CityU 香港城市大學 City University of Hong Kong

HK TECH FORUM 2022 EMPOWERING SOCIETY FOR A BETTER FUTURE

CityU 香港城市大學 City University of Hong Kong

Hong Kong Institute for Advanced Study

CityU Department of Biomedical Sciences 香港城市大學 City University of Hong Kong

Forum on Metabolism in Health and Disease

Program Booklet

15–16 December 2022

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Forum Objectives

Revealing various signaling pathways in metabolism of oxygen, glucose, lipids, proteins and other nutrients is crucial for better understanding of human physiology and diseases. Deeper mechanistic insights into complex signaling networks in various metabolic pathways will advance our knowledge of human metabolism and its role in homeostasis and disease pathogenesis. Application of multi-omics and advanced molecular technologies has in recent years uncovered a large number of signaling molecules with potential values for early detection, prevention and therapeutic intervention of human chronic diseases including cancer, cardio-metabolic disorder and neurodegeneration.

Program Rundown

15 December 2022 (Thursday)

9:15	Opening Ceremony
Session Chair: **Kwan Ting CHOW**	
9:30	***Featured Speaker***: Gregg SEMENZA, Nobel Laureate 2019, Johns Hopkins University, USA Regulation of Metabolism by Hypoxia-Inducible Factors
10:30	***Keynote Speaker***: Nieng YAN, Founding President of Shenzhen Medical Academy of Research & Translation How is electrical signal generated? Structural and mechanistic investigations of Nav channels
11:25	***Tea break I***
11:45	***Invited Speaker***: Xingguo LIU, Chinese Academy of Sciences, China Mr. & Mrs. mitochondria and nucleus in cell reprogramming
12:15	Liang ZHANG, City University of Hong Kong, China Harnessing osmotic force in adipocyte dedifferentiation
12:40	***lunch break***
Session Chair: **Wenjun XIONG**	
14:30	***Keynote Speaker***: Peng LI, Zhengzhou University, China Regulation of lipid droplet fusion and Storage
15:30	***Invited Speaker:*** Carmen WONG, The University of HK, China The ever-growing roles of hypoxia-inducible factors (HIFs) in hepatocellular carcinoma development
16:00	***Tea break II***
16:15	***Invited Speaker***: Kathy LUI, The Chinese University of HK, China T cell regulation of cardiovascular disease and repair: action mechanism and therapeutic implication
16:45	Christoph SCHMITT, Nature Metabolism, Germany
17:15	***End of Day 1***

16 December 2022 (Friday)

Session Chair: **Kui Ming CHAN**	
9:30	***Invited Speaker:*** Evan ROSEN, Harvard University, USA Human adipose tissue at single cell resolution
10:00	Kingston MAK, City University of Hong Kong, China Skeletal biology and Energy Metabolism
10:30	***Tea break I***
10:45	***Keynote Speaker:*** Bao-liang SONG, Wuhan University, China Nutritional Regulation of Cholesterol Metabolism
11:45	Li WANG, City University of Hong Kong, China Atherosclerosis: from mechanism to therapy
12:15	Kannie CHAN, City University of Hong Kong, China CEST imaging of molecules in the brain: applications in brain cancer and neurodegenerative disease
12:40	***Lunch break***
Session Chair: **Jilin ZHANG**	
14:00	***Keynote Speaker:*** Rui-ping XIAO, Peking University, China Role of MG53 in Cardiometabolic Disease
15:00	Lei CHENG, Cell Research, USA
15:30	***Tea break II***
15:45	***Keynote Speaker:*** Zihe RAO, Tsinghua University, China Living of SARS-CoV-2 inside the cell: Understand SARS-CoV-2 replication and transcription from structures
16:45	Ákos KENÉZ, City University of Hong Kong, China Metabolic Inflammation in Dairy Cattle: A One Medicine Approach
17:10	Closing remarks by Yu HUANG, City University of Hong Kong, China

Abstract (Day 1)

Gregg L. SEMENZA

Nobel Prize in Physiology or Medicine (2019)
Johns Hopkins University School of Medicine, USA

Regulation of Metabolism by Hypoxia-Inducible Factors

Cancer cells are characterized by high metabolic demand. Oxygen serves as a key substrate in cellular metabolism and bioenergetics. Hypoxia or low oxygen abundance is a common feature of the tumor microenvironment that occurs due to an imbalance between O_2 supply and demand. Many of the metabolic responses to hypoxia, which affect levels of glucose, glutamine, glycogen, and lipids, are orchestrated by hypoxia-inducible factors (HIFs), which are O_2-regulated transcription factors composed of an O_2-labile HIF-α subunit and a constitutively expressed HIF-1β subunit. Increased expression of HIF-1α protein or increased expression of HIF target genes in primary tumor biopsies is associated with increased patient mortality in many types of cancer. HIFs activate the transcription of genes involved in angiogenesis, cancer stem cell specification, immune evasion, invasion and metastasis as well as metabolism. The mechanisms and consequences of homeostatic responses mediated by the HIFs that modulate tumor metabolism will be discussed.

Nieng YAN

Founding President of Shenzhen Medical Academy of Research & Translation
International Member of the US National Academy of Sciences

How is electrical signal generated? Structural and mechanistic investigations of Na_v channels

Voltage-gated sodium (Na_v) channels are responsible for the initiation and propagation of action potentials. Being associated with a variety of disorders, Na_v channels are targeted by multiple pharmaceutical drugs and natural toxins. We determined the crystal structure of a bacterial Na_v channel Na_vRh in a potentially inactivated state more than a decade ago. Employing the modern methods of cryo-EM, we determined the near atomic resolution structures of a Na_v channel from American cockroach (designated Na_vPaS) and from electric eel (designated $EeNa_v1.4$). Most recently, we have determined the cryo-EM structures of representative human Na_v channels ($Na_v1.1/1.2/1.4/1.5/1.7$) in complex with distinct auxiliary subunits, toxins, and drugs. These structures reveal the folding principle and structural details of the single-chain eukaryotic Na_v channels that are distinct from homotetrameric voltage-gated ion channels. The structures were captured in drastically different states. Whereas the structure of Na_vPaS has a closed pore and the four VSDs in distinct conformations, the others are semi-open at the intracellular gate with VSDs exhibiting similar "up" states. The most striking conformational difference occurs to the III-IV linker, which is essential for fast inactivation. Based on the structural features, we suggest a "door-wedge" allosteric blocking mechanism for fast inactivation of Na_v channels. Structural comparison of the conformationally distinct Na_v channels provides important insights into the electromechanical coupling mechanism of Na_v channels and offers the 3D template to map hundreds of disease mutations.

Xingguo LIU

Chinese Academy of Sciences, China

Mr. & Mrs. mitochondria and nucleus in cell reprogramming

The study of pluripotent stem cells has been mostly focused on molecular biology. However, organelle remodeling and metabolic controlling in cell fate determination remains unclear. After establishing his team since 2010, Prof. Xingguo Liu has been focusing on this direction, and achieved novel findings both in physiological and pathological conditions. On one hand, he discovered the rules of mitochondrial/metabolic regulation of nuclear epigenetics such as the law of mitochondrial oxygen ion signals regulating DNA and histone methylation, a new concept of the "epigenome-metabolome-epigenome" cascade, and organelle remodeling and regulating new functions of pluripotency. On the other hand, he clarified the new pathology of mitochondrial/metabolic diseases such as apoptosis or ferroptosis of liver cells from patients with mitochondrial DNA depletion syndrome, and iPSC technology to drug toxicity research.

Liang ZHANG

City University of Hong Kong, China

Harnessing osmotic force in adipocyte dedifferentiation

Adipocytes have the potential to dedifferentiate into multipotent mesenchymal cells. Recent studies demonstrated that elevated osmolarity and compressive force could induce adipocyte dedifferentiation, representing an appealing procedure for regenerative toolsets. However, it remains elusive about the molecular mechanism that underlies the compression-induced reprogramming of adipocytes. Here we report that osmotic force prompted the adipocytes to eject mitochondrial components in extracellular vesicles, reflecting stresses in energetic metabolism. The ejected mitochondria in turn stimulated the secretion of TNF-α as a pro-inflammatory cytokine, which was necessary for adipocyte dedifferentiation. Ameliorating the metabolic stress of mitochondria inhibited TNF-α signaling and adipocyte dedifferentiation. Mechanistically, we showed that TNF-α activated the β-catenin signaling that drives adipocyte dedifferentiation. Our results defined a novel mitochondria-TNF-α/ β-catenin signaling that drives adipocyte reprogramming in response to osmotic stress.

Peng LI

Zhengzhou University, China

Regulation of lipid droplet fusion and lipid storage

Sufficient energy storage in the form of neutral lipid TAG is important for survival during evolution. However, excess lipid storage leads to the development of metabolic diseases including obesity, diabetes and fatty liver disease. Lipid droplets (LDs) are dynamic subcellular organelles responsible for lipid storage and control intracellular lipid homeostasis. This seminar will discuss the role of CIDE family in controlling LD fusion and lipid storage. CIDE proteins consist Cidea, Cideb and Cidec (Fsp27) are LD and ER-associated proteins. CIDEs deficient animals indicate that these proteins play important roles in controlling lipid storage in adipocytes, hepatocytes, mammary epithelial cells and skin sebocytes. Further molecular and cell biological evidence suggest that CIDE family proteins are highly enriched at LD-LD contact sites (LDCS) and promote atypical form of LD fusion and growth by initiating a directional lipid transfer from smaller to larger LDs. Several regulatory proteins including Perilipin1 (Plin1) and Rab8a are shown to enhance CIDE-mediated LD fusion and growth. Our recent analyses demonstrate that the condensation of Cidec is formed at the LDCS through membrane constrained gel-like phase separation. Using 3D EM tomography and super-resolution imaging, we reveal that Cidec condensates form a gel-like dynamic porous fusion plate with high plasticity contingent on the sizes of the contacting LDs. Thus, we have uncovered the structural and functional significance of phase separation in mediating membrane contact as exemplified by LD fusion and regulating lipid homeostasis. The molecular and physiological insight of lipid droplet fusion and lipid storage will be discovered.

Carmen WONG

The University of Hong Kong, China

The ever-growing roles of hypoxia-inducible factors (HIFs) in hepatocellular carcinoma development

Hypoxia is an important characteristic of hepatocellular carcinoma (HCC), the most common form of primary liver cancer. Hypoxia stabilizes hypoxia-inducible factors (HIFs). HIFs, through their transcriptional activities, empower hypoxic HCC cells with a wide range of abilities to drive different steps of hepatocarcinogenesis including tumor initiation, metabolic adaptation, and immune evasion. HIFs activated the NOTCH signaling pathway to promote liver cancer stemness, macropinoctysis to scavenge extracellular proteins as the nutrient source, and the purinergic signaling to drive the accumulation of myeloid-derived suppressor cells (MDSCs) in HCC. To identify potential vulnerabilities of hypoxic HCC cells for therapeutic targeting, a genome-wide CRISPR-Cas9 library screening was performed in HCC cells under hypoxia and normoxia. The functional screening identified PTPMT1 in the cardiolipin synthesis pathway was crucial to the survival of hypoxic HCC cells. Cardiolipin is an important component of the inner mitochondrial membrane which anchors different complexes of the electron transport chain (ETC). Inhibition of PTPMT1 suppressed cardiolipin synthesis, thereby leading to the disintegration of the inner mitochondrial membrane and leakage of reactive oxygen species (ROS), and eventually inducing apoptosis in hypoxic HCC cells. We demonstrated that PTPMT1 inhibitor, alexidine, effectively suppressed HCC.

Kathy LUI

The Chinese University of Hong Kong, China

T cell regulation of cardiovascular disease and repair: action mechanism and therapeutic implication

Accumulating evidence has demonstrated that immune cells such as macrophages play an important role in regulating the progression of cardiovascular disease and repair. After injury, danger signals released by the damaged tissues trigger the initial pro-inflammatory phase essential for removing cellular debris that is later replaced by the anti-inflammatory phase responsible for tissue healing. Impaired immune regulation can lead to excessive scarring and fibrosis that are detrimental for the restoration of tissue function. Our earlier work has shown that regulatory T-cells respond to cardiovascular injury that are indispensable for the repair and regeneration of the cardiovascular system. In this talk, we will summarize the roles of several T cell subsets not limited to their direct effect on polarizing macrophages after injury, but also their direct function in enhancing replication of cardiovascular cells during tissue repair and regeneration. We will also demonstrate the possible molecular mechanisms by which T cells mediate the development of cardiovascular diseases such as myocardial infarction, ischemia and atherosclerosis through regulating the transcriptomic and epitranscriptomic events in cardiovascular cells. Altogether, our findings may suggest some clinically relevant insights into the development of therapeutics targeting T cells in cardiovascular repair and regeneration.

Abstract (Day 2)

Evan ROSEN

Harvard Medical School, USA

Human adipose tissue at single cell resolution

White adipose tissue is a critical regulator of normal metabolic physiology and is involved in many aspects of pathophysiology. Because adipocytes are large and fragile, they have resisted attempts at single cell sequencing. We have used single nucleus RNA sequencing (sNuc-seq) to characterize human white adipose tissue across multiple axes, including sex, depot, and body weight, and have uncovered a wealth of cell types, including several novel subtypes of adipocytes. We have demonstrated the utility of these data through cross-species comparisons, association with human disease traits, and prediction of novel signaling pathways within the adipose niche.

Kingston MAK

City University of Hong Kong, China

Skeletal biology and Energy Metabolism

Energy metabolism plays important roles in the formation and functions of all cells in our body, including bone cells. Dysregulation of energy metabolism in bone cells consequently disturbs the balance between bone formation and bone resorption and thus bone homeostasis. Our recent works uncovered the active involvement of bone tissues in whole body metabolism and revealed the unexpected connections between bones and glucose metabolism. Our findings shed new insights to the treatment of diabetic-induced bone loss. Interestingly, metabolic diseases have been also reported to affect bone homeostasis and this further demonstrates the active crosstalk between the skeleton and other organs. We will discuss the underlying mechanisms of some critical factors in regulating these dynamic processes. These findings may help to improve the treatment of abnormal skeletal status during ageing and in certain bone disorders, which may also be applied to bone regeneration.

Bao-liang SONG

Wuhan University, China

Nutritional Regulation of Cholesterol Metabolism

Cholesterol is an essential lipid and it costs lots of nutrients and energy to make such a molecule. Therefore, mammals increase cholesterol biosynthesis only after feeding and inhibit the process under fasting condition. However, the regulatory mechanisms of cholesterol biosynthesis at fasting-feeding transition are not fully understood. Here we show that the deubiquitylase USP20 stabilizes HMG-CoA reductase (HMGCR), the rate-limiting enzyme in cholesterol biosynthetic pathway, at feeding state. The post-prandially increased insulin and glucose stimulate mTORC1 to phosphorylate USP20 at S132 and S134, which is further recruited to the HMGCR complex and antagonizes its degradation. The feeding-induced stabilization of HMGCR is abolished in the liver-specific *Usp20* deficient mice and the *Usp20-S132A/S134A* knock-in mice. Genetic deletion or pharmacological inhibition of USP20 dramatically decreases diet-induced body weight gain, reduces lipid levels in the serum and liver, improves insulin sensitivity as well as increases energy expenditure. These metabolic improvements by USP20 inhibition are reversed by the constitutively stable HMGCR(K248R). This study reveals an unexpected regulatory axis from mTORC1 to HMGCR through USP20 phosphorylation and demonstrates USP20 inhibitor as a potential cholesterol-lowering drug to treat metabolic diseases including hyperlipidemia, liver steatosis, obesity and diabetes. I will also present our latest findings on cholesterol excretion.

Li WANG

City University of Hong Kong, China

Atherosclerosis: from mechanism to therapy

Atherosclerotic plaque mainly develops at the branches, bifurcation, and curvature of vascular trees, where the vascular wall is subjected to disturbed blood flow. In this study, we investigate the role of YAP, a mechanical response gene, in disturbed shear forces-induced signal transduction and atherogenesis processes. Our results revealed that YAP is activated by disturbed blood flow while suppressed by unidirectional laminar shear forces. YAP activation promoted atherosclerosis through the JNK-inflammation pathway. Statins, the first-line drugs for atherosclerosis, could inhibit YAP activity, suggesting YAP could be a therapeutic target. To identify new YAP inhibitors for atherosclerosis treatment, we established a drug screening platform and identified several compounds that could inhibit YAP and suppress atherogenesis. Since YAP is a transcriptional factor activated at the early stages of atherosclerosis, we hypothesize that YAP-induced secretory proteins could be early markers for atherosclerosis. Candidate protein was identified to be a YAP-regulated atherosclerotic biomarker. The serum level of candidate protein is higher in atheroprone mice and correlates to plaque formation. Suppression of candidate protein could alleviate the high-cholesterol diet-induced atherogenesis, indicating candidate protein could be a biomarker and a therapeutic target for early-stage atherosclerosis.

Kannie CHAN

City University of Hong Kong, China

CEST imaging of molecules in the brain: applications in brain cancer and neurodegenerative disease

Chemical exchange saturation transfer (CEST) MRI detects the presence of millimolar concentrations of molecules in vivo. This sensitivity has made it possible to study important biomolecules, such as proteins, lipids, metabolites, as well as drugs already approved for clinical use non-invasively. It has become a robust tool in brain tumor diagnosis, which enables the identification of tumor recurrence from radiation necrosis, alterations in proteins, cellularity and IDH mutation using specific CEST contrast. Moreover, many anticancer drugs, liposomes and hydrogels have been shown to have exchangeable protons for CEST detection. In this talk, Dr. Chan will discuss the principle of CEST MRI and how it can be applied to study molecular changes in brain tumors, image anticancer drugs and their delivery to tumors. In particular, the theranostic application of hydrogel-based local brain tumor treatment. Recently, Dr. Chan's team also demonstrated the uniqueness of glucoCEST in the early diagnosis of Alzheimer's disease. With increasing understanding of the technical aspects and associated molecular alterations detected by CEST MRI, this young field is expected to have wide clinical applications beyond cancer diagnosis in a near future.

Rui-ping XIAO

Peking University, China

Role of MG53 in Cardiometabolic Disease

The therapeutic options for diabetic patients with cardiovascular complications are limited, highlighting an outstanding unmet medical need. MG53 (also named TRIM72) is a myokine with cell protective effects. However, MG53 also promotes insulin resistance and metabolic disorders via its E3 ligase activity. Here, we show that in diabetic mice, recombinant E3-dead MG53 mutants (C14A or S255A) effectively protects the heart from ischemia/reperfusion (I/R) injury without metabolic side-effects, whereas wild-type MG53 profoundly exacerbates hyperglycemia and I/R-induced myocardial injury and mortality, especially in mice with advanced diabetes. Consistently, MG53 C14A knock-in mice are protected against high fat diet (HFD)-induced metabolic disorders, while IPC can still trigger cardioprotection in the C14A knock-in mice. These in vitro and in vivo data indicate that E3-dead MG53 mutants not only preserves myocardial protective functions in diabetic individuals, but also defends mice against metabolic dysfunctions incurred by HFD, demonstrating their therapeutic potential in treating diabetes-associated cardiovascular complications.

Zihe RAO

Tsinghua University, China

Living of SARS-CoV-2 Inside the Cell: Understand SARS-CoV-2 Replication and Transcription from Structures

Till June 2022, the pandemic of Coronavirus Disease 2019 (COVID-19) has caused over 532 million infections and over 6.3 million deaths worldwide. It has become the most devastating challenge to global health for a century. As the causative agent of COVID-19, SARS-CoV-2 encodes 16 non-structural proteins (nsp1-nsp16) that assemble a set of protein machineries, the Replication-Transcription Complexes (RTCs), that play central roles in virus replication and transcription cycle inside the host cells.

In the early of COVID-19 outbreak, we rapidly initiated the structural study of SARS-CoV-2 RTCs, aiming to dissect the key mechanisms for SARS-CoV-2 lives in human cells and provide structural information to discover potent antivirals. With great efforts from joint collaborations, we successfully determined the structure of the central RTC (C-RTC) composed by nsp12 (RNA-dependent RNA polymerase, RdRp) with cofactors nsp7 and nsp8, providing the first picture for the world to visualize this key antiviral target. We also elucidated how C-RTC catalyzes and how Remdesivir (RDV) inhibits the synthesis of RNA, through determining the structure of C-RTC in complex with template-product duplex RNA and the active form of RDV. Subsequently, we presented the structure of the elongation RTC (E-RTC), showing how nsp13 (helicase) unwinds the high-ordered structure in genome to yield the functional template for RNA synthesis in C-RTC. After that, we discovered a key intermediate state of RTC towards mRNA capping [Cap(-1)'-RTC], demonstrating the nsp12 NiRAN is indeed the key enzyme to catalyze the second capping action and presenting nsp9 is an "adaptor" for the further recruitments of capping enzymes into RTC. Very recently, we successfully assembled Cap(0)-RTC by Cap(-1)'-RTC and nsp10/nsp14 complex and determined its structures in a monomeric and a dimeric form. The monomeric Cap(0)-RTC structure shows the assembly of a co-transcriptional capping complex (CCC) to RTC for mRNA capping, while most interestingly, the dimeric form reasons an in trans backtracking mechanism for proofreading. Other RTCs responsible for key steps for SARS-CoV-2 living inside cells have also been determined. These works not only provide a basis to understand SARS-CoV-2 proliferates in the host cells through a structural biology lens, but also shed the light for antiviral development against the rapid emerging of SARS-CoV-2 variants.

Ákos KENÉZ

City University of Hong Kong, China

Metabolic Inflammation in Dairy Cattle: A One Medicine Approach

Enhanced dietary energy and protein intake is key to maximising growth performance in cattle. However, a chronic nutrient surplus is documented to trigger obesity, promote insulin resistance and induce low-grade inflammation, ultimately disrupting metabolic integrity. The aim of this research is to uncover the molecular pathways driving metabolic dysregulation due to dietary oversupply in Holstein cattle. Our study investigated the alterations in the liver, muscle and adipose tissue as a response to increased dietary energy and protein supply. In particular, we studied the insulin signalling protein expression and phosphorylation and their associations with the sphingolipid metabolome in these metabolically active tissues. Our findings revealed a similar regulatory network between ceramide accumulation and insulin receptor and protein kinase B expression as previously demonstrated in human type 2 diabetes and point to the initiation of a self-reinforcing cycle of metabolic inflammation, clinically appearing as laminitis. Beyond elucidating physiological mechanisms and proposing refined nutritional strategies, we further discuss the implications for animal welfare and food safety under the One Medicine approach.

Featured Speaker

Gregg L. SEMENZA

Nobel Prize in Physiology or Medicine (2019)

Johns Hopkins University School of Medicine, USA

Biography

Dr. Semenza is the C. Michael Armstrong professor of genetic medicine, with joint appointments in pediatrics, radiation oncology, biological chemistry, medicine, and oncology at the Johns Hopkins University School of Medicine. He serves as the founding director of the Vascular Program at the Johns Hopkins Institute for Cell Engineering and the founding director of the Armstrong Oxygen Biology Research Center.

Dr. Semenza received an A.B. (in Biology) from Harvard University and M.D. and Ph.D. (in Genetics) degrees from the University of Pennsylvania. He completed pediatrics residency training at Duke University Medical Center and postdoctoral training in medical genetics at Johns Hopkins. He has been a member of the Johns Hopkins faculty in 1990.

Dr. Semenza's lab discovered hypoxia-inducible factor 1 (HIF-1), a transcription factor that controls the expression of thousands of genes in response to changes in oxygen availability, for which he was awarded the 2019 Nobel Prize in Physiology or Medicine. His current research interests include investigating the molecular mechanisms of oxygen homeostasis and the role of HIF-1 in cancer progression. He has authored more than 450 research articles and book chapters, and his work has been cited by other scientists more than 175,000 times. Dr. Semenza is co-founder of HIF Therapeutics Inc., which is focused on the development of HIF inhibitors for the treatment of cancer and blinding eye diseases.

In addition to the Nobel Prize, Dr. Semenza has received the Albert Lasker Basic Medical Research Award (2016), Wiley Prize in Biomedical Sciences (2014), Lefoulon-Delalande Grand Prize from the Institut de France (2012), and the Canada Gairdner International Award (2010).

Keynote Speakers

Peng LI

President, Zhengzhou University, China

Academician of the Chinese Academy of Sciences

Biography

Peng Li received B.S. degree from Beijing Normal University (China) in 1987 and Ph.D. degree from University of California at San Diego (U.S.A) in 1995. She then did her post-doctoral training in Howard Hughes Medical Institute, University of Texas Southwestern Medical Center at Dallas (U.S.A) and Institute of Molecular and Cell Biology (Singapore) between 1996-1997. She became assistant professor and principal investigator in the Institute of Molecular and Cell Biology at the end of 1997. She then moved to Hong Kong University of Science and Technology in 2003 and became tenured associate professor in 2005. In 2006, she moved to the Department of Biological Sciences and Biotechnology (currently School of Life Sciences), Tsinghua University as a professor. She was an investigator of Tsinghua-Peking Center for Life Sciences, Professor of School of Life Sciences in Tsinghua University between (2005-2022); director of Institute of Metabolism and Integrative Biology in Fudan University (2018-), and director of the Division of Life Sciences, National Natural Science Foundation of China (NSFC, 2016-). Currently, She is the President of Zhengzhou University. Peng Li's research interest is in the area of lipid metabolism and the development of metabolic diseases including obesity and fatty liver disease with special focus on the biogenesis, fusion and growth of lipid droplets. Peng Li has published more than 80 papers and received more than 10000 citations. She

has been invited speakers of many international meetings including Gordon Research Conference, conference of International Conference on the Bioscience of Lipids (ICBL) and the FASEB Science Research Conference. She served as an editorial board member of various interactional Journals including Cell Metabolism. She is the Editor-in-Chief of recently established international journal "Life Metabolism", a steering committee member of the International Conference on the Bioscience of Lipids (ICBL), vice president of Chinese Biophysics Society and president of Chinese Society of Metabolic Biology. She has received important awards including Singapore Young Scientist award in 1999 and Ho Leung Ho Lee Foundation prize for Scientific and Technological Progress in Life Sciences in 2012. She was elected Academician of the Chinese Academy of Sciences in 2015, elected Fellow of TWAS in 2016 and a fellow of the Chinese Academy of Medical Sciences since 2019.

Zihe RAO

Professor, Tsinghua University, China

Academician of the Chinese Academy of Sciences

Biography

Professor of Tsinghua University, Member of the Chinese Academy of Sciences, member of the American Academy of Arts and Sciences, Member of the Standing Committee of the CPPCC National Committee, Member of the Presidium of Academic Divisions of CAS, Honorary President of Biophysics Society of China, Founding President of China Union of Life Science Societies. He was president of Nankai University, Director-General of the Institute of Biophysics of CAS, and President of International Biophysical Union (IUPAB).

He has revealed fundamental structure-function and mechanistic insights to the replication/transcription, assembly and host invasion of coronavirus, retrovirus, influenza virus, picornavirus, herpesvirus, Africa-Swine-Fever-virus and other disease-causing viruses, and uncovered how Mycobacterium tuberculosis achieves metabolite/energy transport and drug resistance. This has led to new therapeutic targets and innovative drug designs. To date, Zihe Rao has published more than 400 peer reviewed research papers, including 23 papers in Science, Nature and Cell, with over 25,000 citations (retrieved from Google Scholar). He also has 38 innovation patents.

Bao-liang SONG

Vice President, Wuhan University, China

Academician of the Chinese Academy of Sciences

Biography

Professor Song received his B.S. degree from Nanjing University in 1997, and Ph.D. diploma from Chinese Academy of Sciences in 2002. He joined the Brown-Goldstein lab at UT Southwestern Medical Center as a Postdoctoral Fellow. In 2005, he moved to Shanghai Institutes for Biological Sciences at Chinese Academy of Sciences as a Principle Investigator, and then he worked as a professor and was promoted to the Dean of College of Life Sciences, Wuhan University since 2014. He focuses on cholesterol metabolism and his major contributions are: 1) identifying a new cholesterol transport way through lysosome-peroxisome-ER membrane contacts; 2) elucidating the molecular pathway of intestinal cholesterol absorption; 3) revealing the mechanism of feedback regulation of cholesterol biosynthesis; 4) identifying that Smoothened (SMO) is a cholesterol-modified protein.

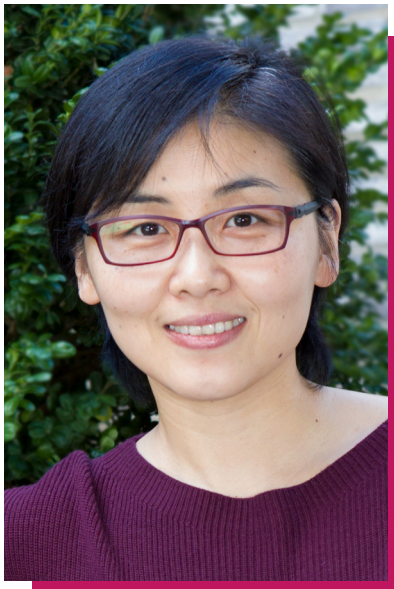
Rui-ping XIAO

Dean of the College of Future Technology at Peking University, China

Associate Editor of the *New England Journal of Medicine*

Biography

Dr. Rui-ping Xiao is the Dean of the College of Future Technology at Peking University and the Peking University Chair Professor. Dr. Xiao's research has been focused on cardiovascular and metabolic diseases, with a major emphasis on a translational approach to take bench discoveries into clinically relevant situations. Ongoing research directions include signaling pathways involved in metabolic syndrome and associated cardiovascular complications. Currently, Dr. Xiao serves as a Council Member of the International Society of Heart Research and an Associate Editor of the New England Journal of Medicine and an Editorial Board Member of multiple international top journals.



Nieng YAN

Founding President of Shenzhen Medical Academy of Research & Translation

International Member of the US National Academy of Sciences

Biography

Dr. Nieng Yan received her B.S. degree from the Department of Biological Sciences & Biotechnology, Tsinghua University, Beijing, China, in 2000. She then pursued her PhD in the Department of Molecular Biology at Princeton University under the supervision of Prof. Yigong Shi between 2000 and 2004. She was the regional winner of the Young Scientist Award (North America) co-sponsored by Science/AAAS and GE Healthcare in 2005 for her thesis on the structural and mechanistic study of programmed cell death. She continued her postdoctoral training at Princeton University, focusing on the structural characterization of intramembrane proteases. In 2007, she joined the faculty of School of Medicine, Tsinghua University. Her lab has been mainly focusing on the structural and functional study of membrane transport proteins exemplified by the glucose transporters and Nav/Cav channels. In 2012 and 2013, she was promoted to tenured professor and Bayer Endowed Chair Professor, respectively. She returned to Princeton University as the founding Shirley M. Tilghman Professor of Molecular Biology in 2017. Dr. Yan was an HHMI international early career scientist in 2012-2017, the recipient of the 2015 Protein Society Young Investigator Award, the 2015 Beverley & Raymond Sackler International Prize in Biophysics, the Alexander M. Cruickshank Award at the GRC on membrane transport proteins in 2016, the 2018 FAOBMB Award for Research Excellence, and the 2019 Weizmann Women & Science Award. She was elected as an International Member of the US National Academy of Sciences in 2019 and an International Honorary Member of the American Academy of Arts and Sciences in 2021.

Invited Speakers

Xingguo LIU

Chinese Academy of Sciences, China

Biography

Professor Liu Xingguo, was honored as "Distinguish Youth Foundation" of National Natural Science Foundation, Chief Scientist of the National Key Research and Development Program of China, 1st finisher of the first prize of the Guangdong Science and Technology Award in Natural Science, The Shulan Medicine Youth Award by the Academician Shusen Lanjuan Talent' Foundation, "2016 Stem cell Young Investigator Award" from Chinese Society for Cell Biology and "Young Bioenergeticist Award" of the International Biophysical Society. He is the Executive Editor of Science Bulletin, the council member of the Asian Society for Mitochondrial Research and Medicine, and the council member of the Biophysical Society of China. Professor Liu has published 60 papers, which has been cited for more than 3000 times. Since 2015, he has published 27 research papers as corresponding author (2 IF>30, 21 IF>9), such as Cell Metabolism (2016、2018), Nature Metabolism, Nature Structural & Molecular Biology, Nature Communications, Science Advances (2019, 2022), Advanced Science, Hepatology. Among his papers, 3 were recommended by F1000, 6 were chosen as cover story. He obtained 8 authorized patents (including one PCT). Professor Liu has been the invited speakers in more than 70 international conferences.

Kathy LUI

The Chinese University of Hong Kong, China

Biography

Dr. Kathy Lui is currently an Associate Professor at the Department of Chemical Pathology, The Chinese University of Hong Kong. She received her Ph.D. degree in Immunology from University of Oxford U.K. in 2009. After that, she had her postdoctoral training at Harvard University, U.S.A until 2014. Her postdoctoral work focused on deciphering the therapeutic potential of the first-in-human modified mRNA (i.e. VEGF modRNA) that has been now undergoing phase-II clinical trial by Moderna and AstraZeneca in patients receiving coronary bypass surgery. In 2014, she started her own laboratory and focused to understand the immunoregulation of cardiovascular diseases and repair. She has published over 90 peer-reviewed articles and received numerous awards and honors including the Croucher Innovation Award in 2017, founding member of the Young Academy of Sciences of Hong Kong in 2018, the first batch of NSFC Excellent Young Scientists in Macau & Hong Kong in 2019, and the RGC Research Fellowship in 2022. Dr Lui has been an early career editorial board of Circulation Research (American Heart Association) in 2020-2022, and an editorial member of Cardiovascular Research (European Society of Cardiology). She is also the current Chairperson of the Hong Kong Society for Immunology.

Evan ROSEN

Harvard Medical School, USA

Biography

Dr. Rosen did his undergraduate work at Cornell University and received an MD and a Ph.D in Cellular and Molecular Biology from the University of Michigan. He then moved to Boston for a residency in Internal Medicine at the Brigham and Women's Hospital, and a fellowship in Endocrinology and Metabolism at Massachusetts General Hospital. After completing a post-doctoral fellowship with Bruce Spiegelman at the Dana-Farber Cancer Institute he started his own research group at the Beth Israel Deaconess Medical Center, where he is now Chief of the Division of Endocrinology, Diabetes, and Metabolism, and Professor of Medicine at Harvard Medical School. He is also an Institute Member of the Broad Institute of Harvard and MIT. Dr. Rosen's lab works on molecular mechanisms related to obesity, adipocyte development, and the molecular basis of insulin sensitivity, with particular emphasis on transcriptional and epigenomic events that affect metabolic health. In addition to his research activities, Dr. Rosen is a practicing endocrinologist.

Carmen WONG

The University of Hong Kong, China

Biography

Dr. Carmen Wong is currently an Associate Professor and Principal Investigator in the Department of Pathology and State Key Laboratory of Liver Research at the University of Hong Kong. She is the program leader of the liver cancer program at Center of Oncology and Immunology at InnoHealth, Hong Kong.

She obtained her PhD degree in the University of Hong Kong and completed her post-doctoral training from the Nobel Laureate, Professor Gregg Semenza, in the Johns Hopkins University, studying the roles and molecular mechanisms of hypoxia (oxygen deprivation) in cancer metastasis.

Her research team currently focuses on the impact of hypoxia and other microenvironmental factors in the metabolic reprogramming and immune evasion in liver cancer. Over the years, her work has been published in PNAS, Gastroenterology, Journal of Hepatology, GUT, Hepatology, Nature Communications, Cell Reports, and the Journal of Clinical Investigation.

She is the recipient of the Croucher Innovation Award, Outstanding Young Researcher Award of HKU, National Natural Science Foundation of China Excellent Young Scientist Fund, Hong Kong Young Scientist Award, the Best PhD thesis Awards of HKU, Croucher Fellowship, University of British Columbia (Canada) Alumni Builder Award. She is an elected member of the Hong Kong Young Academy of Science. She is the co-editor-in-chief of Hepatology Communications (AASLD).

City University of Hong Kong Speakers

Kannie CHAN

City University of Hong Kong, China

Biography

Dr. Chan received her BSc and PhD degrees from The University of Hong Kong. She completed post-doctoral fellowship in magnetic resonance imaging (MRI), and became an Assistant Professor at Department of Radiology, Johns Hopkins University School of Medicine (JHMI) in 2014. She joined the Department of Biomedical Engineering, City University of Hong Kong in 2016, and became Associate Professor in 2019. She is the deputy program leader at the department, and the Associate Director of Hong Kong Centre for Cerebro-cardiovascular Health Engineering. She is also an adjunct faculty of JHMI.

Dr. Chan's research focuses on the development of biomaterials and imaging approaches to facilitate the clinical translation of cancer therapy and cell therapy, and early diagnosis of neurodegenerative diseases. She applies CEST MRI to image glucose utilization in the brain, which have implications on diagnosis and therapy in many neurodegenerative diseases, including identification of early stages of Alzheimer's disease. Her team develops techniques to effectively image and deliver drugs/cells to the brain non-invasively. She published over 67 peer-reviewed articles, including a cover article in Nature Materials, Science Advances, Theranostics, Stroke and ACS Applied Materials & Interfaces; and leading imaging journals, including NeuroImage, Magnetic Resonance in Medicine and NMR in Biomedicine.

Ákos KENÉZ

City University of Hong Kong, China

Biography

Dr. Ákos Kenéz trained as a veterinarian and has a PhD in animal physiology from the University of Veterinary Medicine, Hannover, Germany. Currently, he is an assistant professor at the City University of Hong Kong and he leads the physiology teaching in the bachelor of veterinary medicine programme of the Jockey Club College of Veterinary Medicine and Life Sciences. His research is focused on the comparative physiology of metabolic disorders, bringing together the latest advancements in human biomedical research with current issues in animal sciences. His publications address issues on metabolic dysregulation in chronic inflammation, insulin resistance, oxidative stress, mitochondrial dysfunction, and adiposity. His latest work follows a mass spectrometry metabolomics-based approach to elucidate cellular mechanisms driving metabolic health and disease. The primary aim of these studies is to identify biomarkers of metabolic health in food-producing animals and define nutritional strategies to sustain metabolic integrity while achieving goals of enhanced production efficiency.

Kingston MAK

City University of Hong Kong, China

Biography

Dr Mak received his Ph. D degree from The University of Hong Kong and trained as a postdoctoral fellow in the National Institute of Health, US. He then started as Assistant Professor in the School of Biomedical Sciences, The Chinese University of Hong Kong. Prior to joining City University, he was a Principle Investigator in the Guangzhou Regenerative Medicine and Health, Bioland Laboratory and the Guangzhou National Laboratory. He was trained as a developmental biologist, dissecting differential roles of signaling networks in regulating endochondral bone formation and bone remodeling.

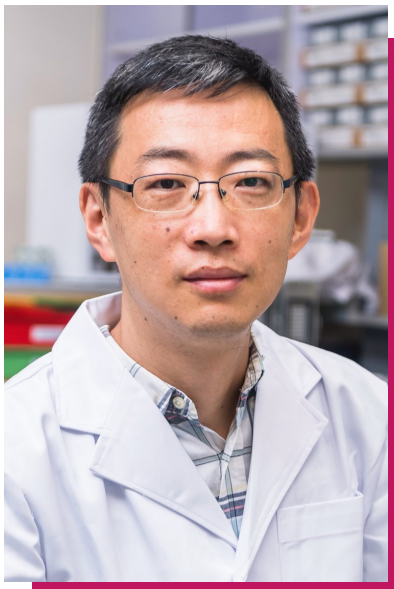
Currently, Dr Mak and his team study the dynamic interactions of cell lineages in the skeletal system and how they contribute as integral players in whole body physiology and energy metabolism. He is also interested in dissecting the mechanisms for cell fate determination aiming to develop new strategies for tissue repair and regeneration. Dr Mak is also interested in studying the pathogenesis of degenerative diseases related to the skeleton such as osteoporosis and osteoarthritis. These research focuses are important to establish the foundation for better therapeutic designs for treatment of these currently uncurable diseases.

Li WANG

City University of Hong Kong, China

Biography

Dr. Li Wang received his bachelor's degree in Biological Science from Yunnan University and obtained his Master's degree from the Shanghai Institutes for Biological Sciences, Chinese Academy of Sciences. Dr. Wang completed his Ph.D. and postdoctoral training at the Chinese University of Hong Kong. His Ph.D. research focused on metabolic disorders and atherosclerotic cardiovascular diseases. Dr. Wang joined the Department of Biomedical Sciences, the City University of Hong Kong as an assistant professor in 2021. Dr. Wang's research interest lies in the early diagnosis of cardiovascular disease and drug discovery. His research on the role of endothelial YAP signaling in atherogenesis was published in Nature and he received the Higher Education Outstanding Scientific Research Output Award (first-class award) in 2019, Ministry of Education, China. He has so far co-authored 34 SCI-indexed publications in many prestigious journals including Nature, Circulation Research, Diabetes, Cardiovascular Research, PNAS, Pharmacology & Therapeutics, Arteriosclerosis, Thrombosis and Vascular Biology and Journal of the American Society of Nephrology.



Liang ZHANG

City University of Hong Kong, China

Biography

Dr. Liang Zhang received his Bachelor of Medicine (MD equivalent) degree from Peking University. He obtained his PhD degree from the University of Iowa and performed his postdoctoral training at the Lunenfeld-Tanenbaum Research Institute in Toronto, Canada. He is currently an Associate Professor in the Department of Biomedical Sciences at City University of Hong Kong.

His research is centred on understanding how interactions and modifications of biomolecules regulate health and diseases. His laboratory applies integrative approaches that combine mass spectrometry-based proteomics and systems biology tools to dissect the wiring of signaling networks. Special interests are focused on exosomes and Wnt signaling in cancer and aging.

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