs), and small nucleolar RNAs (snoRNAs) will generate robust signatures with outstanding sensitivity and specificity for the early detection of PDAC. To this end, they have assembled a multidisciplinary team of strong investigators in genomics and bioinformatics, cancer biology, surgery, and clinical oncology, who have longstanding experience in studying PDAC and have made seminal contributions to the related fields. Apart from academia, they have established strategic collaborations with industrial partners, including SenseTime and BGI, to expedite the transformation of the research outcomes for clinical translation and future commercialisation. They envision that the accomplishment of the project will generate an overarching impact to increase the detection rate of PDAC at early stages, which will improve patient survival in the long run.

Research and Scholarship

Research Awards and Recognitions

Name	Details	
	Award	Organisation
Shuai Yi	Best Poster Award	Gordon Research Conference - Nasopharyngeal Carcinoma 2024

Reviewers of Journal / Conference

Name	Details	
	Role	Journal / Conference
Xin Wang	Reviewer	eClinicalMedicine
		Nature Communications
		npj Breast Cancer
		Cell Genomics
		Database

Grants and Consultancies

Name	Project Title	Funding Source	Start Date (dd/mm/yyyy)	End Date (dd/mm/yyyy)	Amount (HK$)
Xin Wang	Development of Liquid Biopsy Assays Based on Exosomal Small Non-coding RNAs for Non-invasive Early Detection of Pancreatic Cancer	Research Grants Council – Research Impact Fund	30/06/2024	29/06/2029	8,000,000
	Development of Liquid Biopsy Assays Based on Exosomal Small Non-coding RNAs for Non-invasive Early Detection of Pancreatic Cancer	The Chinese University of Hong Kong Research Committee – Research Impact Matching Fund	30/06/2024	29/06/2029	3,188,571
	Dissecting Breast Cancer Subtype-Dependent Aging Acceleration and Developing Molecular and Histology Image-based Aging Clocks for the Prediction of High-risk Young-onset Patients	Research Grants Council – General Research Fund	01/08/2023	31/07/2026	1,572,903
	Multi-modal Deep Learning of Multi-omics Profiles, Radiology, and Histopathology Images to Advance Colorectal Cancer Classification for Precision Oncology	Research Grants Council – Collaborative Research Fund	30/06/2023	29/06/2026	7,520,000
	Multi-modal Deep Learning of Multi-omics Profiles, Radiology, and Histopathology Images to Advance Colorectal Cancer Classification for Precision Oncology	The Chinese University of Hong Kong Research Committee – Group Research Scheme	30/06/2023	29/06/2026	500,000

Grants and Consultancies

Name	Project Title	Funding Source	Start Date (dd/mm/yyyy)	End Date (dd/mm/yyyy)	Amount (HK$)
Xin Wang	Artificial Intelligence (AI)-assisted Risk-based Prostate Cancer Detection: A Synergy of Novel Biomarkers, Advanced Imaging, and Robotic-assisted Diagnosis	Research Grants Council – Collaborative Research Fund	30/06/2023	29/05/2024	1,661,542
	Histology-omics Integrative Subtyping of Esophageal Squamous Cell Carcinoma Based on Multi-scale Geospatial Characterizations of the Tumor Microenvironment	Research Grants Council – General Research Fund	01/08/2022	31/07/2025	964,828
	Overcoming the Intratumor Heterogeneity by Multi-scale Spatial Characterizations of Tumor Microenvironment for Integrative Colorectal Cancer Classification	Research Grants Council – General Research Fund	01/01/2022	31/12/2024	723,092
	Centre for Medical Engineering of Molecular and Biological Probes	Research Grants Council – Areas of Excellence Scheme	01/06/2021	31/05/2029	71,161,000
	Targeting Proton Shifting by a Novel MCT4 Inhibitor in Treating Acute Myeloid Leukemia	Health Bureau – Health and Medical Research Fund	02/03/2022	01/03/2025	1,493,888
	Pathological Roles of TUBB2B and its Therapeutic Potential in Triple-negative Breast Cancer	Health Bureau – Health and Medical Research Fund	01/04/2023	31/03/2026	1,497,000
	Regulation of Cytokine Response and Cell Death by NSP6 of the Omicron Variant of SARS-CoV-2	Health Bureau – Health and Medical Research Fund	01/04/2023	31/03/2026	1,499,880

Grants and Consultancies

Name	Project Title	Funding Source	Start Date (dd/mm/yyyy)	End Date (dd/mm/yyyy)	Amount (HK$)
Xin Wang	Artificial Intelligence and Biology Imaging Guiding Adapted RadioTherapy (AI-BigART) in Patients with Locally Advanced Non-Small Cell Lung Cancer: A Phase II Randomised Trial	Health Bureau – Health and Medical Research Fund	01/04/2023	31/03/2025	1,479,440
	NIP7 as a Novel Therapeutic Target for Triple-negative Breast Cancer	Health Bureau – Health and Medical Research Fund	01/07/2022	31/06/2025	1,479,440

Publications

A. Journal Papers

1. Miyoshi J, Mannucci A, Scarpa M, Gao F, Toden S, Whitsett T, Inge LJ, Bremner RM, Takayama T, Cheng Y, Bottiglieri T, Nagetaal ID, Shrubsole MJ, Zaidi AH, Wang X, Coleman HG, Anderson LA, Meltzer SJ, Goel A, Finbar-Emerald collaborative group. Liquid biopsy to identify Barrett's oesophagus, dysplasia and oesophageal adenocarcinoma: The Emerald multicentre study. *Gut.* Published online 2024:169-181. doi:10.1136/gutjnl-2024-333364.
2. Li J, He L, Zhang X, Li X, Wang L, Zhu Z, Song K, Wang X. GCclassifier: An R package for the prediction of molecular subtypes of gastric cancer. *Computational and Structural Biotechnology Journal.* 2024;23(January):752-758. doi:10.1016/j.csbj.2024.01.010. (Short Communication)

B. Patents

1. **China Patent:**

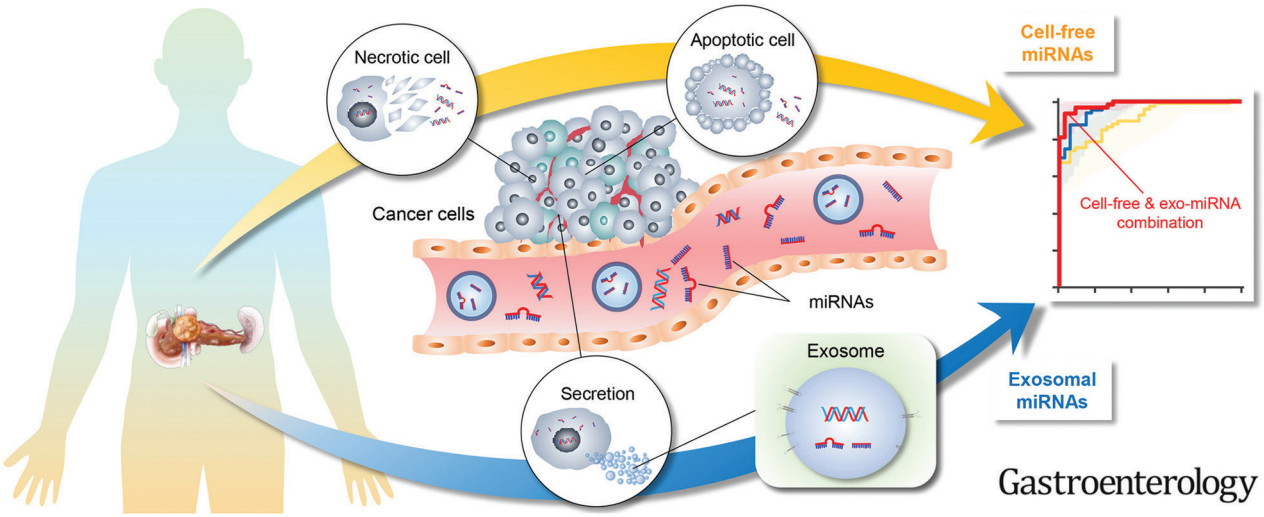
   Title: Model construction method, biological age prediction method and device, and storage medium
   Inventors: Hong R, Wang X, Li J, Wang S
   Patent No: 202411573296.6
   File Date: 5 November 2024

   Title: Breast cancer pathological image tissue delineation method, aging acceleration classification method and device
   Inventors: Wang X, Wang S, Cao Y, Hong R
   Patent No: 202411573310.2
   File Date: 5 November 2024

   Title: A random forest classifier and molecular subtype classifier and a construction method for molecular classification of esophageal squamous cell carcinoma
   Inventors: Cui Y, Wang X, Cui H, Zhu Z
   Patent No: 202411459261.X
   File Date: 18 October 2024

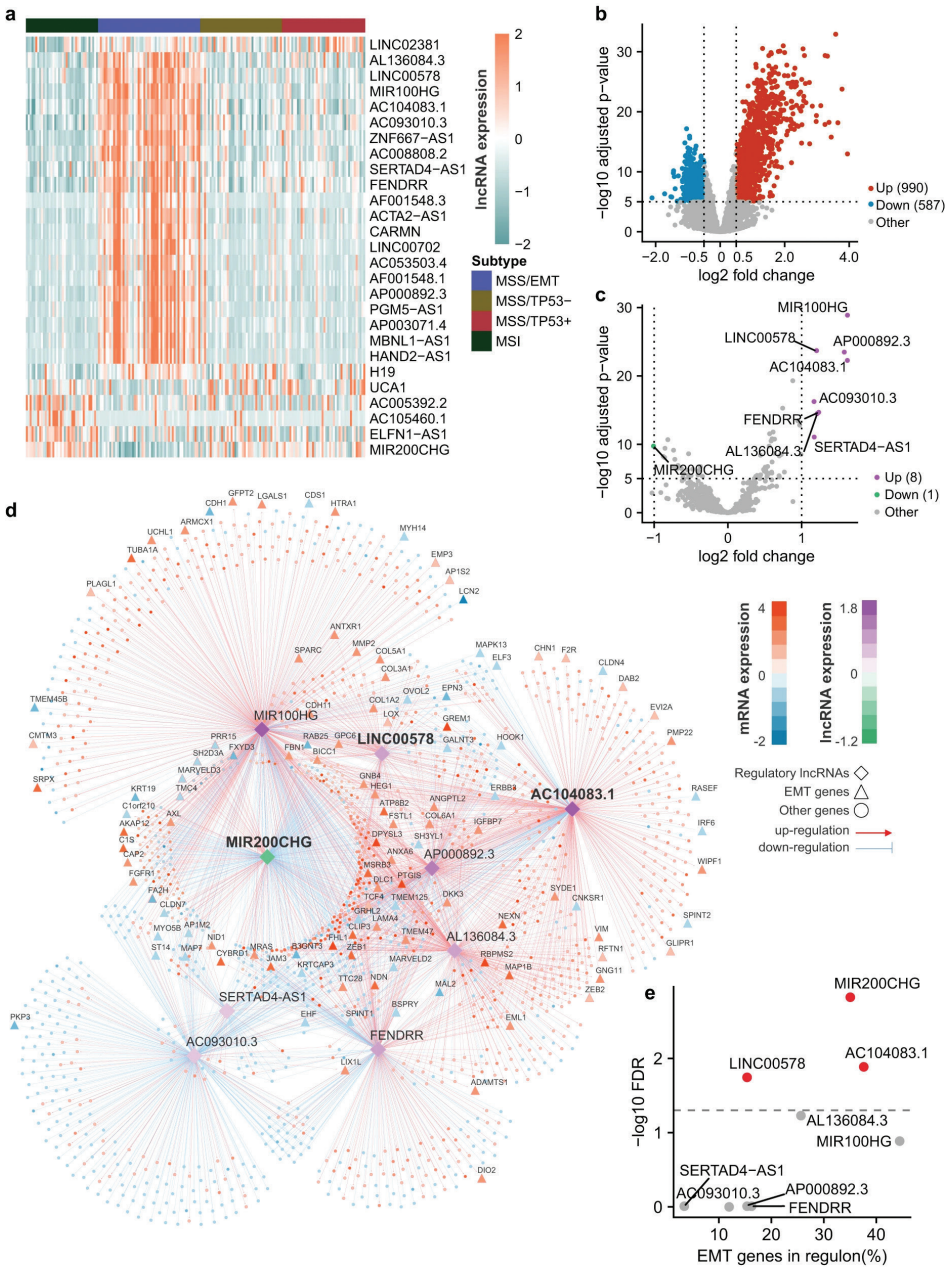
Title: A consensus molecular subtype classification system for esophageal squamous cell carcinoma based on histopathological images
Inventors: Cui Y, Wang X, Cui H, Zhang Y, Cheng X, Qi L
Patent No: 202411459143.9
File Date: 18 October 2024

Title: An automatic tissue delineation system and delineation method for esophageal squamous cell carcinoma based on deep learning of pathological images
Inventors: Wang X, Cui Y, Qi L, Cui H, Cao Y, Cheng X
Patent No: 202411459233.8
File Date: 18 October 2024



Most patients with pancreatic ductal adenocarcinoma are diagnosed at an advanced stage when the disease is incurable; hence, there is a clear unmet clinical need to develop biomarkers for its early detection. Xin Wang has established an exosome-based transcriptomic signature that combines cell-free and exosomal microRNAs that can robustly identify patients with pancreatic ductal adenocarcinoma and offer a liquid biopsy test that is superior to carbohydrate antigen 19-9 measurement. Their exosomal transcriptomic signature has the potential to transform clinical practice by allowing noninvasive and early detection of patients with pancreatic ductal adenocarcinoma.

Sources: Nakamura K, Zhu Z, Roy S, Jun E, Han H, Munoz RM, Nishiwada S, Sharma G, Cridebring D, Zenhausern F, Kim S, Roe DJ, Darabi S, Han IW, Evans DB, Yamada S, Demeure MJ, Becerra C, Celinski SA, Borazanci E, Tsai S, Kodera Y, Park JO, Bolton JS, Wang X, Kim SC, Von Hoff D, Goel A. An exosome-based transcriptomic signature for noninvasive, early detection of patients with pancreatic ductal adenocarcinoma: A multicenter cohort study. Gastroenterology. 2022;163(5):1252-1266.e2. doi:10.1053/j.gastro.2022.06.090.



Integrated network inference identified master regulatory lncRNAs of EMT specifically in the MSS/EMT subtype of GC. (a) The heat map displays the expression profile of the differentially expressed lncRNAs in all four GC subtypes in the TCGA cohort. (b) The volcano plot of top differentially expressed mRNAs between the MSS/EMT subtype and the non-MSS/EMT subtypes in the TCGA cohort. (c) The volcano plot of top differentially expressed lncRNAs between the MSS/EMT subtype and the non-MSS/EMT subtypes in the TCGA cohort. (d) The lncRNA regulatory network inferred from an integrative analysis of mRNA and lncRNA expression profiles in the TCGA cohort. MIR200CHG, AC104083.1, and LINC00578 appeared as the most influential master regulatory lncRNAs for EMT signature genes in GC. mRNAs and lncRNAs were coloured according to the log2 fold change between the MSS/EMT subtype and the non-MSS/EMT subtypes of GC (orange: upregulation of mRNA expression; blue: downregulation of mRNA expression; purple: upregulation of lncRNA expression; green: downregulation of lncRNA expression). The edges between nodes were colored in red (induction) or blue (repression) based on the predicted regulatory relationship. EMT signature genes were denoted as triangles. (e) Statistical significance of the overrepresentation of a lncRNA's regulon for EMT signature genes vs. the proportion of EMT signature genes regulated by a lncRNA. LncRNAs with significant enrichment of EMT signature genes in the regulons were highlighted in red color.

Sources: Zhu Y, Huang C, Zhang C, Zhou Y, Zhao E, Zhang Y, Pan X, Huang H, Liao W, Wang X. LncRNA MIR200CHG inhibits EMI in gastric cancer by stabilizing miR-200c from target-directed miRNA degradation. Nature Communications. 2023;14(1):1-19. doi:10.1038/s41467-023-43974-w.



Genomics and Bioinformatics

Chronic Hepatitis B, Metabolic Dysfunction-Associated Steatotic Liver Disease, Big Data Analytics

基因組學與生物訊息學

PRINCIPAL INVESTIGATOR | **Terry Yip**

TEAM MEMBERS | Vincent Wong, Grace Wong, Jimmy Lai, Angel Chim, Yee Kit Tse, Yan Liang, Vicki Hui, Mandy Lai, Sally Shu, Julie Leung, Yin Lam Huen, Kam Wing Cheung, Cheuk Kwan Lai, Sze Yi Wong, Wun Lam, Pete Tse, Katherine Kwan, Cheuk Man Lai, Siu Yuen Ng, Wai Yan Yau, Man Ki Chu

Research Progress Summary

Research Summary

Terry Yip joined the Li Ka Shing Institute of Health Sciences on 15 July 2024. In 2024, he and his team performed a key study on the risk of fracture among elderly patients with chronic hepatitis receiving tenofovir disoproxil fumarate (*Journal of Hepatology* 2024; 10.1016/j.jhep.2023.12.001). He also collaborated with international investigators to validate the use of vibration-controlled transient elastography (VCTE) and other non-invasive tests in predicting hepatic decompensation and HCC, and the impact of statin usage on long-term liver-related outcomes in patients with metabolic dysfunction-associated steatotic liver disease (MASLD) (*JAMA* 2024; doi: 10.1001/jama.2024.1447, *Gut* 2024; 10.1136/gutjnl-2024-333074). Terry also performed a systematic review and meta-analysis on the histological severity, clinical outcomes and the impact of antiviral treatment in patients with chronic hepatitis B in the indeterminate phase (*Journal of Hepatology* 2025; doi: 10.1016/j.jhep.2024.11.018).

Research Collaboration

In 2024, Terry collaborated with investigators from 16 different centers around the world to establish the VCTE-Prognosis Study Group. They aimed to investigate the role of VCTE and other non-invasive tests in predicting the risk of developing liver-related complications among patients with MASLD. He teamed up with investigators from Stanford University to compare the trend of incidence of alcohol-associated hepatitis in Hong Kong and the United States following the onset of the COVID-19 pandemic (*JHEP Reports*; doi: 10.1016/j.jhepr.2024.101254). Additionally, he collaborated with investigators from Seoul National University to develop a machine learning model to predict liver-related outcomes after the functional cure of chronic hepatitis B (*Journal of Hepatology* 2024; doi 10.1016/j.jhep.2024.08.016). He worked with investigators from Asan Medical Center on two studies on the impact of baseline viral load and on-treatment HCC risk in chronic hepatitis B (*Clinical Gastroenterology and Hepatology* 2024; doi: 10.1016/j.cgh.2024.07.031, *Hepatology* 2024; doi: 10.1097/HEP.0000000000000752). He also partnered with investigators from Yonsei University to develop a model to predict the risk of HCC in patients with chronic hepatitis B after HBsAg seroclearance (*Alimentary Pharmacology & Therapeutics* 2024, doi: 10.1111/apt.17933). He collaborated with investigators from Yokohama City University on the performance of continuous controlled attenuation parameter and liver stiffness measurement by the novel SmartExam in MASLD (*Liver International* 2024, doi: 10.1111/liv.15862). He worked with collaborators from Yonsei University and Bordeaux University to build a liver stiffness-based etiology-independent machine learning algorithm to predict HCC in patients with chronic liver diseases (*Clinical Gastroenterology and Hepatology* 2024; doi: 10.1016/j.cgh.2023.11.005).

Academic Conferences

In 2024, Terry presented two oral presentations on behalf of the VCTE-Prognosis Study Group at two of the biggest international conferences in the field of Hepatology, *i.e.*, the European Association for the Study of the Liver (EASL) Congress in Milan, Italy; and The Liver Meeting by The American Association for the Study of Liver Diseases (AASLD) in San Diego, USA. He also presented his ongoing research works on the risk of fracture at the Annual Meeting of the Asian Pacific Association for the Study of the Live (APASL) in Kyoto, Japan; and at the Asian Pacific Digestive Week (APDW) in Bali, Indonesia. In total, he co-authored more than 40 abstracts in the APASL Annual Conference, EASL Congress, and the AASLD Liver Meeting in 2024.

Research and Scholarship

Research Awards and Recognitions

Name	Details	
	Award	Organisation
Terry Yip	Outstanding Reviewer Award	Hepatoma Research
	Best Poster Presentation Award – Clinical Viral Hepatitis	European Association for the Study of the Liver Congress 2024

Academic Editorships

Name	Details	
	Role	Journal
Terry Yip	Associate Editor	Journal of Hepatology
		Frontiers in Gastroenterology - Hepatology section
		Frontiers in Medicine - Hepatobiliary Diseases
	Editorial Board Member	Clinical Gastroenterology and Hepatology
		Alimentary Pharmacology & Therapeutics
		Hepatology Communications
		Hepatoma Research

Reviewers of Journal / Conference

Name	Details	
	Role	Journal / Conference
Terry Yip	Reviewer	Alimentary Pharmacology & Therapeutics
		Annals of Hepatology
		Arab Journal of Gastroenterology
		Asian Pacific Digestive Week 2024
		Asia-Pacific Journal of Clinical Oncology
		Cancer Medicine
		Clinical and Molecular Hepatology
		Clinical Gastroenterology and Hepatology
		Clinical Nutrition ESPEN
		Clinics and Research in Hepatology and Gastroenterology
		Cochrane
		Computers in Biology and Medicine
		Diabetes Research and Clinical Practice
		Digital Health
		eClinicalMedicine
		Expert Review of Anticancer Therapy
		Exploration of Digestive Diseases
		Frontiers in Medicine
		Frontiers in Oncology
		Gastroenterology Report
		Gastrointestinal Tumors
		Gut
		Hepatology
		Hepatology Communications
		Hepatology International
		International Digestive Disease Forum 2024
		International Immunopharmacology
		The Journal of Allergy and Clinical Immunology: In Practice
		Journal of Clinical and Experimental Hepatology
		JHEP Reports
		Journal of Cancer Metastasis and Treatment
		Journal of Gastroenterology and Hepatology

Reviewers of Journal / Conference

Name	Details	
	Role	Journal / Conference
Terry Yip	Reviewer	Journal of Hepatocellular Carcinoma
		Journal of Medical Virology
		Kidney International
		Liver Cancer
		Liver International
		Nephrology
		Public Health
		World Journal of Gastroenterology

Grants and Consultancies

Name	Project Title	Funding Source	Start Date (dd/mm/yyyy)	End Date (dd/mm/yyyy)	Amount (HK$)
Terry Yip	Workshops on Research Data Management for Patient and Healthcare Data	The Chinese University of Hong Kong Library – Faculty Research Data Management Incentivising Programme Fund	02/01/2024	31/12/2025	100,000
	Secular Trends of Diabetic Care in Patients with Liver Cirrhosis	Research Grants Council – Early Career Scheme	01/01/2024	31/12/2026	1,084,888
	Unsupervised Trajectory Clustering of Monitoring Biomarkers for Predicting Risk of Liver-related Complications in Patients with Type 2 Diabetes Mellitus: A Territory-wide Cohort Study	Health Bureau – Health and Medical Research Fund	01/08/2023	31/07/2025	863,380
	A Novel Risk-Stratified Screening for Non-alcoholic Fatty Liver Disease in Patients with Type 2 Diabetes Mellitus: A Territory-wide Cohort Study	Health Bureau – Health and Medical Research Fund	01/09/2022	31/08/2024	1,297,284

Grants and Consultancies

Name	Project Title	Funding Source	Start Date (dd/mm/yyyy)	End Date (dd/mm/yyyy)	Amount (HK$)
Vincent Wong	Sodium-glucose Co-transporter-2 Inhibitor (SGLT2i) to Prevent of Liver Complications in Patients with Chronic Hepatitis B and Diabetes Mellitus: A Double-blind, Randomised, Placebo-controlled Trial (SGLT2i-HBV Study)	Research Grants Council – General Research Fund	01/06/2023	31/05/2026	1,475,271
Terry Yip Vincent Wong	Monitoring Changes in Liver Fat during a Lifestyle Modification Programme by the Novel Continuous Controlled Attenuation Parameter	Research Grants Council – General Research Fund	01/01/2024	31/12/2025	1,400,000
	Novel Strategies to Facilitate Early Detection, Prevention and Intervention for Long-Term Health problems Related to COVID-19 (NoviTor-COVID study)	Health Bureau – Health and Medical Research Fund	01/04/2021	31/03/2026	45,991,725
	Elimination of Chronic Hepatitis B in Hong Kong- to Meet the WHO Goals (Short Title: HBV Elimination Study)	Health Bureau – Commissioned Studies	01/10/2020	30/09/2024	2,212,992
Jimmy Lai	Prospective Evaluation of a Fast-track Treatment Pathway for Patients with Chronic Hepatitis B Under Primary Care	Hong Kong College of Physicians – Young Investigator Research Grant	01/05/2022	31/12/2025	80,000

Publications

A. Journal Papers

1. Yang Z, Hui VWK, Yip TCF, Lai MSM, Lai JCT, Wong VWS, Cheung R, Wong GLH, Wong RJ. Alcohol-associated hepatitis trends before and following the onset of the COVID-19 pandemic across two distinct cohorts in the United States and Hong Kong. *JHEP Reports.* 2025;7(1):101254. doi:10.1016/j.jhepr.2024.101254.
2. Lai JCT, Wong GLH, Tse YK, Hui VWK, Lai MSM, Chan HLY, Wong VWS, Yip TCF. Histological severity, clinical outcomes and impact of antiviral treatment in indeterminate phase of chronic hepatitis B: A systematic review and meta-analysis. *Journal of Hepatology.* Published online 2024:1-12. doi:10.1016/j.jhep.2024.11.018. (Review)
3. Yip TCF, Wong GLH. Transforming the landscape of liver cancer detection and care. *Nature Reviews Gastroenterology & Hepatology.* 2024;22(February):2024-2025. doi:10.1038/s41575-024-01018-8. (Review)
4. Yip TCF, Peng N, LaiJCT. Reply to: Correspondence on "Long-term use of tenofovir disoproxil fumarate increases fracture risk in elderly patients with chronic hepatitis B. *Journal of Hepatology.* Published online 2024. doi:10.1016/j.jhep.2024.10.013. (Letter)
5. Liang LY, Yip TCF, Lai JCT, Lam ASM, Tse YK, Hui VWK, Chan HLY, Wong VWS, Wong GLH. Dynamic changes in ELF score predict hepatocellular carcinoma in chronic hepatitis B patients receiving antiviral treatment. *Journal of Viral Hepatitis*. Published online 2024:808-819. doi:10.1111/jvh.14004.
6. Peng N, Wang MY, Song SJ, Yip TCF. Spotting undiagnosed significant liver fibrosis in the general population: Impact on subsequent clinical care: Editorial on "Prevalence of clinically significant liver fibrosis in the general population: A systematic review and meta-analysis". *Clinical and Molecular Hepatology.* Published online 2024. doi:10.3350/cmh.2024.0737. (Editorial)
7. Lai JCT, Colombatto P, Wong GLH, Brunetto MR. Why and when could nucleos(t)ide analogues treatment be withdrawn? *Digestive and Liver Disease.* 2024;57(2):558-563. doi:10.1016/j.dld.2024.10.012. (Review)
8. Yang L, Liu C, Lai JCT, Qi X. Editorial: Non-selective beta-blockers: A lifesaving shield for critically ill patients with acute decompensation of cirrhosis? *Alimentary Pharmacology & Therapeutics.* Published online 2024:965-966. doi:10.1111/apt.18207. (Editorial)



A latest study by CU Medicine shows antiviral tenofovir disoproxil fumarate (TDF). TDF is associated with a higher fracture risk than entecavir ETV for patients with chronic hepatitis B aged 60 or above, after two years of treatment.

(From left) Mr Lei, patient with chronic hepatitis B; Jimmy Lai, Specialist in Gastroenterology and Hepatology, Department of Medicine and Therapeutics, Prince of Wales Hospital and Clinician Clinical Lecturer (honorary), Department of Medicine and Therapeutics, CU Medicine; Terry Yip, Assistant Professor in the Department of Medicine and Therapeutics, CU Medicine and Deputy Director of MDAC; and Grace Wong, Professor in the Department of Medicine and Therapeutics, CU Medicine; Director of the Medical Data Analytics Centre (MDAC) and Deputy Director of The Chinese University of Hong Kong Center for Liver Health.

Source: https://www.med.cuhk.edu.hk/press-releases/cuhk-study-reveals-antiviral-drug-tenofovir-disoproxil-fumarate-increases-fracture-risk-in-elderly-patients-with-chronic-hepatitis-b



A team photo of the four professors at the Liver Meeting 2024 by the American Association for the Study of Liver Diseases.

Source: Grace Wong



Non-Coding RNAs and Cellular Signalling

Non-Coding RNAs

非編碼核糖核苷酸研究及細胞訊號轉導

PRINCIPAL INVESTIGATOR | **Huating Wang**

TEAM MEMBERS | Xiaona Chen, Suyang Zhang, Liangqiang He, Yang Li, Yulong Qiao, Qiang Sun, Yi Jin, Qin Zhou, Xingyuan Liu, Chuhan Li, Feng Yang, Yang Fu, Ziliu Wang, Xiaofan Guo, Gexin Liu, Fuk Yuk Leung

Research Progress Summary

During the past year, the team led by **Huating Wang** continued the work on understanding the intrinsic and extrinsic regulatory mechanisms orchestrating skeletal muscle stem cells and muscle regeneration/aging. Specifically, they have been focusing on the following projects: (1) DHX36 binding induces RNA structurome remodeling and regulates RNA abundance via m6A reader YTHDF1; (2) Multiomics mapping and characterisation of cellular senescence in aging human skeletal muscle uncovers a novel senotherapeutic for sarcopenia. Findings from their research were published in *Nature Communication* and are well accepted by peers among the scientific communities. As a result, they were invited to present their work at international and regional conferences such as EMBO Myogenesis Workshop, China Aging Society Annual Meeting, etc. In addition, fruitful collaborations have been established with peer scientists from Hong Kong, China, the United States and Europe. Three patent applications have been submitted. And a start-up biotech company has been established.

Research and Scholarship

Research Awards and Recognitions

Name	Details	
	Award	Organisation
Huating Wang	Ten Thousand Talent Programme	Ministry of Education of the People's Republic of China
Yang Fu	TRS Trainee Symposium Presentation Award	Hong Kong University of Science and Technology
Yang Li	Outstanding Academic Poster Award	Aging Symposium by Westlake University & Cell Press

Fellowships

Name	Details	
	Fellowship	Organisation
Yulong Qiao	Postdoctoral Fellowship	The Chinese University of Hong Kong
Suyang Zhang	Research Committee Postdoctoral Fellowship	
Yi Jin		

Academic Editorships

Name	Details	
	Role	Journal
Huating Wang	Editorial Board Member	Skeletal Muscle
		Life Medicine
		Frontiers

Reviewers of Journal / Conference

Name	Details	
	Role	Journal / Conference
Huating Wang	Reviewer	Journal of Orthopaedics
		Nature Communications
		Development
		The EMBO Journal
		Advanced Science

Grants and Consultancies

Name	Project Title	Funding Source	Start Date (dd/mm/yyyy)	End Date (dd/mm/yyyy)	Amount (HK$)
Huating Wang	Elucidation of Intrinsic and Extrinsic Alterations Regulating Skeletal Muscle Stem Cell Aging: Mechanisms for Sarcopenia	Health Bureau – Health and Medical Research Fund	02/12/2021	01/06/2025	1,496,150
	3D Genome Rewiring during Muscle Stem Cell Linage Development and Aging	Research Grants Council – General Research Fund	01/01/2021	30/06/2024	1,194,637
	Elucidating the Novel Regulatory Function of RNA Binding Proteins in 3D Genome Organization	Research Grants Council – General Research Fund	01/01/2023	31/12/2025	1,425,114
	Elucidating the Function of RNA Binding Proteins in 3D Genome Organization	The Chinese University of Hong Kong – Postgraduate Fellowship Scheme	12/05/2022	30/04/2026	750,000
	Mechanistic Investigation of m6A Mediated Gene Regulatory Functions in Skeletal Muscle Stem Cells and Muscle Regeneration	The Chinese University of Hong Kong – Postgraduate Fellowship Scheme	12/05/2022	30/04/2026	750,000
	Mechanistic Dissection of Alternative Promoter Usage in Skeletal Muscle Stem Cells using Runx1 as a Paradigm	The Chinese University of Hong Kong – Postgraduate Fellowship Scheme	05/08/2024	04/08/2027	750,000
	In vivo RNA Structure Probing Unveils DHX36 Binding-structure Interplay in Regulation of mRNA Abundance	Research Grants Council – General Research Fund	01/08/2023	31/07/2026	1,600,000
	In vivo RNA Structure Probing Unveils DHX36 Binding-structure Interplay in Regulation of mRNA Abundance	The Chinese University of Hong Kong Research Committee – Direct Grant	01/08/2023	31/07/2026	20,000

Grants and Consultancies

Name	Project Title	Funding Source	Start Date (dd/mm/yyyy)	End Date (dd/mm/yyyy)	Amount (HK$)
Huating Wang	Stem Cell Senescence in Skeletal Muscle Ageing: Mechanism and Treatment or Sarcopenia	Health Bureau – Health and Medical Research Fund	19/08/2023	18/08/2026	1,491,150
	Stem Cell-niche Interactions in Tissue Maintenance and Engineering	Research Grants Council – Theme-based Research Scheme	01/01/2022	31/12/2026	1,052,000
	Matching Fund for TRS Projects - Stem Cell-niche Interactions in Tissue Maintenance and Engineering	The Chinese University of Hong Kong Research Committee – Group Research Scheme	01/01/2022	31/12/2026	87,000
	國家重點研發計劃 — 代謝微環境紊亂對骨骼肌疾病和穩態維持的功能及干預策略	Ministry of Science and Technology of China	01/12/2022	30/11/2027	4,608,000
Xiaona Chen	Unraveling the Functional and Mechanistical Role of DNA G-Quadruplex in Skeletal Muscle Stem Cells and Muscle Regeneration	The Chinese University of Hong Kong Research Committee – Direct Grant	01/06/2023	31/05/2024	150,000
	Unravelling the Functional and Mechanistic Role of DNA G-Quadruplexes in Skeletal Muscle Aging: Potential Treatment for Sarcopenia	The Chinese University of Hong Kong Research Committee – Direct Grant	01/06/2024	31/05/2025	150,000
	NSFC 國家自然科學基金委員會 - 肌肉再生過程中骨骼肌幹細胞內 DNAG- 四和分子機制研究	National Natural Science Foundation of China	01/01/2024	31/12/2026	324,720
	廣東省自然科學基金青年提升項目 — DNAG- 四鏈體對骨骼肌幹細胞和肌肉及其分子機制研究	Department of Science and Technology of Guangdong Province	01/01/2024	31/12/2026	319,560

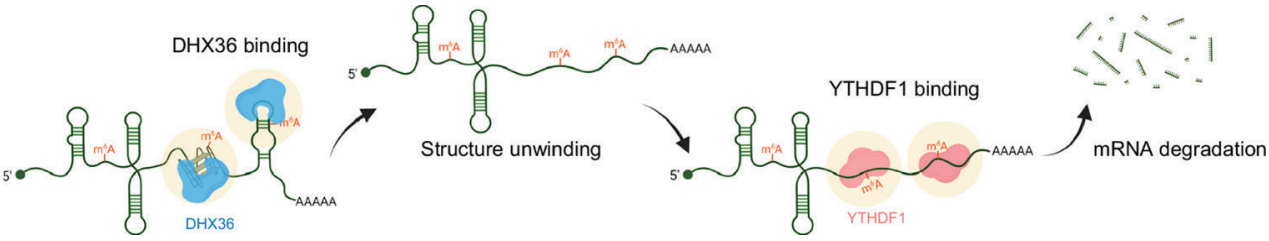
Publications

A. Journal Papers

1. Chen X, Li Y, Xu J, Cui Y, Wu Q, Yin H, Li Y, Gao C, Jiang L, Wang H, Wen Z, Yao Z, Wu Z. Styxl2 regulates *de novo* sarcomere assembly by binding to non-muscle myosin IIs and promoting their degradation. *eLife*. 2024. doi:10.7554/elife.87434.
2. Zhang Y, Zhao J, Chen X, Qiao Y, Kang J, Guo X, Yang F, Lyu K, Ding Y, Zhao Y, Sun H, Kwok CK, Wang H. DHX36 binding induces RNA structurome remodeling and regulates RNA abundance via m6A reader YTHDF1. *Nature Communications*. 2024;15(1):1-19. doi:10.1038/s41467-024-54000-y.
3. Zhao X, Chen Z, Wang H, Sun H. Occlusion enhanced pan-cancer classification via deep learning. *BMC Bioinformatics*. 2024;25(1):1-24. doi:10.1186/s12859-024-05870-y.

B. Book Chapter

1. He L, Sun H, Wang H. 3D organization of enhancers in MuSCs. *Current Topics in Developmental Biology*. 2024;158:407-431. doi:10.1016/bs.ctdb.2024.01.011.



DHX36 binds to and resolves the structured sites. The increased structural accessibility of DHX36-bound m6A sites promotes m6A- dependent YTHDF1 binding to promote target mRNA degradation.

Source: Zhang Y, Zhao J, Chen X, Qiao Y, Kang J, Guo X, Yang F, Lyu K, Ding Y, Zhao Y, Sun H, Kwok CK, Wang H. DHX36 binding induces RNA structurome remodeling and regulates RNA abundance via m6A reader YTHDF1. Nature Communications. 2024;15(1):1-19. doi:10.1038/s41467-024-54000-y.



Non-Coding RNAs and Cellular Signalling

Cellular Signalling

非編碼核糖核苷酸研究及細胞訊號轉導

PRINCIPAL INVESTIGATOR

William Wu

TEAM MEMBERS

Matthew Chan, Lin Zhang, Xiaodong Liu, Huarong Chen, Likai Tan, Qing Li, Idy Ho, Chuan Xie, Judeng Zeng, Xiaoting Zhang, Zidan Zou, Fenfen Qin, Yingzhi Liu, Wenye Xu, Tingting Jin, Ziheng Huang, Qian Li, Hao Su, Yanjun Jiang, Shuai Yan, Ling Lin, Shilan Wang, Dongjiao Chen, Hongyan Chen, Na Qin, Jing Ren, Yushan Wang, Zemin Chen, Haiyun Shang, Yichen Yang, Xinyi Zhang, Ki Fung Suk

Research Progress Summary

Identification of LOX-1 as the host cell surface receptor for mediating adhesion of *Helicobacter pylori*

In 2024, it was estimated that about two-thirds of the world's population were infected with *H. pylori*. While most infections are asymptomatic, 10-20% of patients infected with *H. pylori* develop peptic ulceration and up to 2% gastric adenocarcinoma. *H. pylori* induced gastritis may also occur. Treatment with antibiotics is possible but expensive and is associated with side-effects. The research team led by **William Wu** discovered that LOX-1 is a key receptor for mediating the attachment of *Helicobacter pylori* to gastric epithelial cells. Importantly, this surface protein is downregulated during *H. pylori* infection via an m^6A-dependent manner as a host response to attenuate the bacterial adhesion and invasion. It was further shown that pharmacological blockade of LOX-1 reduces *H. pylori* colonisation. These findings not only highlight the importance of m^6A modification for host cells to defend against *H. pylori* infection, but also provide evidence that targeting LOX-1 might help control *H. pylori* infection.

Research and Scholarship

Research Awards and Recognitions

Name	Details	
	Award	Organisation
William Wu	Highly Cited Researcher in the Field of Cross-field (2024)	Clarivate Analytics
	Best Scientists in the Discipline of Medicine in China (Ranked 147th Nationally Based on D-Index in 2024)	Research.com
	World's Top 2% Scientists	Updated Science-Wide Author Databases of Standardised Citation Indicators Compiled by Stanford University
	Listed on the Academic Impact Rankings of Global Scientists 2023 (Career-long Impact) among 134 CUHK Scholars (2024)	Global Author ID

Academic Editorships

Name	Details	
	Role	Journal
William Wu	Editorial Board Member	Oncogene
	Associate Editor	"Pharmacology of Anti-Cancer Drugs" Section under Frontiers in Pharmacology and Frontiers in Oncology
	Topic Editor/ Guest Associate Editor	Frontiers in Microbiology

Reviewers of Journal / Conference

Name	Details	
	Role	Journal / Conference
William Wu	Peer Reviewer	Cell Death and Differentiation
		Science of the Total Environment
		Oncogene
		Gut

Grants and Consultancies

Name	Project Title	Funding Source	Start Date (dd/mm/yyyy)	End Date (dd/mm/yyyy)	Amount (HK$)
William Wu	Sex Differences in the Gut Colonization of *Carnobacterium maltaromaticum* for Suppressing Colorectal Tumorigenesis	Research Grants Council – General Research Fund	01/01/2023	31/12/2025	1,180,120

Grants and Consultancies

Name	Project Title	Funding Source	Start Date (dd/mm/yyyy)	End Date (dd/mm/yyyy)	Amount (HK$)
William Wu	*Carnobacterium maltaromaticum* as a Novel Probiotic Treatment for Attenuating Gut Barrier Dysfunction and Systemic Inflammation in Sepsis	Health Bureau – Health and Medical Research Fund	13/11/2022	12/11/2025	1,499,960
	Mechanism of VitD3 Targeting Autophagy-Lysosomal Pathway Inhibiting C. *difficile*-related Inflammation	National Natural Science Foundation of China	01/01/2021	31/12/2024	589,599
	Developing Probiotics into High-efficacy and Safe Prophylactics and Adjuvant Therapies for Colorectal Cancer	Research Grants Council – Research Impact Fund	30/06/2022	29/06/2027	9,790,000
	Developing Mechanism-driven Probiotics for Improving Response to Immunotherapy in Colorectal Cancer	Innovation and Technology Commission – Innovation and Technology Support Programme (Platform Research Projects)	26/2/2023	25/2/2025	3,994,999
	Probiotics and their Metabolites for Treating Chronic Pain (Phase 2)	The Chinse University of Hong Kong – Peter Hung Pain Research Institute	10/08/2024	09/08/2026	2,500,000
	Tranexamic Acid to Reduce Delirium after Gastrointestinal Surgery: The TRIGS-D Trial	Health Bureau – Health and Medical Research Fund	01/06/2024	31/05/2027	1,488,160
	Augmenting the cGAS-STING Pathway for Eliminating *Helicobacter pylori* Infection via Autophagy	Research Grants Council – General Research Fund	01/01/2024	31/12/2026	1,577,000
	Elucidating the Role and Therapeutic Potential of RNA N^1-Methyladenosine (m^1A) Modification in Sepsis	Health Bureau – Health and Medical Research Fund	01/04/2023	31/03/2026	1,499,808

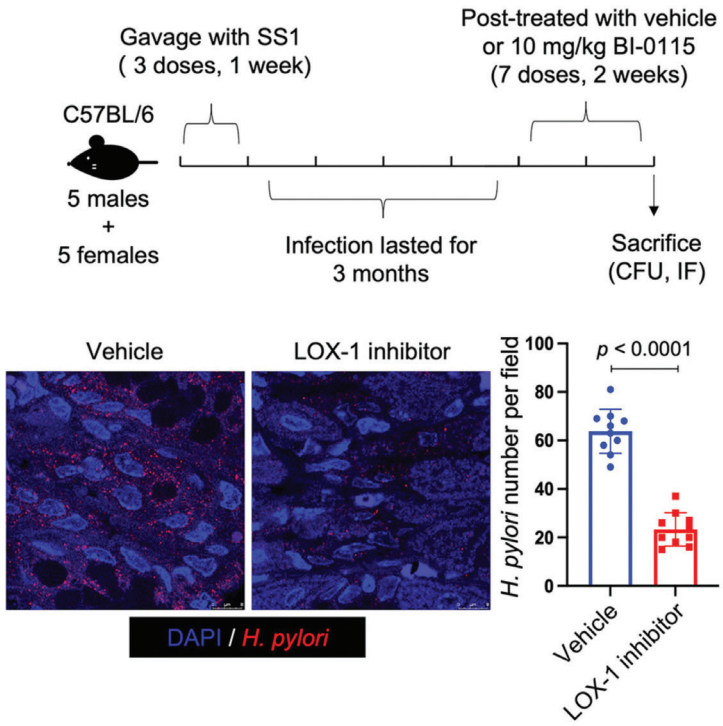
Grants and Consultancies

Name	Project Title	Funding Source	Start Date (dd/mm/yyyy)	End Date (dd/mm/yyyy)	Amount (HK$)
William Wu	Elucidating the role of RNA N^1-methyladenosine Modifications in Colorectal Cancer	Research Grants Council – General Research Fund	01/01/2023	31/12/2025	1,130,669
	Delineating the Sensorimotor Cortex-spinal Cord Descending Pain Pathway and Its Interaction with Gut Microbiota	Research Grants Council – General Research Fund	01/01/2023	31/12/2025	1,114,323
	Adjuvant Immunotherapy with *Streptococcus thermophilus*-induced Natural Killer Cells for Colorectal Cancer Treatment	Health Bureau – Health and Medical Research Fund	26/11/2022	25/11/2025	1,498,092
	Bacteroides uniformis as a Novel Probiotic Treatment for Attenuating Microglia Reactivation and Pain Hypersensitivity in Peripheral Neuropathy	Health Bureau – Health and Medical Research Fund	01/08/2022	31/07/2024	1,298,728
	基于腸道菌群分析鑒定疱疹后遺神经痛早期篩查標志物及緩解疼痛益生菌的研究	Shenzhen-Hong Kong-Macau Technology Research Programme (Type C), Shenzhen Science and Technology Innovation Commission	30/04/2022	30/04/2024	1,071,999
	Elucidating the Role and Mechanism of RNA N^6-methyladenosine m^6A Regulator METTL3 in Promoting Colorectal Cancer through Modulating Gut Microbiota	Research Grants Council – General Research Fund	01/01/2022	31/12/2024	1,150,352

Publications

A. Journal Papers

1. Wu WKK, Yu J. Microbiota-based biomarkers and therapeutics for cancer management. *Nature Reviews Gastroenterology and Hepatology*. 2024;21(2):72-73. doi:10.1038/s41575-023-00879-9. (Opinion article)
2. Zeng J, Xie C, Huang Z, Cho CH, Chan H, Li Q, Ashktorab H, Smoot DT, Wong SH, Yu J, Gong W, Liang C, Xu H, Chen H, Liu X, Wu JCY, Ip M, Gin T, Zhang L, Chan MTV, Hu W, Wu WKK. LOX-1 acts as an N^6-methyladenosine-regulated receptor for *Helicobacter pylori* by binding to the bacterial catalase. *Nature Communications*. 2024;15(1). doi:10.1038/s41467-024-44860-9.
3. Xu W, Zhang Y, Chen D, Huang D, Zhao Y, Hu W, Lin L, Liu Y, Wang S, Zeng J, Xie C, Chan H, Li Q, Chen H, Liu X, Wong SH, Yu J, Chan FKL, Chan MTV, Ng SC, Wu WKK, Zhang L. Elucidating the genotoxicity of *Fusobacterium nucleatum*-secreted mutagens in colorectal cancer carcinogenesis. *Gut Pathogens*. 2024;16(1). doi:10.1186/s13099-024-00640-w.
4. Chen H, Liu W, Coker OO, Qin N, Chen H, Wang Y, Liu X, Zhang L, Choi GYS, Wong WT, Leung CCH, Ling L, Hui M, Gin T, Wong SH, Chan MTV, Wu WKK. Blood microbial signatures associated with mortality in patients with sepsis: A pilot study. *Heliyon*. 2024;10(8). doi:10.1016/j.heliyon.2024.e29572.
5. Jiang X, He X, Wong J, Scheeff S, Hau SCK, Wong TH, Qin Y, Fan CH, Ma B, Chung NL, Huang J, Zhao J, Yan Y, Xiao M, Song X, Hui TKC, Zuo Z, Wu WKK, Ko H, Chow KHM, Ng BWL. Lactone-to-lactam editing alters the pharmacology of bilobalide. *JACS Au*. Published online September23, 2024. doi:10.1021/jacsau.4c00416.
6. Ho IHT, Zou Y, Luo K, Qin F, Jiang Y, Li Q, Jin T, Zhang X, Chen H, Tan L, Zhang L, Gin T, Wu WKK, Chan MTV, Jiang C, Liu X. Sodium butyrate restored TRESK current controlling neuronal hyperexcitability in a mouse model of oxaliplatin-induced peripheral neuropathic pain. *Neurotherapeutics*. Published online January1, 2024. doi:10.1016/j.neurot.2024.e00481. (Epub ahead of print)



Pharmacological inhibition of LOX-1 reduced *H. pylori* infection in mouse stomachs

Source: Zeng J, Xie C, Huang Z, Cho CH, Chan H, Li Q, Ashktorab H, Smoot DT, Wong SH, Yu J, Gong W, Liang C, Xu H, Chen H, Liu X, Wu JCY, Ip M, Gin T, Zhang L, Chan MTV, Hu W, Wu WKK. LOX-1 acts as an N^6-methyladenosine-regulated receptor for helicobacter pylori by binding to the bacterial catalase. Nature Communications. 2024;15(1). doi:10.1038/s41467-024-44860-9.



Non-Coding RNAs and Cellular Signalling

RNA Modifications in Gastrointestinal Cancer and Infectious Diseases

非編碼核糖核苷酸研究及細胞訊號轉導

PRINCIPAL INVESTIGATOR | **Huarong Chen**

TEAM MEMBERS | Judeng Zeng, Xiaoting Zhang, Hao Su, Hongyan Chen, Zihe Xu, Na Qin, Haiyun Shang, Ki Fung Suk

Research Progress Summary

Blood microbial signatures associated with mortality in patients with sepsis: A pilot study

Huarong Chen and his research team's study uncovered two distinct microbial signatures in the blood of septic patients. Compositional and ecological analysis of blood microbial DNA may thus be useful in predicting mortality of septic patients.

TRMT61A initiates the m^1A-ONECUT2-MAPK axis, driving colorectal tumorigenesis and emerging as a promising therapeutic target. Their study unveiled a consistent elevation of m^1A levels and the expression of the m^1A methyltransferase TRMT61A in primary CRC, suggesting a dysregulation of m^1A modification during cancer development. TRMT61A can catalyse the addition of m^1A to ONECUT2 mRNA, thereby enhancing mRNA stability and activating oncogenic signaling in CRC. Targeting TRMT61A may serve as a promising therapeutic avenue in the context of CRC.

Research and Scholarship

Research Awards and Recognitions

Name	Details	
	Award	Organisation
Huarong Chen	2023 Top Reviewers (Jan 2024)	The Journal Oncogene

Fellowships

Name	Details	
	Fellowship	Organisation
Huarong Chen	Youth Council Member	Gastroenterology Branch of Cross-Strait Medical Interchange Association
		China Anti-Cancer Association
	Member	American Association for Cancer Research
		American Gastroenterological Association
	Professional Committee Member	China Anti-Cancer Association for the Screening, Early Detection and Early Treatment of Cancer

Academic Editorships

Name	Details	
	Role	Journal
Huarong Chen	Associate Editor	BMC Medicine
		Experimental Cell Research
	Editorial Board Member	Oncogene
		Microbes & Immunity
	Guest Editor	Diagnostics

Reviewers of Journal / Conference

Name	Details	
	Role	Journal / Conference
Huarong Chen	Peer Reviewer	Clinical Epigenetics
		MedComm
		Aging

Reviewers of Journal / Conference

Name	Details	
	Role	Journal / Conference
Huarong Chen	Peer Reviewer	Oncogene
		Advanced Science
		Gut
		Molecular Therapy
		Cell Death Discovery
		Clinical and Translational Medicine
		Experimental Cell Research
		Journal of Translational Medicine
		Pharmacological Research
		Journal of Nanobiotechnology
		Chinese Medical Journal
		PLOS One
		Nature Communications
		Gut Microbes
		Environmental Pollution
		Cancer Letters
		Molecular Cancer Research
		World Journal of Gastroenterology

Grants and Consultancies

Name	Project Title	Funding Source	Start Date (dd/mm/yyyy)	End Date (dd/mm/yyyy)	Amount (HK$)
Huarong Chen	Elucidating the Role of RNA N^1-Methyladenosine Modifications in Colorectal Cancer	Research Grants Council – General Research Fund	01/01/2023	31/12/2025	1,130,669
	Targeting m^6A Modification to Boost Chemotherapy and Immunotherapy Efficacy in Colorectal Cancer	Research Grants Council – Collaborative Research Fund	30/06/2024	29/06/2027	1,000,000

Grants and Consultancies

Name	Project Title	Funding Source	Start Date (dd/mm/yyyy)	End Date (dd/mm/yyyy)	Amount (HK$)
Huarong Chen	Elucidating the Role and Mechanism of RNA N^6-Methyladenosine m^6A Regulator METTL3 in Promoting Colorectal Cancer Through Modulating Gut Microbiota	Research Grants Council – General Research Fund	01/01/2022	31/12/2024	1,150,352
	Elucidating the Role of RNA N^6-Methyladenosine Writer Methyltransferase like 3 (METTL3) in Driving Immune Suppression in Colorectal Cancer	National Natural Science Foundation of China	01/01/2022	31/12/2024	RMB 300,000
	Defining the role of TRNA Methyltransferase 61A (TRMT61A) in Colorectal Cancer	National Natural Science Foundation of China	01/01/2023	31/12/2026	RMB 520,000
	Elucidating the Role and Therapeutic Potential of RNA N^1-methyladenosine (m^1A) Modification in Sepsis	Health Bureau – Health & Medical Research Fund	01/04/2023	31/03/2026	1,499,808

Publications

A. Journal Papers

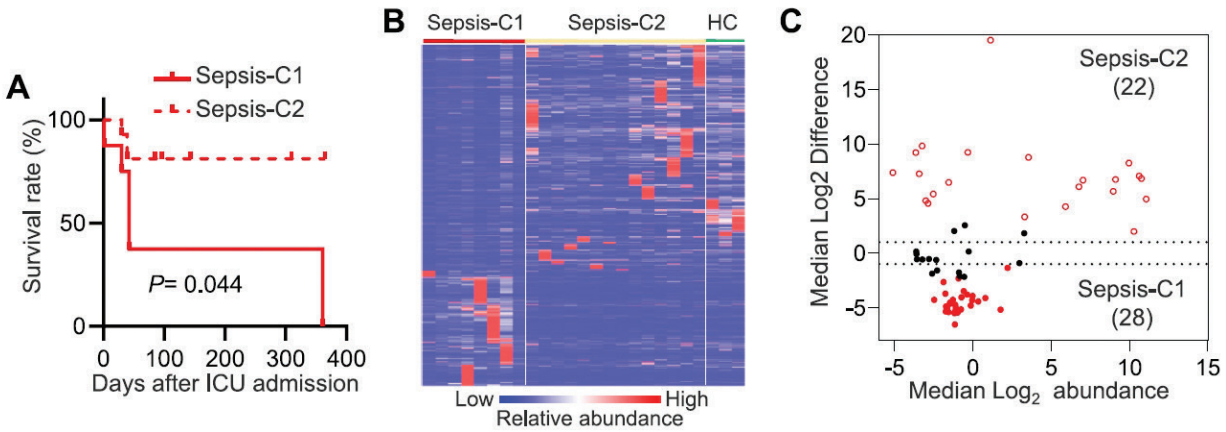
1. Chen H, Liu W, Coker OO, Qin N, Chen H, Wang Y, Liu X, Zhang L, Choi GYS, Wong WT, Leung CCH, Ling L, Hui M, Gin T, Wong SH, Chan MTV, Wu WKK. Blood microbial signatures associated with mortality in patients with sepsis: A pilot study. *Heliyon*. 2024;10(8). doi:10.1016/j.heliyon.2024.e29572.
2. Ho IHT, Zou Y, Luo K, Qin F, Jiang Y, Li Q, Jin T, Zhang X, Chen H, Tan L, Zhang L, Gin T, Wu WKK, Chan MTV, Jiang C, Liu X. Sodium butyrate restored TRESK current controlling neuronal hyperexcitability in a mouse model of oxaliplatin-induced peripheral neuropathic pain. *Neurotherapeutics*. Published online January 1, 2024. doi:10.1016/j.neurot.2024.e00481. (Epub ahead of print)
3. Xu W, Zhang Y, Chen D, Huang D, Zhao Y, Hu W, Lin L, Liu Y, Wang S, Zeng J, Xie C, Chan H, Li Q, Chen H, Liu X, Wong SH, Yu J, Chan FKL, Chan MTV, Ng SC, Wu WKK, Zhang L. Elucidating the genotoxicity of *Fusobacterium nucleatum*-secreted mutagens in colorectal cancer carcinogenesis. *Gut Pathogens*. 2024;16(1). doi:10.1186/s13099-024-00640-w.
4. Yang J, Wei H, Lin Y, Chu ESH, Zhou Y, Gou H, Guo S, Lau HCH, Cheung AHK, Chen H, To KF, Sung JJY, Wang Y, Yu J. High soluble fiber promotes colorectal tumorigenesis through modulating gut microbiota and metabolites in mice. *Gastroenterology*. 2024;166(2):323-337.e7. doi:10.1053/j.gastro.2023.10.012.

5. Zeng J, Xie C, Huang Z, Cho CH, Chan H, Li Q, Ashktorab H, Smoot DT, Wong SH, Yu J, Gong W, Liang C, Xu H, Chen H, Liu X, Wu JCY, Ip M, Gin T, Zhang L, Chan MTV, Hu W, Wu WKK. LOX-1 acts as an N^6-methyladenosine-regulated receptor for *Helicobacter pylori* by binding to the bacterial catalase. *Nature Communications*. 2024;15(1). doi:10.1038/s41467-024-44860-9.

6. Qin N, Chen H, Su H, Zhang X, Shang H, Xu Z, Zeng Z, Chen H. The roles and potential clinical implications of gut microbiome in sepsis. *Microbes and Immunity*. 2025, 2(1), 17–30. doi:10.36922/mi.4742. (Review)

B. Book Chapter

1. Shang H, Zhang X, Su H, Chen H, Qin N, Chen H. RNA modifications as a therapeutic target in gastrointestinal cancer: Exploring emerging opportunities. In: *Interdisciplinary Cancer Research*. Springer, Cham. Published online 2024:1-21. doi:10.1007/16833_2024_298.



Identification of microbial species associated with sepsis.

Source: Chen H, Liu W, Coker OO, Qin N, Chen H, Wang Y, Liu X, Zhang L, Choi GYS, Wong WT, Leung CCH, Ling L, Hui M, Gin T, Wong SH, Chan MTV, Wu WKK. Blood microbial signatures associated with mortality in patients with sepsis: A pilot study. Heliyon. 2024;10(8). doi:10.1016/j.heliyon.2024.e29572.



Non-Coding RNAs and Cellular Signalling

Gene Regulation in Muscle Stem Cells During Muscle Regeneration and Ageing

非編碼核糖核苷酸研究及細胞訊號轉導

PRINCIPAL INVESTIGATOR | **Xiaona Chen**

TEAM MEMBERS | Suyang Zhang, Feng Yang, Xiaofan Guo

Research Progress Summary

In this year, the research team led by **Xiaona Chen** focused on dissecting the functional role of DNA G-quadruplexes in adult muscle stem cells during the muscle regeneration and aging process. They mapped the G4 landscape in MuSCs during lineage progression and aging and uncovered a highly dynamic formation of G4 in this process. They are actively working on dissecting the functional roles of G4 and related molecular mechanisms and also preparing the manuscript.

Xiaona got two direct grants from The Chinese University of Hong Kong, one National Natural Science Foundation of China (NSFC) youth grant and one Guangdong Provincial Natural Science Foundation grant this year to support her research. She also made one publication on journals and several oral presentations in academic conferences, and she keeps collaborating actively with Chun Kit Kwok in the City University of Hong Kong.

Research and Scholarship

Grants and Consultancies

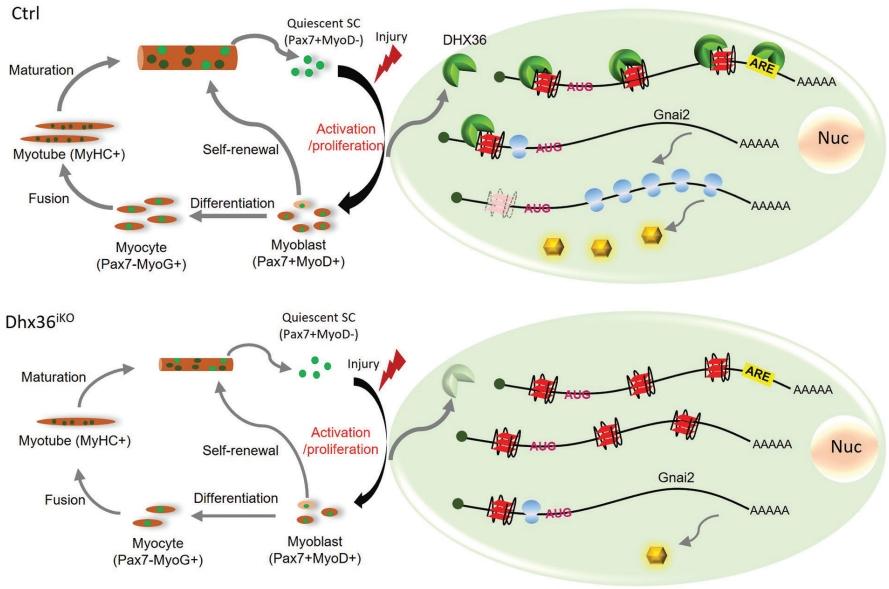
Name	Project Title	Funding Source	Start Date (dd/mm/yyyy)	End Date (dd/mm/yyyy)	Amount (HK$)
Xiaona Chen	Unraveling the Functional and Mechanistical Role of DNA G-quadruplex in Skeletal Muscle Stem Cells and Muscle Regeneration	The Chinese University of Hong Kong Research Committee – Direct Grant	01/06/2023	31/05/2024	150,000
	Unravelling the Functional and Mechanistic Role of DNA G-quadruplexes in Skeletal Muscle Aging: Potential Treatment for Sarcopenia	The Chinese University of Hong Kong Research Committee – Direct Grant	01/06/2024	31/05/2025	150,000
	肌肉再生過程中骨胳肌幹細胞內 DNA G - 四鏈體的功能和分子機制研究	National Natural Science Foundation of China	01/01/2024	31/12/2026	RMB 300,000
	DNA G - 四鏈體對骨胳肌幹細胞和肌肉再生的調控及其分子機制研究	Guangdong Provincial Natural Science Foundation	01/01/2024	31/12/2026	RMB 300,000
	In vivo RNA Structure Probing Unveils DHX36 Binding-structure Interplay in Regulation of mRNA Abundance	Research Grants Council – General Research Fund	01/08/2023	31/07/2026	1,600,000

Publications

A. Conference Papers

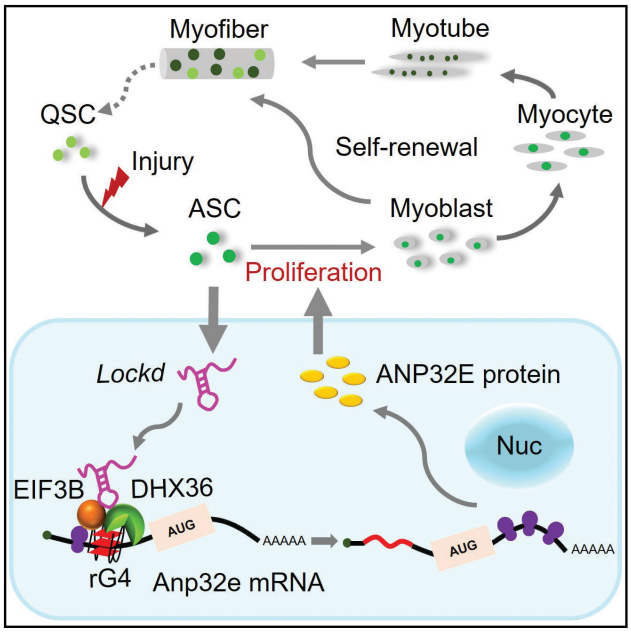
1. Chen X. G-quadruplexes in muscle stem cells and muscle regeneration. In: *20th Annual Meeting of Joint Scoliosis Research Centre of The Chinese University of Hong Kong and Nanjing University*. 20-01-2024.
2. Chen X. Functional study of G-quadruplex in skeletal muscle stem cells. In: *The 9th China International Orthopedic Research Summit and Expo*. Jul 25-28, 2024.

3. Chen X. DHX36 binding induces RNA structurome remodeling and regulates RNA abundance via m6A reader YTHDF1. In: *Cell Symposia: Functional RNAs*. Oct 22-24, 2024.



The functional and mechanistic role of DHX36 in regulating MuSC proliferation and muscle regeneration.

Source: Chen X, Yuan J, Xue G, Campanario S, Wang D, Wang W, Mou X, Liew SW, Umar MI, Isern J, Zhao Y, He L, Li Y, Mann CJ, Yu X, Wang L, Perdiguero E, Chen W, Xue Y, Nagamine Y, Kwok CK, Sun H, Muñoz-Cánoves P, Wang H. Translational control by DHX36 binding to 5'UTR G-quadruplex is essential for muscle stem-cell regenerative functions. Nature Communications. 2021;12(1):1-22. doi:10.1038/s41467-021-25170-w.



The functional and mechanistic role of *Lockd* in regulating MuSC proliferation and muscle regeneration.

Source: Chen X, Xue G, Zhao J, Zhang Y, Zhang S, Wang W, Li Y, Yuan J, He L, Chan CY, Liu Y, Chen W, Zhao Y, Hu P, Sun H, Kwok CK, Wang H. Lockd promotes myoblast proliferation and muscle regeneration via binding with DHX36 to facilitate 5'UTR rG4 unwinding and Anp32e translation. Cell Reports. 2022;39(10):110927. doi:10.1016/j.celrep.2022.110927.



Nephrology
Biomarker and Translational Research
腎臟疾病研究

PRINCIPAL INVESTIGATOR | **Cheuk Chun Szeto**

TEAM MEMBERS | Jack Ng, Peter Poon, Ka Bik Lai, Cathy Luk, Chuanlei Li, Lixing Xu, Phyllis Cheng, Winston Fung, Gordon Chan

Research Progress Summary

Knowledge Transfer and Academic Conferences

In 2024, **Cheuk Chun Szeto** and his team publicised the result of their research at a number of academic conferences in different countries outside Hong Kong, including Korea, the United Kingdom, the United Arab Emirates, Canada, Macau, and Mainland China. The topics of these conferences range from electrolyte disturbances, peritoneal dialysis, cardiovascular and metabolic complications of kidney disease. These conferences provide an opportunity for experts in the field to discuss strategies, share experiences and knowledge, and promote advancements in the management of kidney-related diseases and conditions.

Specific conferences include:

1. Vascular Catheter Infections – From Outside to Inside, from Prevention to Treatment. In: Central Renal Committee Renal Commission Training, Hong Kong, January 2024.
2. The Success Story of Peritoneal Dialysis in Hong Kong. In: Royal College of Physicians of Edinburgh International Medical Updates (IMU), Edinburgh, UK, May 2024.
3. Dimitri G. Oreopoulos Memorial Lecture: Bridge Over Troubled Water. In: Canadian Society of Nephrology Annual Scientific Meeting, Montreal, Canada, May 2024.

4. Management of Hyponatremia. In: Advance in Medicine, Department of Medicine & Therapeutics, The Chinese University of Hong Kong, May 2024.
5. Richard Yu Lecture: The Greatest Enemy of Nephrology. In: Advance in Medicine, Department of Medicine & Therapeutics, The Chinese University of Hong Kong, May 2024.
6. Innovations in Hyperkalemia Management and Updates to the 2024 KDIGO Guidelines. In: Pharmacist Association of Macao symposium, Pharmacist Association of Macao, May 2024.
7. Translational Research and Nover Therapeutic Targets in CKD. In: Asian Pacific Congress of Nephrology 2024, Seoul, South Korea, June 2024.
8. Optimizing CKD Management. In: Department of Health Continuous Education Program, Hong Kong, September 2024.
9. A Few Nephrology Mysteries in Hematology. In: Hong Kong Society of Nephrology Educational Symposium, Hong Kong, September 2024.
10. Management of PD-related Infections. In: International Society for Peritoneal Dialysis Congress 2024, Dubai, UAE, September 2024.
11. Early Detection of Peritonitis. In: International Society for Peritoneal Dialysis Congress 2024, Dubai, UAE, September 2024.
12. Case Discussion on the Cardiovascular-Kidney-Metabolic Syndrome. In: Hong Kong College of Physicians Annual Scientific Meeting 2024, Hong Kong, October 2024.
13. Hong Kong CKD Consensus: Key Recommendations and Rationale. In: CaReMe Forum. The Hong Kong Chinese Medical Association (HKCMA), Hong Kong, October 2024.
14. Newer Antibiotics for the Treatment of Peritoneal Dialysis-related Peritonitis. In: The PD Future Forum of the 4th Renal Replacement Therapy Forum, Beijing, China, November 2024.
15. Renal Genetic Diseases. In: Hospital Authority Central Commission Training Program 2024-25 on "Genetics and Genomics in Renal Medicine (Adult)", Hong Kong, November 2024.
16. Cardio-Kidney-Metabolic Syndrome: A Nephrologist's Perspective. In: Hong Kong Society of Endocrinology, Reproduction, and Metabolism Annual Scientific Meeting, Hong Kong, November 2024.

Organisation of Academic Conferences

In 2024, the team contributed to the organisation of the 5th International Congress of Chinese Nephrologists in Hong Kong. This conference provides an important platform for esteemed experts in the field to gather and engage in comprehensive discussions about the latest advancements in the management of kidney diseases and dialysis. The focus of these meetings is on promoting collaboration and the exchange of knowledge. They allow participants to share their experiences, insights, and expertise, thereby aiding the overall progress and development of collaborative research projects with other centres.

Research Collaborations

Local collaborations

The group works closely with local experts in artificial intelligence, 3D tissue imaging, and nanoparticle therapy. By collaborating with these specialists, they aim to drive progress in the management of kidney-related diseases through innovative research and cutting-edge technology.

Specific collaborations include:

1. With Jonathan Choi, Department of Biomedical Engineering, The Chinese University of Hong Kong, on Nanoparticle Therapy for Kidney Disease.
2. With Xiaoyu Yan, School of Pharmacy, The Chinese University of Hong Kong, on Novel Treatment of Renal Anemia.
3. With Nelson Tang, Department of Chemical Pathology, The Chinese University of Hong Kong, on Immunological Response of COVID Vaccination.
4. With Marques Ng, School of Nursing, The Chinese University of Hong Kong, on Psychological Health of Patients with Kidney Disease.

5. With Weitian Chen, Department of Diagnostic Radiology and Organ Imaging, The Chinese University of Hong Kong, on Novel Methods for the Assessment of Kidney Fibrosis.
6. With Ting-hsuan Chen, Department of Biomedical Engineering, City University of Hong Kong, on Novel Diagnostic Tools for Albuminuric Kidney Diseases.

Overseas collaborations

The group also engages in extensive collaboration with researchers worldwide in nephrology and dialysis, partnering with experts from countries such as Canada, the United Kingdom, Austria, Germany, the USA, and Israel. Their joint projects cover diverse areas, including studying endotoxemia in chronic kidney disease to understand its pathophysiological mechanisms and potential therapeutic strategies, developing innovative technologies for rapid bacterial identification to create advanced tools for detecting pathogens accurately in nephrology settings, and investigating novel peritoneal dialysis solutions to enhance the efficacy and safety of treatment. The primary objective of these initiatives is to explore and develop cutting-edge technologies for the management of kidney diseases, ultimately contributing to improved patient outcomes.

Specific collaborative projects include:

1. With Stanley Fan, Barts Health NHS Trust, London, England, United Kingdom on: Polymerase Chain Reaction/ Electrospray Ionization-Mass Spectrometry (PCR/ESI-MS) for Rapid Bacterial Identification in Peritoneal Dialysis Effluent.
2. With Daniel March, Department of Infection, Immunity & Inflammation, University of Leicester, England, United Kingdom on: Endotoxemia and Cardiovascular Disease in Dialysis Patients
3. With Christoph Aufricht, The Medical University of Vienna, Austria on: Alanyl-Glutamine in Peritoneal Dialysis Fluids Improves Peritoneal Health and Systemic Inflammation
4. With Nelson Leung, Mayo Clinic College of Medicine, USA, on: Novel Tools for the Risk Stratification of IgA Nephropathy.
5. Zytoprotec GmbH, Germany on: Alanyl-Glutamine in Peritoneal Dialysis Fluids Improves Peritoneal Health and Systemic Inflammation.
6. liberDi, The Trendlines Group, Israel on: The LiberDi Dialysis System.

Research and Scholarship

Research Awards and Recognitions

Name	Details	
	Award	Organisation
Cheuk Chun Szeto	Dr. Dimitrios G. Oreopoulos Award	Canadian Society of Nephrology
	Best Abstract Award	European Renal Association Annual Scientific Meeting 2024

Academic Editorships

Name	Details	
	Role	Journal
Cheuk Chun Szeto	Deputy Editor	Nephrology
	Associate Editor	Peritoneal Dialysis International
	Theme Editor (Peritoneal Dialysis)	Clinical Kidney Journal

Reviewers of Journal / Conference

Name	Details	
	Role	Journal / Conference
Cheuk Chun Szeto	Reviewer	Kidney International
		Americal Journal of Kidney Disease

Grants and Consultancies

Name	Project Title	Funding Source	Start Date (dd/mm/yyyy)	End Date (dd/mm/yyyy)	Amount (HK$)
Cheuk Chun Szeto	Modified Creatinine Index as a Non-Invasive Tool for the Monitoring of Muscle Mass in Peritoneal Dialysis	Health Bureau – Health and Medical Research Fund	01/12/2023	30/11/2025	1,015,344
	Fluid Overload as the Cause of Gut Permeability Barrier Dysfunction in Chronic Kidney Disease	Lo's Family Charity Fund Limited	01/07/2022	30/06/2024	1,800,000
	Efficacy and Safety of Multiple Doses of Oral BI 690517 Over 14 Weeks, Alone and in Combination with Empagliflozin, in Patients with Diabetic and Non-diabetic Chronic Kidney Disease	Boehringer Ingelheim International GmbH	15/06/2022	13/02/2024	222,267
	Artificial Intelligent Methods and Technologies for Precise Diagnosis and Treatment of Cancer	Innovation and Technology Commission – Mainland-Hong Kong Joint Funding Scheme	01/01/2022	31/12/2024	2,136,125
	A Longitudinal Observational Cohort of Autosomal Dominant Polycystic Kidney Di sease Patients in Hong Kong : The Establishment of a Hong Kong Polycy	Drs. Richard Charles & Esther Yewpick Lee Charitable Foundation	01/07/2021	30/06/2026	932,539

Grants and Consultancies

Name	Project Title	Funding Source	Start Date (dd/mm/yyyy)	End Date (dd/mm/yyyy)	Amount (HK$)
Cheuk Chun Szeto	A Multicentered, Single-group Phase 2, Exploratory, Open-label Study to Investigate Safety and Effect of Sparsentan in Combination with Sodium Glucose Cotransporter-2 (SGLT2) Inhibition	Travere Therapeutics, Inc.	01/01/2024	30/12/2024	89,600
	Efficacy and Safety of Finerenone on the Progression of Kidney Disease in Patients with Non-diabetic Chronic Kidney Disease	Bayer HealthCare Limited	01/12/2021	01/03/2026	355,000
	Atrasentan in Patients with IgA Nephropathy at Risk of Progressive Loss of Renal Function (The ALIGN Study)	Chinook Therapeutics U.S., Inc	30/06/2021	31/01/2026	499,037
	A Phase 3, Multicenter, Randomized, Double-blind, Placebo-controlled Trial to Evaluate the Efficacy and Safety of Sibeprenlimab Administered Subcutaneously in Subjects with Immunoglobulin A Nephropathy	Otsuka Pharmaceutical	01/10/2023	01/06/2027	673,495

Publications

A. Journal Papers

1. Xu L, Ng JKC, Chan GCK, Fung WWS, Chow KM, Szeto CC. Comparing bioimpedance spectrometry and traditional creatinine kinetics methods for the assessment of muscle mass in peritoneal dialysis patients. *Clinical Kidney Journal*. 2024;17(11):315. doi:10.1093/ckj/sfae315.
2. Ng JKC, Fung WWS, Chan GCK, Cheng PMS, Pang WF, Chow KM, Szeto CC. Modified creatinine index as a marker of skeletal muscle mass in peritoneal dialysis patients. *Clinical Kidney Journal*. 2024;17(10):297. doi:10.1093/ckj/sfae297.

3. Zhong Y, Wei B, Wang W, Chen J, Wu W, Liang L, Huang XR, Szeto CC, Yu X, Nikolic-Paterson DJ, Lan HY. Single-cell RNA-sequencing identifies bone marrow-derived progenitor cells as a main source of extracellular matrix-producing cells across multiple organ-based fibrotic diseases. *International Journal of Biological Sciences*. 2024;20(13):5027-5042. doi:10.7150/ijbs.98839.

4. Jin Y, Cheng IT, Wu D, Yan X, Lau SL, Wong NS, Hung VW, Qin L, Lee RKL, Griffith JF, Szeto CC, So H, Tam LS. Imaging in psoriatic arthritis: Established methods and emerging techniques. *Therapeutic Advances in Musculoskeletal Disease*. 2024;16. doi:10.1177/1759720x241288060. (Review)

5. Chan GCK, Ng JKC, Szeto CC, Chow KM. Effects on calcium phosphate homeostasis after sodium-glucose cotransporter 2 inhibitor in patients with advanced chronic kidney disease and type 2 diabetes mellitus. *Diabetes Research and Clinical Practice*. 2024;216:111818. doi:10.1016/j.diabres.2024.111818.

6. Fung WWS, Chao ACW, Pang WF, Wong RSM, Chow KM, Szeto CC. An unusual case of adult-onset still's disease complicated with anti-complement factor H antibodies associated atypical haemolytic uraemic syndrome. *BMC Nephrology*. 2024;25(1):1-6. doi:10.1186/s12882-024-03548-4.

7. Chan GCK, Kalantar-Zadeh K, Ng JKC, Tian N, Burns A, Chow KM, Szeto CC, Li PKT. Frailty in patients on dialysis. *Kidney International*. 2024;106(1):35-49. doi:10.1016/j.kint.2024.02.026. (Review)

8. Fung WWS, SZE RKH, Szeto CC, Chow KM. *Staphylococcus lugdunensis* peritoneal dialysis-related peritonitis: A matched comparative analysis. *Kidney Medicine*. 2024;6(5):100811. doi:10.1016/j.xkme.2024.100811.

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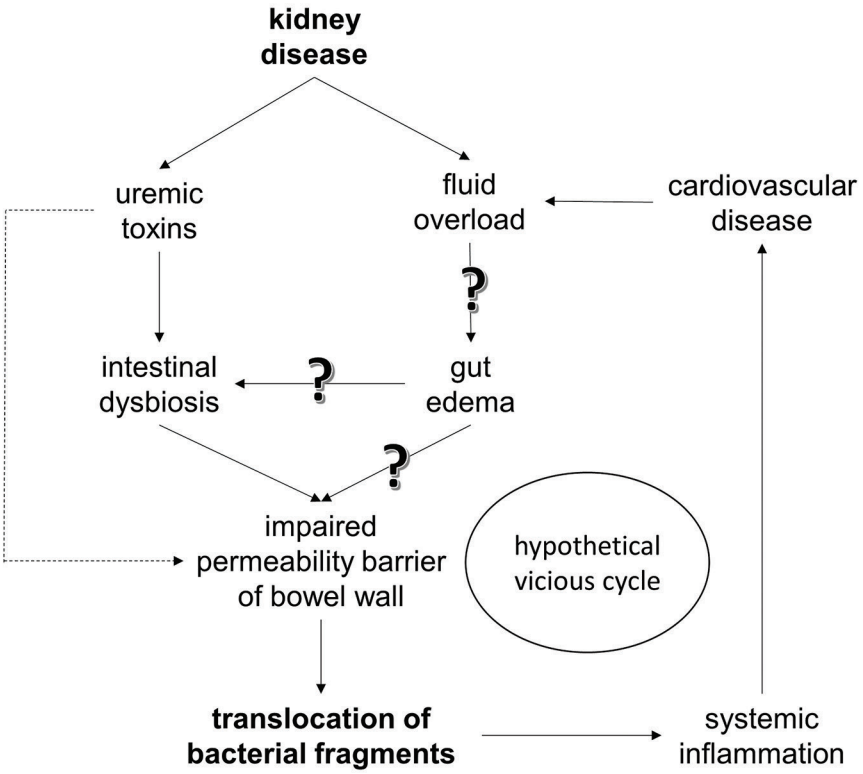
10. Li C, Ng JKC, Chan GCK, Fung WWS, Lai KB, Poon PYK, Luk CCW, Chow KM, Szeto CC. Gut permeability, circulating bacterial fragments and measures of congestion in peritoneal dialysis. *Clinical Kidney Journal*. 2024;17(3). doi:10.1093/ckj/sfae056.

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12. Li C, Szeto CC. Urinary podocyte markers in diabetic kidney disease. *Kidney research and clinical practice*. 2024;43(3). doi:10.23876/j.krcp.23.109.

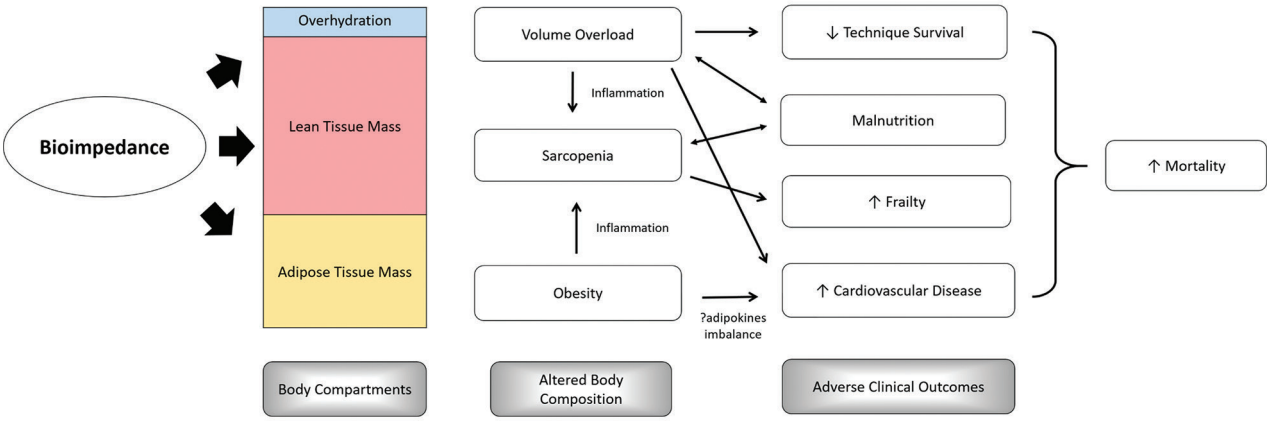
13. Zeng L, Ng JKC, Fung WWS, Chan GCK, Chow KM, Szeto CC. Urinary podocyte stress marker as a prognostic indicator for diabetic kidney disease. *BMC Nephrology*. 2024;25(1):1-7. doi:10.1186/s12882-024-03471-8.

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Pathogenic mechanism and consequence of bacterial fragment translocation in uremia. Organic uremic toxins may affect intestinal barrier function directly or via the proliferation of dysbiotic bacteria in the gut. In addition, renal failure results in fluid overload and gut edema, which also affects the intestinal barrier function. The end result is a translocation of bacterial fragments to the systemic circulation, which leads to systemic inflammation and cardiovascular disease, resulting in a vicious cycle by further aggravating fluid overload.

Source: Szeto CC, McIntyre CW, Li PKT. Circulating bacterial fragments as cardiovascular risk factors in CKD. Journal of the American Society of Nephrology. 2018;29(6):1601-1608. doi:10.1681/asn.2018010068.



Components of body composition that are determined by bioimpedance spectroscopy and their prognostic implications.

Source: Chan GCK, Fung WWS, Szeto CC, Ng JKC. From MIA to FIFA: The vicious matrix of frailty, inflammation, fluid overload and atherosclerosis in peritoneal dialysis. Nephrology. 2023;28(4):215-226. doi:10.1111/nep.14150.



Nephrology
腎臟疾病研究

PRINCIPAL INVESTIGATOR | **Jack Ng**

TEAM MEMBERS | Cheuk Chun Szeto, Kai Ming Chow, Gordon Chan, Winston Fung, Phyllis Cheng, Peter Poon, Cathy Luk, Lixing Xu

Research Progress Summary

Jack Ng and his research team continued their research on nutritional assessment in patients on peritoneal dialysis. Based on their previous experience applying contemporary bioimpedance spectroscopy in the assessment of body composition of patients with chronic kidney disease, they have shown that there was a significant difference in lean tissue mass (LTM) measured by bioimpedance spectroscopy and fat-free edema-free body mass (FEBM) which was determined by traditional creatine kinetics method. This discrepancy was more pronounced in male patients and correlated with LTM and residual renal function, highlighting the limitations of FEBM in assessing skeletal muscle mass. In addition, they applied the modified creatinine index (MCrI) by Canaud's formula, which is an accurate surrogate marker for muscle mass in hemodialysis patients, in the assessment of muscle mass in patients on peritoneal dialysis. They found that MCrI (modified by the inclusion of total weekly Kt/V) significantly correlated with LTM measured by bioimpedance spectroscopy. In an exploratory prospective cohort of 605 incident PD patients, MCrI significantly predicted patient survival within 12 months. In essence, MCrI was a simple and reliable marker of skeletal muscle mass, and may serve as a short-term prognostic indicator.

The research team is also interested in identifying novel disease biomarkers in diabetic kidney disease and developing new diagnostic methods in patients on peritoneal dialysis. Their recent work showed that urinary podocin to nephrin mRNA ratio significantly correlated with the severity of tubulointerstitial fibrosis. Their findings on urinary podocyte markers may have the potential to better predict the progression of diabetic kidney disease without the need for renal biopsy, which is an invasive procedure. On the other hand, the team is collaborating with Jacky Lam, Department of

Chemical Pathology, The Chinese University of Hong Kong, to develop a protocol based on metagenomic sequencing of cell-free DNA in peritoneal fluid for more rapid and accurate diagnosis of peritoneal-dialysis associated peritonitis.

In 2024, the team is responsible for organising the 5th International Congress of Chinese Nephrologists. This serves as a valuable platform for renowned experts in the field to gather and exchange their experiences and insights on all important aspects of chronic kidney disease: from prevention, diagnosis and management. Furthermore, Jack and his team members are invited to deliver lectures at local and international academic conferences. The topics include novel treatment of diabetic kidney disease, frailty in chronic kidney disease, and advancement in techniques in hemodialysis and peritoneal dialysis.

Research and Scholarship

Research Awards and Recognitions

Name	Details	
	Award	Organisation
Jack Ng	Distinguished Research Paper Award	Hong Kong College of Physicians
Cheuk Chun Szeto	Dr. Dimitrios G. Oreopoulos Award	Canadian Society of Nephrology

Academic Editorships

Name	Details	
	Role	Journal
Jack Ng	Editorial Board	Scientific Reports
Gordon Chan	Editorial Board	BMC Nephrology
Cheuk Chun Szeto	Associate Editor	Peritoneal Dialysis International
	Theme Editor (Peritoneal Dialysis)	Clinical Kidney Journal
Kai Ming Chow	Editor	Nephrology

Reviewers of Journal / Conference

Name	Details	
	Role	Journal / Conference
Jack Ng	Reviewer	American Journal of Nephrology
		Diabetes Research and Clinical Practice
		Scientific Reports
		Renal Failure
		Peritoneal Dialysis International
		Nephrology
		5th International Congress of Chinese Nephrologists
		Asian Pacific Congress of Nephrology 2024

Grants and Consultancies

Name	Project Title	Funding Source	Start Date (dd/mm/yyyy)	End Date (dd/mm/yyyy)	Amount (HK$)
Jack Ng	Relationship between Peritonitis and Short-term Cardiovascular Risk in Patients on Peritoneal Dialysis: What is the Role of Volume Status and Inflammation?	The Chinese University of Hong Kong Research Committee – Direct Grants	30/06/2024	29/06/2025	150,000
	Empagliflozin on Residual Kidney Function in Incident Peritoneal Dialysis Patients: A Pilot Randomized Controlled Trial (EMPIRIC-PD trial)	Hong Kong College of Physicians	1/10/2024	31/12/2026	80,000
	Gene-sequencing Study for the Early Diagnosis in Peritoneal Dialysis-related Peritonitis: A Pilot Study	Hong Kong Society of Nephrology	23/5/2023	30/6/2025	40,000
	Community Albuminuria Screening Program for Early Detection of Chronic Kidney Disease	Boehringer Ingelheim (Hong Kong) Ltd	15/12/2024	31/01/2026	300,000
	Modified Creatinine Index as a Non-invasive Tool for the Monitoring of Muscle Mass in Peritoneal Dialysis	Health Bureau – Health and Medical Research Fund	01/04/2024	31/03/2026	1,025,344

Publications

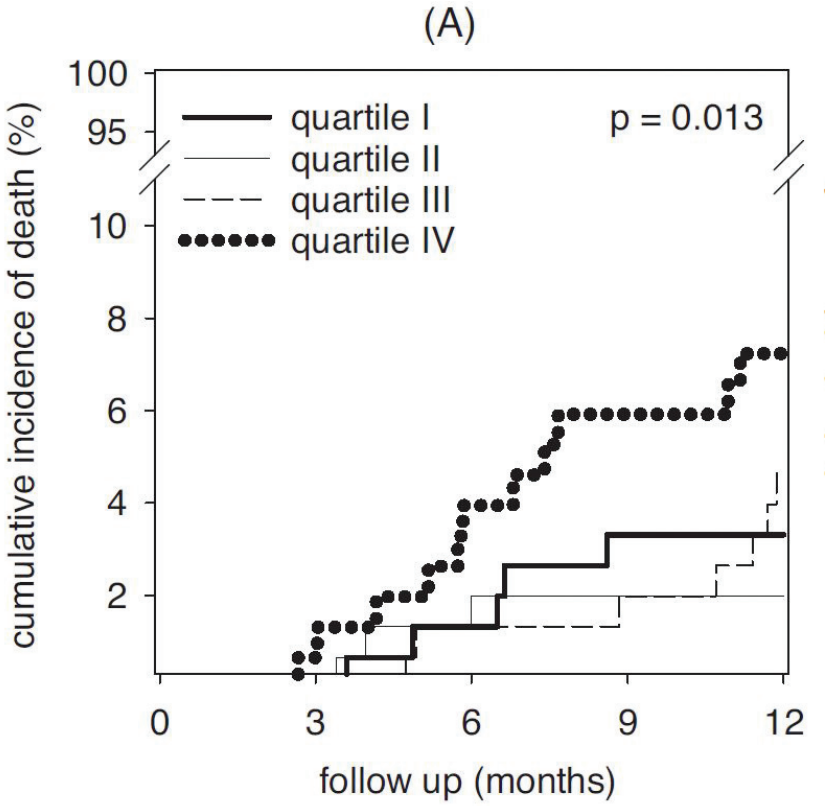
A. Journal Papers

1. Xu L, Ng JKC, Chan GCK, Fung WWS, Chow KM, Szeto CC. Comparing bioimpedance spectrometry and traditional creatinine kinetics methods for the assessment of muscle mass in peritoneal dialysis patients. *Clinical Kidney Journal*. 2024;17(11):315. doi:10.1093/ckj/sfae315.
2. Ng JKC, Fung WWS, Chan GCK, Cheng PMS, Pang WF, Chow KM, Szeto CC. Modified creatinine index as a marker of skeletal muscle mass in peritoneal dialysis patients. *Clinical Kidney Journal*. 2024;17(10):297. doi:10.1093/ckj/sfae297.
3. Li PKT, Ng JKC, Cai G, Chen W, Chow KM, Fan S, He JC, Hooi LS, Pei Y, Teo BW, Wong MG, Wu IW, Zhou J, Tian N, Ye Z, Yu X. Navigating the global economic landscape of dialysis: A summary of expert opinions from the 4th International Congress of Chinese Nephrologists. *Kidney Diseases*. 2024;10(5):384-397. doi:10.1159/000540152. (Review)

4. Chan GCK, Ng JKC, Szeto CC, Chow KM. Effects on calcium phosphate homeostasis after sodium-glucose cotransporter 2 inhibitor in patients with advanced chronic kidney disease and type 2 diabetes mellitus. *Diabetes Research and Clinical Practice*. 2024;216:111818. doi:10.1016/j.diabres.2024.111818.

5. Chan GCK, Kalantar-Zadeh K, Ng JKC, Tian N, Burns A, Chow KM, Szeto CC, Li PKT. Frailty in patients on dialysis. *Kidney International*. 2024;106(1):35-49. doi:10.1016/j.kint.2024.02.026. (Review)

6. Zeng L, Ng JKC, Fung WWS, Chan GCK, Chow KM, Szeto CC. Urinary podocyte stress marker as a prognostic indicator for diabetic kidney disease. *BMC Nephrology*. 2024;25(1):1-7. doi:10.1186/S12882-024-03471-8.



Cumulative incidence curves for all-cause mortality. Quartile IV denoted patients with highest modified creatinine index.

Source: Ng JKC, Fung WWS, Chan GCK, Cheng PMS, Pang WF, Chow KM, Szeto CC. Modified creatinine index as a marker of skeletal muscle mass in peritoneal dialysis patients. Clinical Kidney Journal. 2024;17(10):297. doi:10.1093/ckj/sfae297.



Robotics & Artificial Intelligence
機械人與人工智能

PRINCIPAL INVESTIGATOR | **Zheng Li**

TEAM MEMBERS | Zixiao Chen, Yingbai Hu, Ruoyu Xu, Xuyang Ren, Zhiwei Cui, Ai Dong, Yisen Huang, Shunlei Li, Wanyu Ma, Yehui Li, Haihong Li, Jixiu Li, Michael Lei, Yichong Sun, Yitian Xian, Wing Yin Ng, Zixing Jiang, Xiao Luo, Limin Zou, Yisong Zhao, Jun Yang, Kwun Lam Tai, Ka Ming Lau, Dongming Han, Ke Xie, Wai Shing Chan, Yuxin Han

Research Progress Summary

Zheng Li's team continued to explore the possibilities across different aspects of surgical robots including a semi-autonomous transperineal prostatic biopsy robotic system, a multi-helical continuum mechanism for minimally invasive surgical robots inspired by DNA structure, a novel soft-tethered magnetic-pneumatic steered endoscope system for single-port video-assisted thoracic surgery (VATS), an intelligent magnetic anchored and guided endoscope (MAGS) embedded with autonomous view control based on surgeon preference, a novel hybrid magnetic actuation and sensing system towards real-time capsule pan-endoscopy screening and a stereotactic brain biopsy robotic system with the incorporation of medical image processing and artificial intelligence. Some of the projects have progressed from conceptual design and prototype to clinically prepared system for animal tests and clinical trials. Following the rapid recovery of on-site international conferences and events, the team members proactively presented their research results in top exhibitions and academic conferences such as Geneva International Exhibition, IEEE International Conference on Robotics and Automation (ICRA), IEEE/RSJ International Conference on Intelligent Robots and Systems (IROS) and IEEE International Conference on Robotics and Biomimetics (ROBIO). Meanwhile, their works were successfully published in leading journals. In particular, the prostate biopsy robotic system and the magnetically actuated capsule endoscope received the Gold Medal and Silver Medal in the International Exhibition of Inventions of Geneva 2024. At least eight projects in the team are funded by General Research Fund, Innovation and Technology

Fund, Research Grants Council and The Chinese University of Hong Kong in which five of them initiated from 2024. The team will continue to strive for strengthening collaborations with long term partners including ETH Zurich, Johns Hopkins University and Imperial College London meanwhile increasing participation in different academic and research activities in 2025.

Research and Scholarship

Research Awards and Recognitions

Name	Details	
	Award	Organisation
Philip Chiu Zheng Li Yichong Sun Yehui Li	Gold Medal of the 49th International Exhibition of Inventions Geneva (IEIG) (Wireless Localization-Open "Eyes" of Magnetic Robot towards Autonomous Surgery)	Swiss Federal Government, the Geneva State Government, the Geneva City Government, the World Intellectual Property Organization
Zheng Li Philip Chiu Hon Chi Yip Wai Shing Chan	Silver Medal of the 49th International Exhibition of Inventions Geneva (IEIG) ("Invisible Hands" Perform Dexterous Tissue Manipulation in Endoluminal Surgery)	Swiss Federal Government, the Geneva State Government, the Geneva City Government, the World Intellectual Property Organization
孫藝崇 李銘浩 任旭陽 李小沉 陳瑋誠 劉思毅 韓棟明 馮昊聰	初創企業三等獎，第 10 屆香港大學生創新及創業大賽	Innovation and Technology Commission, Hong Kong New Generation Culture Association, HKSTP, Bank of China (Hong Kong)
Sumedha Saxena Xiangqian Shi Chengyu Yang Pak Chung Lee Chengpeng Hu Kai-yu Tong Zheng Li	Hand Landmark Detection Approach for the Personalized Soft Wearable Robotic Hand on Post-Stroke Hand Rehabilitation" is awarded as the Best Conference Paper Award of WRRC	World Rehabilitation Robot Convention 2024
李崢 陳瑋誠 孫藝崇 趙偉仁 葉瀚智	銀獎，第二十八屆全國發明展覽會 -「一帶一路」暨金磚國家技能發展與技術創新競賽	中國發明協會，金磚國家技能發展與技術創新比賽組委會，一帶一路暨金磚國家技能發展國際聯盟

Academic Editorships

Name	Details	
	Role	Journal
Zheng Li	Associate Editor	IEEE Robotics and Automation Letters
		IEEE Transactions on Medical Robotics and Bionics
	Topic Editor	Frontiers in Robotics and AI

Reviewers of Journal / Conference

Name	Details	
	Role	Journal / Conference
Zheng Li	Reviewer	Science Advances
		Advanced Science
		IEEE Transactions on Biomedical Engineering
		IEEE Transactions on Industrial Electronics
		IEEE Transactions on Cybernetics
		IEEE Transactions on Robotics Transactions on Mechatronics
		IEEE Transactions on Medical Robotics and Bionics
		IEEE Robotics and Automation Letters
		IEEE Transactions on Neural Systems and Rehabilitation Engineering
		International Journal of Robotics Research
		Soft Robotics
		Sensors Journal
		Scientific Report
		Journal of Mechanisms and Robotics
		Biomedical Signal Processing and Control
		Science China Technological Sciences
		IEEE/RSJ International Conference on Intelligent Robots and Systems
		IEEE International Conference on Robotics and Automation
		Hamlyn Symposium on Medical Robotics
		IEEE International Conference on Robotics and Biomimetics
		IEEE/EMBS International Conference on Biomedical Robotics and Biomechatronics

Grants and Consultancies

Name	Project Title	Funding Source	Start Date (dd/mm/yyyy)	End Date (dd/mm/yyyy)	Amount (HK$)
Zheng Li	Intelligent Surgical Robotic Assistant with Multimodal-AI Perception and Interaction	Research Grants Council – Collaborative Research Fund	30/06/2024	29/06/2027	7,778,633

Grants and Consultancies

Name	Project Title	Funding Source	Start Date (dd/mm/yyyy)	End Date (dd/mm/yyyy)	Amount (HK$)
Zheng Li	Robotic System for Minimally Invasive Transperineal Prostate Diagnosis and Therapy	The Chinese University of Hong Kong, Faculty of Medicine – Passion for Perfection Scheme	01/04/2024	31/03/2028	10,000,000
	Toward Real-time Capsule Pan-endoscopy Screening with a Novel Hybrid Magnetic Actuation and Sensing System	Research Grants Council – General Research Fund	01/01/2024	31/12/2026	1,122,534
	Magnetic Anchored and Guided Endoscope with Surgeon Preference Embedded Autonomous View Control	Research Grants Council – General Research Fund	01/01/2023	31/12/2025	965,158
	Design of Elastomer-based Soft Actuator and Flexible Electronic Polymers Sensor for Rehabilitation of Hand Function after Stroke	Research Grants Council – General Research Fund	01/01/2024	31/12/2025	844,415
	Intelligent Surgical Robotic Assistant with Multimodal-AI Perception and Interaction	The Chinese University of Hong Kong Research Committee – Group Research Scheme	30/06/2024	29/06/2027	500,000
	Intelligent Diagnosis and Rehabilitation Walking Assistance System for Lower Extremity Hemiplegia Based on Multimodal Learning	Innovative Technology Commission – Midstream Healthcare Projects	01/10/2023	30/09/2025	2,323,000
	Multi-scale Medical Robotics Center for Research Institute	Innovation and Technology Commission – InnoHK Scheme	01/05/2020	30/04/2025	Amount not to be disclosed

Publications

A. Journal Papers

1. Li Y, Ng WY, Li W, Huang Y, Zhang H, Xian Y, Li J, Sun Y, Chiu PWY, Li Z. Towards semi-autonomous colon screening using an electromagnetically actuated soft-tethered colonoscope based on visual servo control. *IEEE Transactions on Biomedical Engineering.* 2024;71(1):77-88. doi:10.1109/tbme.2023.3292336.
2. Huang Y, Li J, LiW , Zhang X, Sun Y, Xie K, Hu Y, Chiu PWY, Li Z. An accelerated anti-noise adaptive neural network for robotic flexible endoscope with multitype surgical objectives and constraints. *IEEE Transactions on Systems Man Cybernetics-Systems.* 2024;55(1):990-1003. doi:10.1109/tsmc.2024.3492324.
3. Liu C, Li Y, Cui Z, Zhang H, Sun Y, Li Z. Robust adaptive dynamic control of electromagnetically actuated soft-tethered robots for medical intervention. *Control Engineering Practice.* 2024;153(March):106107. doi:10.1016/j.conengprac.2024.106107.
4. Li J, Zhang T, Cheng T, Li Y, Ng CSH, ChiuPWY, Li Z. Design, analysis, and preliminary validation of magnetic anchored and cable driven endoscope for minimally invasive surgery. *IEEE Transactions on Medical Robotics and Bionics.* 2024;6(4):1397-1400. doi:10.1109/tmrb.2024.3472833.
5. Li J, Cheng T, Chan WS, Chen Z, Li Y, Ng CSH, Chiu PWY, Li Z. A scorpion-inspired 5-DOF miniature remote actuation robotic endoscope for minimally invasive surgery. *IEEE Transactions on Medical Robotics and Bionics.* 2024;6(4):1748-1759. doi:10.1109/tmrb.2024.3464114.
6. Hu Y, Zhou W, Liu Y, Zeng M, Ding W, Li S, Li G, Li Z, Knoll A. Efficient online planning and robust optimal control for nonholonomic mobile robot in unstructured environments. *IEEE Transactions on Emerging Topics in Computational Intelligence.* 2024;8(5):1-17. doi:10.1109/tetci.2024.3424527.
7. Li Y, Ng WY, Sun Y, Huang Y, Li J, Chiu PWY, Li Z. Colon lumen center detection enables autonomous navigation of an electromagnetically actuated soft-tethered colonoscope. *IEEE Transactions on Instrumentation and Measurement.* 2024;73:1-15. doi:10.1109/tim.2024.3403172.
8. Zhang H, Li Y, Shi X, Sun Y, Li J, Huang Y, Ng WY, Liu C, Chiu PWY, Lee CK, Li Z. Toward automatic stomach screening using a wireless magnetically actuated capsule endoscope. *IEEE Transactions on Medical Robotics and Bionics.* 2024;6(2):512-523. doi:10.1109/tmrb.2024.3387040.
9. Li J, Zhang T, Cheng T, Li Y, Huang Y, Ng CSH, Chiu PWY, Li Z. Design, analysis, and kinematic framework of a long-range magnetic anchored and guided endoscope. *IEEE-ASME Transactions on Mechatronics.* 2024;29(6):4228-4239. doi:10.1109/tmech.2024.3368611.
10. Ng WY, Li Y, Pan T, Sun Y, Dou Q, Heng PA, Chiu PWY, Li Z. A simultaneous polyp and lumen detection framework toward autonomous robotic colonoscopy. *IEEE Transactions on Medical Robotics and Bionics.* 2024;6(1):163-174. doi:10.1109/tmrb.2024.3349623.
11. Zhang H, Li Z, Lee CK. Transmitter adaptation and wireless power control for capsule endoscopy. *IEEE Transactions on Power Electronics.* 2024;39(4):4884-4894. doi:10.1109/tpel.2023.3345277.
12. Huang Y, Li W, Zhang X, Li J, Li Y, Sun Y, Chiu PWY, Li Z. 4-DOF visual servoing of a robotic flexible endoscope with a predefined-time convergent and noise-immune adaptive neural network. *IEEE-ASME Transactions on Mechatronics.* 2024;29(1):576-587. doi:10.1109/tmech.2023.3286850.

B. Conference Papers

1. Sun Y, Chan WS, Li Y, Zhang H, Huang Y, Hu H, Yan Chiu PW, Li Z. An octopus-inspired-configuration sensor array concept toward torso-oriented magnetic localization task and simulation verification. *IEEE International Conference on Intelligent Robots and Systems*. Published online 2024:10628-10633. doi:10.1109/iros58592.2024.10802250.
2. NG WY, Huang Y, Xie K, Chiu PWY and Li Z. Multimodal robotic surgical instrument transfer and sorting platform: Scrub nurse robot. *2024 IEEE International Conference on Robotics and Biomimetics*.

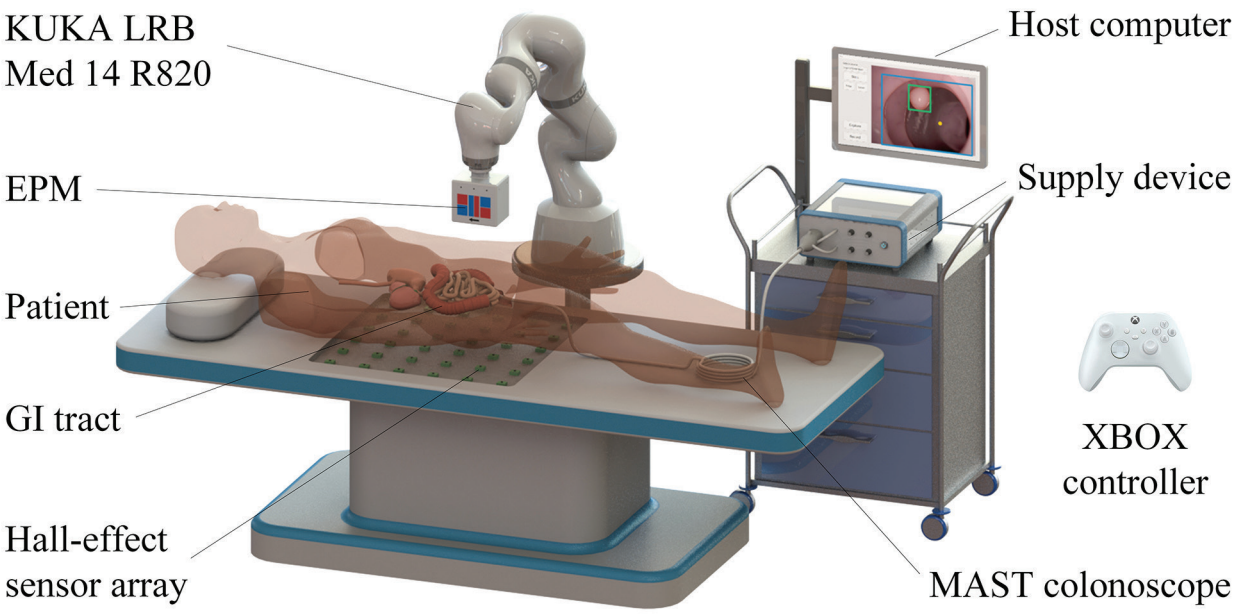
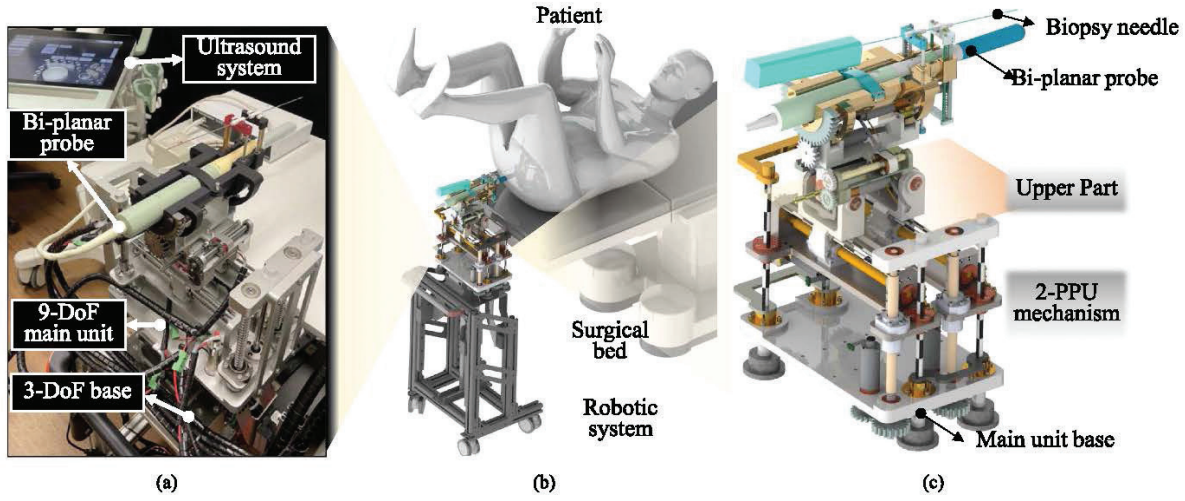


Illustration of the designed magnetically actuated soft-tethered colonoscope system with automatic manipulation functions.

Source: Zheng Li's team - Unpublished data



Overview of the robotic transperineal prostate biopsy (TPPB) system. (a) Prototype of the system. (b) Basic layout of TPPB. (c) Overview of the CAD model of the designed main unit (a novel 9-DoF serial-parallel hybrid mechanism).

Source: Luo X, Lei MC, Xian Y, Hu Y, Zou L, Xie K, Chiu PKF, Li Z. A novel integrated mechanism with dual RCM-constraints toward robotic transperineal prostate biopsy. IEEE/ASME Transactions on Mechatronics. Published online 2025. doi:10.1109/tmech.2025.3555814.



Robotics & Artificial Intelligence

Miniature Devices for Diagnosis and Treatment of Gastrointestinal Diseases

機械人與人工智能

PRINCIPAL INVESTIGATOR | **Kai Fung Chan**

TEAM MEMBERS | Chong Zhang, Haojin Yang, Lili Lu, Huaiwen Tian, Qianli Ma, Junjia Guo, Yihang Jiang, Shuai Jiang, Chak Kit Cheng, Hin Ho Lui, Jiaolong Peng

Research Progress Summary

Kai Fung Chan and his research team are working on developing micro-/nanorobotics for minimally invasive endoluminal intervention. They applied slime robots for biofilm eradication in the body, for example, biofilm in the biliary stent. They have tested the developed microrobotic platform in *ex vivo* models and will continue to test it in *in vivo* models. The slime robot was awarded the Gold Medal at the 14th International Invention Fair in the Middle East 2024.

Also, their team collaboratively developed magnetic tissue plasminogen activator (tPA)-anchored nanorobots (tPA-nbots) to treat ischemic stroke. The novel technology exhibits a thrombolysis rate 5 to 20 times faster than traditional treatment and capabilities in recanalising more distal and smaller branches. It demonstrates the potential to benefit patients by reducing brain damage and minimising side effects. This work was published in *Science Advances*.

Besides, they continue to develop a miniature battery-free remote sensing system, namely RefluxChip, with an extended detection period for real-time monitoring of Gastroesophageal Reflux Disease (GERD) in a noninvasive and inexpensive fashion. This work was awarded the Silver Medal at the 14th International Invention Fair in the Middle East 2024.

They have established a collaboration with an industrial partner, Micro-Tech, which is a well-established company in mainland China for medical stents. With sponsorship from Micro-Tech, their team successfully secured an Innovation and Technology Fund (ITF) – Innovation and Technology Support Programme (ITSP) (Platform) project for the development of a new implant for GERD treatment. In this project, they will design a submucosal soft electronic implant (SME-Stim) in the esophagus, that can conduct long-term wirelessly-powered electrical stimulation for minimally invasive GERD treatment.

For knowledge transfer activities, the research team established a start-up company, M-Cube Scientific Limited, for technology transfer and commercialisation of the developed microrobotic platform for endovascular intervention. The company has also been awarded the Technology Start-up Support Scheme for Universities from ITF.

Research and Scholarship

Research Awards and Recognitions

Name	Details	
	Award	Organisation
Dongdong Jin Qinglong Wang Kai Fung Chan Neng Xia Haojin Yang Qianqian Wang Simon Yu Li Zhang	Hong Kong's Top Ten Innovation and Technology News 2023	Beijing-Hong Kong Academic Exchange Centre
Li Zhang Philip Chiu Kai Fung Chan Mengmeng Sun	Gold Award	14th International Invention Fair in the Middle East 2024
Li Zhang Philip Chiu Kai Fung Chan Chong Zhang	Silver Award	14th International Invention Fair in the Middle East 2024

Reviewers of Journal / Conference

Name	Details	
	Role	Journal / Conference
Kai Fung Chan	Reviewer	Science Robotics
		International Journal of Molecular Sciences
		BMC Medicine
		Biomedicine
		Pharmaceuticals
		Bioengineering
		Scientific Reports

Grants and Consultancies

Name	Project Title	Funding Source	Start Date (dd/mm/yyyy)	End Date (dd/mm/yyyy)	Amount (HK$)
Kai Fung Chan	QuickCAS: An easy-to-use *In-vitro* Diagnostic System for Quick Detection of Infectious Pathogens based on Microrobotic Technology	Faculty of Medicine, The Chinese University of Hong Kong – Passion for Perfection Scheme	01/04/2023	31/03/2025	2,510,000
	Development of Magnetic Heterogeneous Cell Spheroid Microrobots for Active Immunotherapy of Bile Duct Cancer	Research Grants Council – General Research Fund	01/01/2024	31/12/2026	797,964
	A Microrobotic Platform with Swarming Magnetic Microgels for Endovascular Embolization	Research Grants Council – Research Impact Fund	30/06/2022	29/06/2027	9,642,857
	AI-assisted Microrobotic Platform for Minimally Invasive Interventions	Research Grants Council – Strategic Topics Grant	01/01/2024	31/12/2028	29,655,000

Publications

A. Journal Papers

1. Qi Z, Cai M, Hao B, Cao Y, Su L, Liu X, Chan KF, Yang C, Zhang L. Robust 3-D path following control framework for magnetic helical millirobots subject to fluid flow and input saturation. *IEEE Transactions on Cybernetics*. Published online August 29, 2024:1-13. doi:10.1109/tcyb.2024.3439708.

B. Book Chapters

1. Zhang L, Chiu PWY, Chan KF. Recent Progress in Medical Miniature Robots: from Bench to Bedside. In: *Elsevier*. ISBN: 978-044-313-3855, 2024.

C. Patents

1. **The United States Provisional Patents:**

   Title: Medical nanorobots
   Inventors: Zhang L, Wang B, Chan KF
   US Provisional Patent: 63/550,630
   Filing Date: 7 February 2024

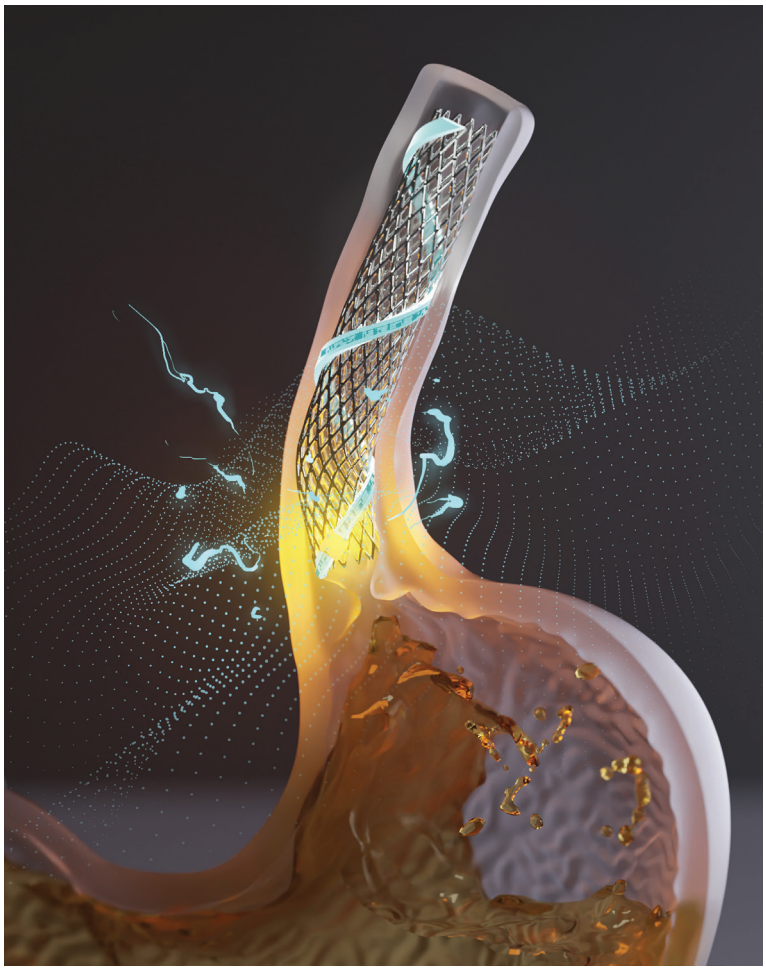
Title: Methods and systems for electromagnetic field generation
Inventors: Zhang L, Yu E, Chan KF
US Provisional Patent: 63/559,383
Filing Date: 29 February 2024

2. **The United States Non-Provisional Patent:**

Title: Mobile-electromagnetic coil-based magnetic actuation systems
Inventors: Zhang L, Du XZ, Chan KF, Yang LD, Zhang MQ
US Non-Provisional Patent: US20210369373A1
Date: 28 August 2024

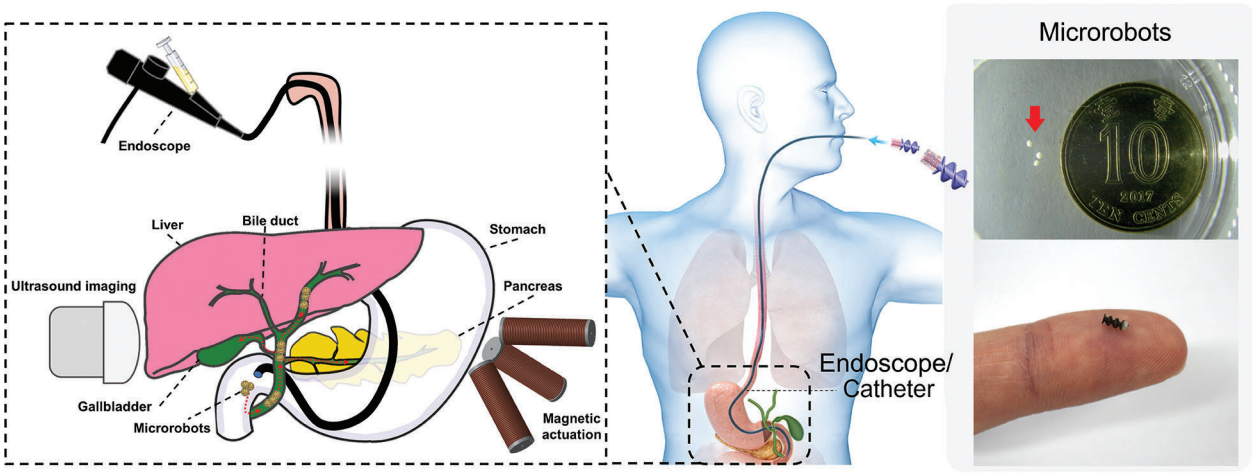
3. **China Patent:**

Title: Microrobotic platform for endovascular embolization
Inventors: Zhang L, Yu CHS, Jin D, Chan KF
PCT: CN2024/088816
Filing Date: 19 April 2024



Wirelessly powered deformable electronic stent for noninvasive electrical stimulation therapy of gastroesophageal reflux disease.

Source: Kai Fung Chan's team



Microrobotic platform for targeted endoluminal delivery in the gastrointestinal tract.

Sources: Wang B, Chan KF, Yuan K, Wang Q, Xia X, Yang L, Ko H, Wang YXJ, Sung JJY, Chiu PWY, Zhang L. Endoscopy-assisted magnetic navigation of biohybrid soft microrobots with rapid endoluminal delivery and imaging. Science Robotics. 2021;6(52):2813. doi:10.1126/scirobotics.abd2813.

Su L, Jin D, Wang Y, Wang Q, Pan C, Jiang S, Yang H, Yang Z, Wang X, Xia N, Chan KF, Chiu PWY, Sung JJY, Zhang L. Modularized microrobot with lock-and-detachable modules for targeted cell delivery in bile duct. Science Advances. 2023;9(50). doi:10.1126/sciadv.adj0883.

Press Release "CUHK Develops Biohybrid Soft Microrobots with a Rapid Endoluminal Delivery Strategy for Gastrointestinal (GI) Diseases" from Communications and Public Relations Office, The Chinese University of Hong Kong



Jeremy Teoh
張源津

Interview with Principal Investigator
與首席研究員對話

Jeremy Teoh completed his Bachelor's degree of Medicine and Surgery at the University of Hong Kong in 2009, then started the research work in prostate cancer at The Chinese University of Hong Kong. He has published extensively on androgen deprivation therapy in the Asian population. Over time, Jeremy has developed an immense interest in bladder cancer and contributed to a global consensus statement on *en bloc* resection of bladder tumour (ERBT). Jeremy is also leading a bladder cancer organoid project, and a first-in-human clinical trial in transurethral robotic ERBT. In 2021, he was awarded the Ten Outstanding Young Persons Award (Hong Kong) and the SIU-Innovators Award. In 2023, he was appointed Adjunct Professor at the Medical University of Vienna. In 2024, he obtained the Doctor of Medicine at The Chinese University of Hong Kong (CUHK), and was also awarded the World Chinese Urological Society Rising Star Award. Currently, Jeremy is an Associate Professor, and the Assistant Dean (External Affairs) of the Faculty of Medicine, The Chinese University of Hong Kong.

Q1 What first inspired you to focus on urology, especially bladder cancer? How has your passion for this field grown over time?

My passion for urology began with family influence. My father is a urologist, and my brother is an upper gastrointestinal surgeon. Both inspired me to pursue a medical career. During my early teens, I watched my brother practise surgical tools at home, which sparked my interest in surgery. My calm personality also helps me navigate surgical challenges.

I chose cancer surgery in particular because I enjoy helping patients to overcome traumatic illnesses and live normally. Urology appealed to me because cancers in this field are often detected early and there is a higher chance of resolving the illnesses completely. The field covers a wide range of sub-specialties, making it more interesting. Initially, Professor Anthony Chi-fai Ng who specialises in prostate cancer inspired me, but later I shifted my focus to bladder cancer because the unresolved questions in conventional treatments attracted my attention. I am dedicated to enhancing treatments in the field of bladder cancer.



Professor Anthony Chi-fai Ng (left)

Q2 What do you see as the biggest challenges or unanswered questions in bladder cancer today?

There are two major challenges in bladder cancer treatments. First, cancer often recurs due to incomplete tumour removal. The conventional surgery, transurethral resection of bladder tumour (TURBT), involves cutting the tumour into pieces for removal, but in over 30% of cases, residual disease remains and that usually requires further intervention. To address the limitation of conventional surgery, our team developed *en bloc* resection of bladder tumour (ERBT), which removes the tumour in one piece. This technique reduces the one-year recurrence rate from 38% to 29%, which is a significant improvement. We are now focused on promoting ERBT to overcome the traditional surgical constraints.

Second, the tumour biology and heterogeneity of bladder cancer remain a significant obstacle. Tumours can be multifocal cancer, high-grade cancer, or include carcinoma-*in-situ*. The bladder's exposure to carcinogens in urine also complicates the situation. Surgery alone cannot tackle these biological challenges; thus, we are developing a bladder cancer organoid biobank, paving the way for more effective and personalised medical treatments.

Q3 Your study on *en bloc* resection of bladder tumour (ERBT) shows a significant reduction in tumour recurrence compared to traditional methods, which is a huge advancement in bladder cancer therapy. What were some of the key challenges you faced in gaining acceptance for a new surgical approach, and how did you overcome the obstacles?

It was indeed a very difficult journey. First, when I pioneered ERBT at Prince of Wales Hospital, there were no prior examples in Hong Kong and only rare cases in Europe. As a brave move into an unknown area, I needed to learn how to perform the surgery. Eventually, I also needed to teach other surgeons to perform ERBT in a systematic manner.

Convincing doctors to adopt ERBT was not easy, as surgeons used to conventional surgery questioned its benefits and safety. I was grateful that the urology community in Hong Kong is supportive. 13 Hong Kong hospitals and 350 patients participated in a study showing that ERBT successfully reduced the one-year recurrence rate for non-muscle-invasive bladder cancer without increasing complications. A lot of effort was made to prove the benefits and safety of ERBT. To promote ERBT and to investigate post-surgery needs, for example, whether chemotherapy or Bacillus Calmette - Guérin is still required, we established the Global ERBT Registry. It supports training, promotes ERBT across hospitals, and collects real-world data to refine long-term bladder cancer care.

Last but not least, ERBT's technical difficulty, especially for large tumours, posed obstacles as removing them in one piece is challenging. The emerging robotic innovations are easing this hurdle.

Q4 How has robotic surgery changed urological surgery and patients' experience? How do you see robotic assistance shaping the future of clinical practice?

Robotic techniques mark groundbreaking advancements in transurethral surgery. I envision that transurethral robotic systems can remove bladder tumours with greater precision and efficiency. This could potentially lead to safer procedures and a better experience for patients. Looking forward, I anticipate that robotic innovations will continue to address different surgical challenges, offering better experiences for patients.



Jeremy Teoh performing robotic surgery

Q5 You have recently developed a bladder cancer patient-derived organoid biobank, which enables a groundbreaking 'test-before-treatment' approach for bladder cancer. Could you explain this technology and how it improves the patient experience compared to traditional methods?

Bladder cancer is difficult to treat because each tumour varies widely. Unlike many others cancers which have clear mutations for targeted therapy, bladder cancer is heterogeneous, meaning that no predominant mutation can be assumed. It makes finding the right medicine challenging.

Our team pioneered Asia's first bladder cancer organoid biobank, hoping to find precise medicine for each type of tumour. We culture various tumour cells to test which medicine works best for each of them. This test-before-treatment approach will help doctors choose the right drug accurately.

Building the biobank is not easy. Some cells fail to grow in the laboratory, and some take a long time to culture. Beyond drug testing, the biobank also facilitates the study of tumour biology and drug resistance. We observe how tumours respond to drugs and explore their molecular features. Looking forward, we aim to match drugs to patients' molecular features for precise medication. This biobank enhances bladder cancer treatment by offering accurate and effective solutions.

Q6 What long-term changes do you think Asia's first bladder cancer organoid biobank could bring to bladder cancer treatment, or even treatment for other types of cancer?

We expect that with a better understanding of tumour biology, more precise treatments can be offered to patients. By testing each tumour, doctors will know which medicine works best for that specific tumour type. This improves treatment outcomes significantly.

The biobank also supports drug development. Late-stage bladder cancer often resists drugs, making it difficult to treat. By studying resistance mechanisms, we hope to discover new drugs to address tough cancers. Bladder cancer is an ideal starting point for an organoid biobank due to its heterogeneity. When medicines are used accurately, cancer can be better controlled, and patients' life expectancy may be extended.

Beyond bladder cancer, we aim to apply this biobank technology to other heterogeneous tumours. This approach should gradually improve treatments for various cancers with more precise choice of medicines.

Q7 You have participated in various international urology associations and helped formulate guidelines with the European Association of Urology. Why are these associations and standards so important, and what are your goals for engaging with these societies?

The largest urology association is the European Association of Urology (EAU) and the American Urological Association (AUA). The EAU's guidelines, in particular, largely affect the clinical practices worldwide. I am deeply honoured to participate in the EAU and help to formulate two key guidelines, namely Non-Muscle-Invasive Bladder Cancer, and Upper Urinary Tract Urothelial Cell Carcinoma. Crafting these guidelines is a critical responsibility as they directly influence doctors' practices, and the formulators must consider diverse healthcare systems globally.

Our Hong Kong research on *en bloc* resection of bladder tumour (ERBT) impacted the EAU guidelines, which now recommend ERBT as the first-line treatment for bladder cancer. I am also very honoured to receive the EAU Best Paper on Clinical Research Award 2025, an award for the top paper across all urology journals that year.

The Société Internationale d'Urologie (SIU), the world's third-largest urology association, advocates diverse international collaboration. Since 2022, I have served as the SIU Congress Organising Chair, which marked a milestone for Hong Kong's leadership in the global urology association. I look forward to enhancing Asian researchers' participation in SIU and fostering international networks. We hope Asian urological research could bring greater impact at the international level.



- Photo with the European Association of Urology Guideline Panels

Q8 As a researcher and doctor in cancer, can you share an unforgettable story about how your work has directly helped a patient's life?

One unforgettable case involved a patient with muscle-invasive bladder cancer (stage T3). Three colleagues urgently sought my help due to the case's complexity. The patient had a transplanted kidney near the bladder, making surgery highly challenging. Moreover, his anti-rejection medications complicated the recovery. As a leading team in bladder cancer treatment, we embraced the challenge with our expertise. We performed a robotic cystectomy to remove the bladder. After the surgery, further adjuvant immunotherapy was given for better oncological control. Despite the complexity of his medical condition, his post-operative recovery was very smooth. Two to three years later the patient still remains disease-free and is in good health. This case is memorable because we are grateful for its remarkable success despite challenging circumstances.

Q9 As a new Principal Investigator of the Institute, what are your vision and goals in 5 years?

I hope CUHK's Urology continues to be a leading research institution in Asia and even internationally. Our team strives to deliver practice-changing impact, not only through research outputs but also by bringing clinical improvements worldwide. The team looks forward to growing in size and recruiting more research staff and doctors. Managing a large team is an art. It's ideal when each team member can excel in their subspecialties and work well together as a team.



- Photo of the inaugural ARISTA workshop, which aims to nurture the future rising stars in Asian urology

Q10 What are your core principles when training the next generation of clinical researchers, and what advice would you give them?

Training the next generation of clinical researchers is my passion. Many Asian researchers, especially those in developing countries, are enthusiastic about research. However, they often have limited resources compared to researchers in Hong Kong. Our team hosts research training workshops regularly, covering research methodology, analysis, and even AI and coding. I am glad that the participants find this systematic training useful.

Over the years, our team culture inspires many junior clinicians. Seeing our research deliver practice-changing and meaningful impact sparks their interest in pursuing research. My training vision goes beyond CUHK to Asia. Through the CUHK Urology Symposium, I established the Asian Rising Star Programme for Research Skills Training and Academic Leadership (ARISTA), which aims to groom top Asian researchers. ARISTA, meaning 'the best' in Greek and 'to harvest' in Latin, perfectly expresses our goal: to train outstanding researchers for global benefit. The programme content covers more than just science, extending to research and development, as well as leadership. It ultimately aims to nurture the next generation of leaders. We endeavour to strengthen CUHK's academic standing in urology in Asia.



- Participated in a leadership meeting between the Chinese Urological Association and the Société Internationale d'Urologie



Yun Kwok Wing
榮潤國

Interview with Principal Investigator
與首席研究員對話

Yun Kwok Wing earned his medical degree in 1986 from The Chinese University of Hong Kong, where he now serves as Chairman and Professor of Psychiatry and holds the Choh-Ming Li Professor of Psychiatry title. Globally recognised for his contributions to sleep medicine and mental health, he established Hong Kong's first epidemiological data on sleep disorders and pioneered digital approaches to mental wellness. Over past three decades, he has integrated psychiatry, neuroscience, and technology to advance understanding of the sleep-mental health relationship.

Q1 What inspired your focus on sleep and mental health research? Why do you believe sleep is critical for both preventing and treating psychiatric conditions?

Sleep has long captivated my curiosity. As a student, I wondered why we need to dedicate a third of our lives to it. This fascination guided me to psychiatry under the mentorship of Professor Char-Nie Chen, a trailblazer in Hong Kong's sleep and mental health research.

Far from a passive state, sleep is a vital restorative process that shapes cognition, emotional regulation, and memory - key domains often disrupted in mental illness. Research reveals that sleep disturbances are not merely symptoms but can precede and even contribute to disorders like depression, anxiety, or psychosis. By addressing sleep, we target a critical biological and psychological nexus to prevent severe mental health challenges. Neuroscience further underscores sleep's role in glymphatic clearance, a process that flushes brain waste during sleep, with profound implications for mental health, cognitive ageing, and neurodegeneration. We are only beginning to unravel sleep's essential contributions to brain health.

Q2 You've highlighted that three-quarters of mental illnesses emerge before age 24. How can addressing sleep issues in youth, such as through your Digital CBT-I application, prevent severe conditions like depression later in life?

Adolescent brain development influences sleep patterns, often turning teenagers into "night owls" due to biological underpinning, school, digital usage and social pressures. Insomnia and delayed sleep phase are prevalent and can predict future mental health issues. Our digital CBT-I application, developed in collaboration with Peking University as part of an intervention study, reduced depression incidence by 42% over one year in adolescents who completed a six-week CBT-I program compared to controls. This suggests that enhancing sleep quality may help prevent psychiatric disorders by reshaping adolescents' developmental trajectory.

Q3 Your Digital CBT-I application achieved an 84% completion rate, and you led the world's first insomnia prevention study in adolescents. Why do digital tools resonate so well with young people, and what practical sleep habits can families adopt to safeguard youth mental health?

Young people today are digital natives, connected through mobile devices and real-time interactions. However, when facing psychological distress, many shy away from professional help due to stigma or accessibility issues. Our Digital CBT-I app provides an interactive, accessible, and research-based solution with an 84% completion rate - far exceeding traditional in-person interventions.

Families can support healthy sleep habits with these practical steps:

- Keep consistent sleep and wake times, including weekends, to reinforce the circadian rhythm.
- Reduce screen time before bed, as blue light delays melatonin release.
- Design a sleep-friendly environment - quiet, dark, and cool.
- Promote morning exposure to natural light to reset the body's internal clock.

These simple, consistent changes would lay a robust foundation for mental resilience over time.

Q4 Your team has developed AI tools to assess depression using digital markers like facial expressions and voice. Combined with interventions like your sleep application, how do you see technology reshaping mental health care in the coming years?

Artificial intelligence offers immense potential in psychiatry. Traditional diagnosis rely on subjective self-reports and clinician interpretation, which can delay and obscure the early detection. Digital phenotyping using AI to analyse behavioural data like voice, facial expressions, speech, and physiological signals, adds objectivity. Subtle changes in speech, tone, or language expressions may help to detect features of depression or anxiety early.

Our team develops AI models that correlate these biomarkers with clinical outcomes, that may pave the way to develop a closed-loop system: detect risk early, deliver interventions like CBT-I, and track responses dynamically. The potential is immense, but it comes with significant ethical responsibilities, including data privacy, algorithmic transparency, and clinical validation which must be addressed prior to large-scale deployment.



- Photo of Yun Kwok Wing and his research group members

Q5 What are the key opportunities and challenges in making these evidence-based digital tools widely accessible in clinics, schools, and communities?

Digital tools expand access, reaching those who avoid traditional mental health services. However, they also present several challenges:

- Quality assurance: The market is flooded with unvalidated mental health applications. Users need to differentiate the evidence-based tools from them.
- Data privacy and ethics: Transparent and confidential handling of sensitive data like facial, speech or mood patterns is essential.
- Digital-clinical integration: Healthcare systems need policies, training, and infrastructure to incorporate these tools.
- Digital dependency: Tools should augment, not replace, human relationships and community support.

Q6 During your tenure as Associate Dean (Student Affairs) from 2011 to 2019, you helped establish Hong Kong's first Wellness Team at the University to provide intensive support and mental wellness education for medical students. What changes have you observed in students due to this team's support, and how can such mental health initiatives be further developed within the University?

As Associate Dean, I identified the need for a structured system to support medical student wellness amid intense academic and emotional pressure. We established Hong Kong's first Wellness Team, offering wellness education, resilience training, and confidential psychological services to destigmatise mental health.

Students became more open to seeking help, proactive in self-care, and resilient to academic stress. Wellness should be embedded in university culture from orientation to graduation through regular staff training, ongoing program evaluation, and psychological safety in teaching and mentoring.

Q7 Your research has shown that bright light therapy can be an effective treatment for individuals identified as "night owls" with delayed sleep patterns, by resetting their circadian rhythm. Why is maintaining a regular body clock so crucial for mental health, and what are some simple lifestyle changes that can help people, particularly young individuals, align their sleep-wake cycles more effectively?

The circadian system, our body's 24-hour biological clock, regulates alertness, hormone release, and immunity. Disruptions from irregular sleep, night-shift work, or excessive screen time increase the risk of sleep and mood disorders. Bright light therapy delivers intense light post-waking to reset circadian timing, advances sleep onset, and improves depressive mood.

Therefore, we recommend:

- Get 30 minutes of morning sunlight.
- Avoid bright screens 2 hours before desired bedtime
- Maintain consistent sleep and meal schedules.
- Use dim, warm evening lighting.
- Limit caffeine late in the day.

These synchronise internal rhythms, enhancing sleep, emotional regulation, and cognitive performance.

Q8 As the leader of Hong Kong's Jockey Club Sleep Well Project, Hong Kong's first large-scale sleep health outreach program, how does this initiative deliver research-backed CBT interventions to the community, and what support can participants expect?

The Jockey Club Sleep Well Project, supported by the Jockey Club Charities Trust and local NGOs, is Hong Kong's first large-scale sleep health outreach programme. Our Digital CBT-I platform targets adults aged 18–65, with over 20,000 participants, many with years of chronic insomnia. It offers a stepped-care approach: self-guided modules for milder cases and intensive support for severe cases. This initiative generates real-world evidence, shaping future health policy and intervention design.

Q9

Your research links REM Sleep Behaviour Disorder (RBD) to neurodegenerative diseases like Parkinson's, and your ground-breaking family-based study uncovered potential familial links. What should the public know about the long-term health risks of sleep disorders like RBD, and are there early screening or intervention strategies for at-risk families?

RBD involves acting out dreams and loss of muscle atonia during REM sleep. It's a strong early warning sign for future neurodegenerative diseases like Parkinson's, dementia with Lewy bodies, and multiple system atrophy, with 80–90% of idiopathic RBD patients developing such conditions within 10–15 years. Our family-based study found gut microbiome patterns in RBD patients' relatives resembling those in Parkinson's, suggesting genetic or microbial predisposition. In other words, iRBD will offer a critical window for the development of future neuroprotection to prevent neurodegeneration. Although no current cure exists, early identification allows monitoring, lifestyle changes, and potential future neuroprotective interventions..

Q10

Your recent work connects gut microbiome imbalances to sleep and neurodegeneration. Can you explain, in simple terms, how gut bacteria influence brain health and what this could mean for the future of mental health and neurological care?

The gut and brain communicate via the gut-brain axis, involving neural, hormonal, and immune pathways. Gut microbes regulate mood, inflammation, and brain function. Our research revealed that individuals with RBD and their close relatives show microbiome shifts similar to Parkinson's patients, potentially affecting neuroinflammation and sleep. Modulating the microbiome through diet, prebiotics, probiotics, or faecal transplantation might reduce risk or delay onset, opening new paths for early detection and prevention.

Q11 Your findings show that individuals with chronic conditions like diabetes are twice as likely to experience depression. Why is integrating mental health screening into routine physical care crucial, and what practical steps can healthcare systems take to implement this more widely and sustainably?

Physical and mental health are deeply interconnected. For example, people with diabetes are twice as likely to experience depression, worsening health outcomes. Yet, most healthcare systems treat them separately.

We need integration - simple depression screening in primary care, diabetes clinics, or dental settings. Digital applications can streamline this. As tools alone aren't enough, we need trained professionals, strong referral networks, and coordinated care teams. A holistic approach significantly reduces both psychological and physical disease burdens.

Q12 Having built a strong foundation in dry laboratory research, what motivated you to incorporate wet laboratory approaches as a LiHS Principal Investigator? What are your key aspirations and objectives for your research program over the next five years?

After years of dry lab work in epidemiology, digital tools, and clinical trials, I sought to understand the biological mechanisms behind our observations. At LiHS, I now integrate microbiome analysis, molecular assays, and neuroimaging with digital phenotyping. We're building platforms combining facial expression analysis, speech biomarkers, and biological sampling to track mental health across the lifespan. My vision is a predictive, personalised brain health model which merges digital, clinical, and molecular data to inform public health and individualised care - an ambitious but achievable goal.



Siew Ng
黃秀娟

From Science to Impacts
從科學到影響

Q1 What is the inflammatory bowel disease? In what ways will the patients be affected/suffer in their daily lives?

Inflammatory bowel disease (IBD), including ulcerative colitis (UC) and Crohn's disease (CD), is a chronic condition causing gastrointestinal inflammation. UC affects the colon and rectum, leading to symptoms like abdominal pain and bloody diarrhoea, while CD can involve any part of the gastrointestinal tract, causing similar symptoms along with complications like strictures.

Patients with IBD experience varying impacts on their daily lives: mild cases may allow for normal activities with occasional symptoms, while moderate cases can disrupt routines and require medication adjustments.

In severe cases, debilitating symptoms may lead to frequent hospitalisations, surgery, emotional distress, and a significant decline in quality of life. Overall, IBD profoundly affects patients' physical health and social interactions, necessitating comprehensive care and support.

Q2 How prevalent is IBD worldwide and how large of an economic burden can it cause?

IBD affects over 7 million people worldwide, with rising prevalence in industrialised nations and emerging economies in Asia, Africa, and South America. Current annual healthcare costs exceed $20 billion worldwide, driven by expensive therapies (e.g., biologics), hospitalisations, and surgeries. Indirect costs from lost productivity and disability amplify this burden. The continuing rise in IBD prevalence and ageing populations worldwide will lead to an increasing use of health-care resources by patients with IBD. This trajectory positions IBD as a major public health crisis, highlighting the urgent need for early diagnosis and timely intervention through accessible, cost-effective diagnostic tools and robust monitoring strategies to improve outcomes and reduce long-term costs.

Q3 What are the common causes, risk factors and causative agents of IBD?

The etiology of IBD is multifactorial, involving complex interactions among genetic, immune, microbiome, and environmental factors such as diet and lifestyle. Genetic factors can increase susceptibility, while an imbalanced microbiome may trigger inflammatory responses. Environmental factors also play a crucial role in the development of IBD.

Q4 What is the traditional way of IBD diagnosis? Are there any clinically definitive biomarkers for IBD diagnosis?

Traditional IBD diagnosis requires multiple tests, including physical examination, laboratory analyses (e.g., CRP, ESR), invasive endoscopic procedures, and radiographic imaging - all of which are complex and costly for patients. Other existing serological and fecal markers (e.g., calprotectin) indicate inflammation but lack specificity for IBD. Furthermore, determining effective cut-off values for these markers remains a challenge.

Q5 How does our microbiome give rise to IBD, and help prevent/ treat it?

Our metagenomic analysis revealed significant enrichment of *Escherichia coli* and *Bacteroides fragilis* in the gut microbiota of IBD patients. These findings align with previous studies: specific strains such as adherent-invasive *E. coli* (AIEC) promote IBD progression by adhering to and invading intestinal epithelial cells, thereby activating pro-inflammatory pathways. Similarly, *Bacteroides fragilis* exacerbates intestinal inflammation through toxin production (e.g., *B. fragilis* toxin, BFT), both of which disrupt epithelial barrier integrity and drive excessive release of pro-inflammatory cytokines. Notably, we identified a novel oral bacterium, *Actinomyces species oral taxon 181*, significantly enriched in stool samples from both CD and UC patients. However, its role in IBD pathogenesis requires further investigation. Conversely, we observed a marked depletion of short-chain fatty acid (SCFA)-producing bacteria in IBD patients. SCFAs like butyrate are essential for suppressing gut inflammation and maintaining mucosal homeostasis. These findings collectively underscore the critical role of gut microbiome in IBD development and highlight its potential as biomarkers and targets for IBD diagnosis and treatment.

Q6 What are the other current options, apart from microbiome-modulation, for IBD treatment?

In clinical practice, anti-inflammatory agents like aminosalicylates are first-line therapy for mild-to-moderate ulcerative colitis, while corticosteroids serve as rapid remission inducers. Immunomodulators (e.g., azathioprine) provide sustained immune suppression. For refractory or severe cases, targeted therapies take precedence: biologics such as anti-TNF agents (infliximab) and IL-12/23 inhibitors address specific inflammatory pathways, and small molecules like JAK inhibitors offer oral precision. Antibiotics are adjunctive, primarily for infections or complications like fistulas. When drug therapy or other treatments don't relieve the IBD symptoms, surgery like colectomy for UC or resection for CD complications may be recommended.

Q7 How can your multiplex droplet digital polymerase chain reaction assay (m-ddPCR) improve IBD diagnosis?

Our multiplex ddPCR simplifies complex microbiome analysis from the metagenomic sequencing platform into a rapid, cost-effective tool. Unlike qPCR, it uses droplet partitioning for absolute quantification, which greatly improves the sensitivity for detecting the low abundance bacteria. Multiplex detection enables measurement of four species in one reaction, which greatly reduces the cost of diagnosis. Compared with the fecal calprotectin, our multi-bacteria biomarkers panel incorporated with an AI model offers more accurate IBD diagnosis.

Q8 Apart from a local cohort, international cohorts are also used to identify and validate potential IBD gut microbial biomarkers. Are there any crucial differences in biomarkers/disease manifestation for different socio-ethnical groups?

Microbial communities vary among different geographies and populations due to diet and genetics. However, our study found that our IBD associated bacterial biomarkers are universal and specific, exhibiting significant differences across various geographies and populations and demonstrating consistent diagnostic performance. Nevertheless, larger-scale multicenter cohorts are needed to validate the stability of these biomarkers through standardised methods and control of confounding factors.

Q9 What are the next steps for IBD research?

The next research steps involve conducting prospective studies with a larger and more diverse group of patients with various gastrointestinal symptoms. This will enable a comprehensive evaluation of bacterial biomarkers in real-world populations. *In vivo* and *in vitro* experiments can provide mechanistic insights into the causal role of these bacteria and metabolic dysregulations in the pathogenesis of IBD, as well as their future clinical utility in disease monitoring and predicting treatment response.

Q10 How can we translate the research findings from this publication for better IBD prophylaxis, diagnosis, prognosis and even treatment?

Our team is working on both the diagnosis, monitoring and treatment of IBD. In this study, we have identified the IBD-associated bacterial species and developed a diagnostic tool for IBD. We are currently optimising the technology and conducting further validation, and the test is expected to be ready for clinical use by 2027. Disease monitoring and predicting treatment response is crucial for patient management and personalised treatment, which is also our next goal—detecting the disease through tracking changes in the microbiome. Our research has also identified some bacteria that are lacking in IBD patients. The role of these bacteria in maintaining gut homeostasis and their potential as next-generation probiotics will require further investigation. We remain committed to translating our microbiome findings into personalised strategies to improve disease diagnosis and management.

Q11 How can we maintain a "healthy microbiome" so that we can minimise the risk factors for IBD, and eventually other diseases?

To maintain a healthy microbiome and reduce the risk of diseases such as IBD, prioritise a balanced diet rich in fruits and vegetables while limiting ultra-processed foods. Avoid unnecessary antibiotics that disrupt the ecological balance and engage in activities like stress management and regular exercise to reduce chronic inflammation, supporting microbial diversity and gut health. Our diet directly impacts our microbes, so it is essential to consume a varied, plant-based, fibre-rich, low-fat, and low-sugar diet. Embrace a rainbow diet with a wide variety of colourful fruits and vegetables each week to keep our microbes content and diverse. Boost prebiotic intake with foods like bananas, asparagus, onions, and garlic to promote the growth of beneficial bacteria. When considering probiotics, ensure they have technologies like microencapsulation to survive stomach acidity and effectively colonise the gut. Minimise antibiotic use to protect our microbiome. Lastly, owning a pet may enhance our microbiome diversity, potentially reducing eczema and allergies in children. Balancing these dietary and lifestyle choices can significantly impact our overall health and microbial well-being.

Relevant Publication

Zheng J, Sun Q, Zhang M, Liu C, Su Q, Zhang L, Xu Z, Lu W, Ching J, Tang W, Cheung CP, Hamilton AL, O'Brien ALW, Wei SC, Bernstein CN, Rubin DT, Chang EB, Morrison M, Kamm MA, Chan FKL, Zhang J, Ng SC. Noninvasive, microbiome-based diagnosis of inflammatory bowel disease. *Nature Medicine*. 2024;30(12):3555-3567. doi:10.1038/s41591-024-03280-4.

屬全球首套診斷工具 可盡早確診免病情惡化

中大研發非入侵性檢測診斷炎症性腸病



■左起：黃秀娟、陳家亮、患者林先生、鄭佳瑩及張靖婉。



■由中大團隊研發的非入侵性炎症性腸病診斷工具，整體的靈敏度及特異度接近九成。

- Siew Ng led a team to develop a microbial-targeted screening metagenomic platform enabling a non-invasive, accurate and efficient early diagnosis of inflammatory bowel disease (IBD).

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