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Issue 06 / April 2025

ICMS NEWSLETTER

News

* UM inaugurates UM-TIB Joint Laboratory for Synthetic Biology and Chinese Medicine
* International experts gather at UM to discuss TNFR2 immunoregulation and innovative drug development
* UM Macao Centre for Testing of Chinese Medicine holds promotion event
* UM-CUHK Symposium on Chinese Medicine and Immunology holds at UM
* UM's Open Day 2025 concludes successfully

Visits

* Delegation of Shandong University visits ICMS for collaborations
* Professor from the Faculty of Pharmacy of the University of Lisbon, Portugal, visits ICMS
* Delegation from Shenzhen visits ICMS

Researches

* *Nature Communications*: Discovery of furanodienone (FDN), a ginger-derived compound, as a highly selective pregnane X receptor (PXR) agonist
* *Medcomm*: Ginsenoside Rk2 alleviates hepatic ischemia/reperfusion injury by enhancing AKT membrane translocation and activation
* *Journal of Controlled Release*: AI-directed formulation strategy design initiates rational drug development
* *Phytomedicine*: Siegesbeckia orientalis ethanol extract alleviates neutrophil-involved neuronal inflammatory injury poststroke

News & Updates

UM inaugurates UM-TIB Joint Laboratory for Synthetic Biology and Chinese Medicine

The Institute of Chinese Medical Sciences (ICMS) and the State Key Laboratory of Quality Research in Chinese Medicine of the University of Macau (UM) and the Tianjin Institute of Industrial Biotechnology (TIB) of the Chinese Academy of Sciences jointly held the Macao Forum on Synthetic Biology and Traditional Chinese Medicine and the agreement signing and plaque unveiling ceremony for the UM-TIB Joint Laboratory for Synthetic Biology on March 11, 2025. The event aimed to promote the interdisciplinary integration of Chinese medicine and synthetic biology, and explore new pathways for the modernisation and internationalisation of Chinese medicine.

Speaking at the opening ceremony of the forum, UM Rector Yonghua Song said that synthetic biology, as an emerging discipline, provides new technological means for the modernisation of Chinese medicine. He expressed hope that the forum would further strengthen cooperation between Macao and research institutes in mainland China, and drive innovative development in the field of synthetic biology for Chinese medicine.

In his speech, TIB Director-General Hua Xiang highlighted the vast application prospects of synthetic biology in fields such as biomanufacturing and drug research and development. He looks forward to close cooperation between the two parties to advance the research and industrialisation of synthetic biology for Chinese medicine.

Following the speeches, representatives of UM and TIB signed an agreement and unveiled the plaque for the UM-TIB Joint Laboratory for Synthetic Biology and Chinese Medicine. The joint laboratory will focus on synthetic biology research for Chinese medicine, new drug development, and industrial applications.

The forum also featured a roundtable discussion on "The Current Status, Opportunities, and Challenges of Developing Synthetic Biology and Biomanufacturing for Chinese Medicine in Macao" and presentations by professors from ICMS and TIB. It brought together experts and scholars from academia, industry representatives, and government officials.

International experts gather at UM to discuss TNFR2 immunoregulation and innovative drug development

The International Symposium on TNFR2 Immunobiology and Immunopharmacology was held at the University of Macau (UM) from 3 to 4 March, 2025. The event brought together renowned experts and scholars from prestigious institutions worldwide, including Harvard University, University of Oxford, Yale University, and Johns Hopkins University, as well as R&D professionals from the pharmaceutical industry. The two-day symposium provided a valuable platform for exchange and cooperation among experts in life sciences from Macao and mainland China, allowing young researchers to interact with internationally renowned scientists.

The symposium was co-organised by Professor Xin Chen, director of the Institute of Chinese Medical Sciences and director of the State Key Laboratory of Quality Research in Chinese Medicine at UM, and Professor Denise L. Faustman from Harvard University. In his opening remarks, UM Rector Yonghua Song highlighted UM's commitment to advancing research and education on the frontline of biomedicine. Chen noted that Macao's research achievements in TNFR2 (tumour necrosis factor receptor type II) have become an important part of global efforts in the field, showcasing Macao's contributions to contemporary science and technology. He also thanked the Science and Technology Development Fund of the Macao SAR for its significant support of conducting TNFR2 research in Macao.

The event brought together researchers from Harvard University, University of Oxford, Yale University, Johns Hopkins University, Leiden University, National Cancer Institute (NCI) of the US National Institutes of Health (NIH), French National Institute of Health and Medical Research (Inserm), University of Toulouse, University of Würzburg, Royal Melbourne Institute of Technology (RMIT University), University of California, San Diego, Mayo Clinic College of Medicine and Science, University of Groningen, Ghent University, University of Southern Denmark, University of Florida, University of Miami, Duke-National University of Singapore (NUS) Medical School, Universiti Sains Malaysia, University of Macau (UM), and renowned academic and research

institutions from Hong Kong and mainland China. Representatives from pharmaceutical companies worldwide, including BioNTech-resano GmbH, Boston Immune Technologies and Therapeutics (BITT), HiFiBiO Therapeutics, Simcere Pharmaceutical Group, and Adlai Nortye, reported on the latest research on the development of innovative drugs targeting TNFR2.

The symposium also featured 21 poster presentations from different countries and regions, providing more opportunities for academic exchange. Moreover, the symposium was an event officially endorsed by the US-based Society for Leukocyte Biology (SLB), which presented the Poster Award with prize of USD 1,000 to outstanding young researchers. The selection committee comprised of Professor Benoit L. Salomon from the French National Institute of Health and Medical Research (Inserm), Professor Harald Wajant from the University of Würzburg, and Assistant Professor Nathan Archer from Johns Hopkins University. After a rigorous selection process, UM doctoral students Chen Zhonghao and Wang Yiru, along with Zhou Xiaofei, a researcher from Biocytogen Pharmaceuticals (Beijing) Co Ltd, received the awards.

Nearly 300 students, scholars, and professionals from renowned universities, research institutes, pharmaceutical companies, and innovation funding agencies worldwide also attended the symposium and engaged in in-depth discussions on the potential applications of targeting TNFR2 in the treatment of autoimmune diseases and cancer. In her closing remarks, Faustman said that TNFR2 is now considered a promising target in the treatment of tumours and autoimmune diseases. In-depth research into its immunobiological mechanisms is crucial for driving innovative drug development. She added that exchanges and discussions at the symposium have laid a solid foundation for future breakthroughs.

Also present at the opening ceremony of the symposium were Ip Kuai Lam, member of the Administrative Committee of the Science and Technology Development Fund of the Macao SAR and Carlos Roberto Xavier, head of the Department of Higher Education of the Education and Youth Development Bureau of the Macao SAR Government.

UM Macao Centre for Testing of Chinese Medicine holds promotion event

The Macao Centre for Testing of Chinese Medicine (MCTCM) of the University of Macau (UM) held its first promotion event on February 18, 2025, with the aim of strengthening connections with the industry, promoting the development of the Chinese medicine and "big health" industries, and providing technical support for Macao's economic diversification. More than 60 government officials and industry practitioners attended the event.

At the opening ceremony, Sai Ian Lei, vice president of the Pharmaceutical Administration Bureau of the Macao SAR Government, said that "Drug testing and inspection are fundamental cornerstones of pharmaceutical supervision and management. Through scientifically testing methods, we can effectively monitor the quality of medicines and ensure the safety of our citizens' medication. More importantly, a well-established drug inspection system can enhance public confidence in local drugs and traditional Chinese medicines. By collaborating with third-party testing services, we aim to work with MCTCM to support the innovative development of Chinese medicine and promote the health industry in Macao."

Wei Ge, vice rector of UM, mentioned that UM will continue to promote the economic diversification of the Macao SAR and support the work and development of MCTCM.

Shaoping Li, director of UM MCTCM, gave an overview of the centre's development, technical features, and development goals. He said that MCTCM will provide high-quality technical support for the registration of Chinese medicines in Macao and the quality control in the market.

The Department of General Management of UM MCTCM also introduced the centre's range of services and fees, as well as its customer service platform. Through the MyLIMS electronic platform, clients can consult, submit requests, and make enquiries. After the event, the participants visited the centre's laboratory and had further discussions on cooperation.

UM-CUHK Symposium on Chinese Medicine and Immunology holds at UM

The Institute of Chinese Medical Sciences (ICMS) of the University of Macau (UM) held the "UM-CUHK Symposium on Chinese Medicine and Immunology 2025" on 18 January. The symposium brought together experts and scholars from both UM and the Chinese University of Hong Kong (CUHK) to discuss the latest advancements in the fields of Chinese medicine and immunology.

During the forum, Xin Chen, director of ICMS, introduced the organisational structure, research directions, talent cultivation, and faculty teams of ICMS and the State Key Laboratory of Quality Research in Chinese Medicine (SKL-QRCM) of UM. He expressed hope that the two universities will further promote exchanges and cooperation in the modernisation and internationalisation of Chinese medicine. He also highlighted SKL-QRCM's dedication to the "Research and Applications of Immunomodulatory Active Chinese Medicine", which aims to advance the fundamental research, development and practical application of the immunomodulatory property of Chinese medicine.

Ten professors from UM and CUHK gave presentations during the forum, sharing the latest research advancements in the fields of Chinese medicine and immunology, with a focus on the role of Chinese medicine in immune regulation. The symposium promoted academic exchange between faculty and students from both universities, and laid the foundation for future cooperation.

UM's Open Day 2025 concludes successfully

On January 12, 2025, the University of Macau (UM) successfully held its annual Open Day event. The Institute of Chinese Medical Sciences (ICMS) organized a series of workshops and interactive game booths under the theme "Model Organisms", attracting nearly 300 students and parents from diverse regions. The event aimed to provide participants with deeper insights into traditional Chinese medicine (TCM) culture while allowing them to experience the academic atmosphere and research achievements of ICMS.

With over a decade of expertise in zebrafish research, ICMS has achieved significant scientific breakthroughs in the field. This year, focusing on "Model Organisms", researchers delivered accessible explanations to translate complex biotechnological concepts into easily digestible knowledge. Diverse formats—including science exhibitions, model organism postcard-making activities, and interactive games—enabled participants to immerse themselves in the academic atmosphere, explore personal interests, and gain exposure to TCM knowledge.

Participants also engaged in direct interactions with ICMS researchers to explore the institute's scientific achievements, specialized academic programs, and future research directions. The event not only effectively promoted TCM culture and biotechnology awareness but also strengthened ties between the university and the community, offering valuable references and options for parents and potential fucture students.

Academic Visits

Delegation of Shandong University visits ICMS for collaborations

On March 26, 2025, a delegation led by Professor Shucai Li, President of Shandong University, visited the Institute of Chinese Medical Sciences (ICMS) and the State Key Laboratory of Quality Research in Chinese Medicine (SKL-QRCM) at the University of Macau. They were warmly received by Professor Peng Li, Deputy Director of ICMS and Director of the Macao Centre for Research and Development in Chinese Medicine, along with Assistant Directors Professor Xiuping Chen, Professor Jinjian Lu, Assistant Professor Wai San Cheang, and Associate Professor Hua Yu.

During the discussions, Professor Peng Li delivered a welcome speech and a detailed introduction to ICMS and SKL-QRCM, highlighting the rapid development of traditional Chinese medicine disciplines in recent years. The delegation presented an overview of Shandong University's leading disciplines and state key laboratories. Both parties engaged in in-depth discussions on topics including Chinese medicine research, research commercialization, international academic collaboration, faculty and student exchanges, and joint research projects. Following the meeting, the delegation toured ICMS laboratories and core facilities, offering high praise for the laboratory infrastructure. Both institutions expressed strong interest in deepening cooperation in areas such as new drug development, modernization of traditional medicine, and interdisciplinary research.

Professor from the Faculty of Pharmacy of the University of Lisbon, Portugal, visits ICMS

On March 17, 2025, Professor Afonso Miguel Cavaco from the Faculty of Pharmacy of the University of Lisbon, Portugal, visited the Institute

of Chinese Medical Sciences (ICMS) for in-depth academic exchanges. In addition to introducing the latest developments in the field of pharmacy in Portugal and other Portuguese-speaking countries, he also discussed the innovative development of pharmaceutical research with postgraduates of medicinal administration, and shared research and academic experiences.

During the meeting, Professor Xin Chen, Director of ICMS, and Professor Afonso Miguel Cavaco had a comprehensive discussion on how to leverage the integration of teaching and scientific research to promote the research translation and international development of traditional Chinese medicine. In his keynote speech, Professor Afonso Miguel Cavaco also systematically introduced the structure of the scientific research and education system of the Faculty of Pharmacy of the University of Lisbon.

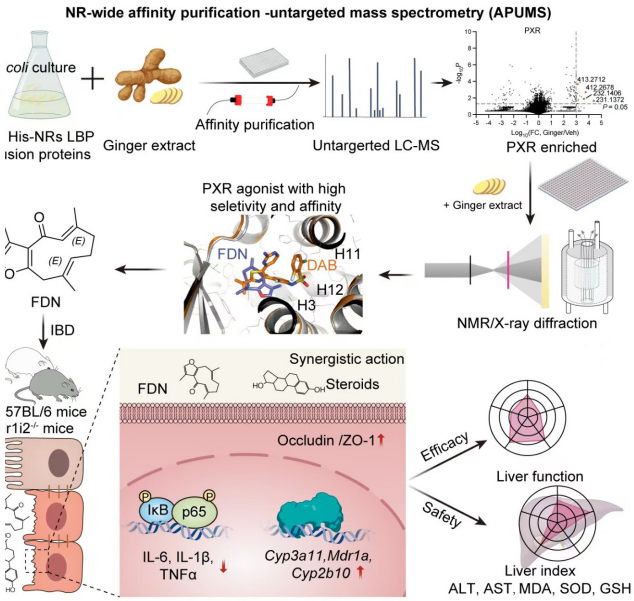
Delegation from Shenzhen visits ICMS

On March 14, 2025, a delegation led by Qing Chen, Member of the Standing Committee of the CPC Shenzhen Municipal Party Committee and Member of the Party Leadership Group of the Shenzhen Municipal People's Government, visited the Institute of Chinese Medical Sciences (ICMS) and State Key Laboratory of Quality Research of Chinese Medicine (SKL-QRCM) at the University of Macau. They were warmly received by Professor Chen Xin, Director of ICMS and SKL-QRCM, as well as Professor Peng Li, Deputy Director of ICMS and Director of Macao Centre for Research and Development in Chinese Medicine, and Associate Professor Jiahong Lu, Deputy Director of ICMS.

Professor Xin Chen provided the delegation with a detailed introduction to the overall profile, research directions, scientific achievements, and future development plans of ICMS and SKL-QRCM to the delegation. He also led the delegation on a tour of the laboratory. Professor Chen emphasized that ICMS has been committed to promoting innovative research in Chinese medicine, maintaining close collaborations with partners in the Greater Bay Area and internationally. Through high-quality scientific and translational research, ICMS aims to advance the globalization of Chinese Medicine.

During the visit, member of the CPC Shenzhen Standing Committee and Shenzhen Party Leadership Group Qing Chen highly commended the remarkable achievements of ICMS and SKL-QRCM in the field of Chinese medicine and spoke highly of their research outcomes. As a key city in the Guangdong-Hong Kong-Macau Greater Bay Area, Shenzhen looks forward to strengthening cooperation with UM, a leading base for Chinese medicine research, to drive innovative development in the field of Chinese Medicine.

Research Highlights



A schematic diagram of nuclear receptor-wide affinity purification-untargeted mass spectrometric (APUMS) strategy for screening natural PXR agonists - furanodienones in ginger

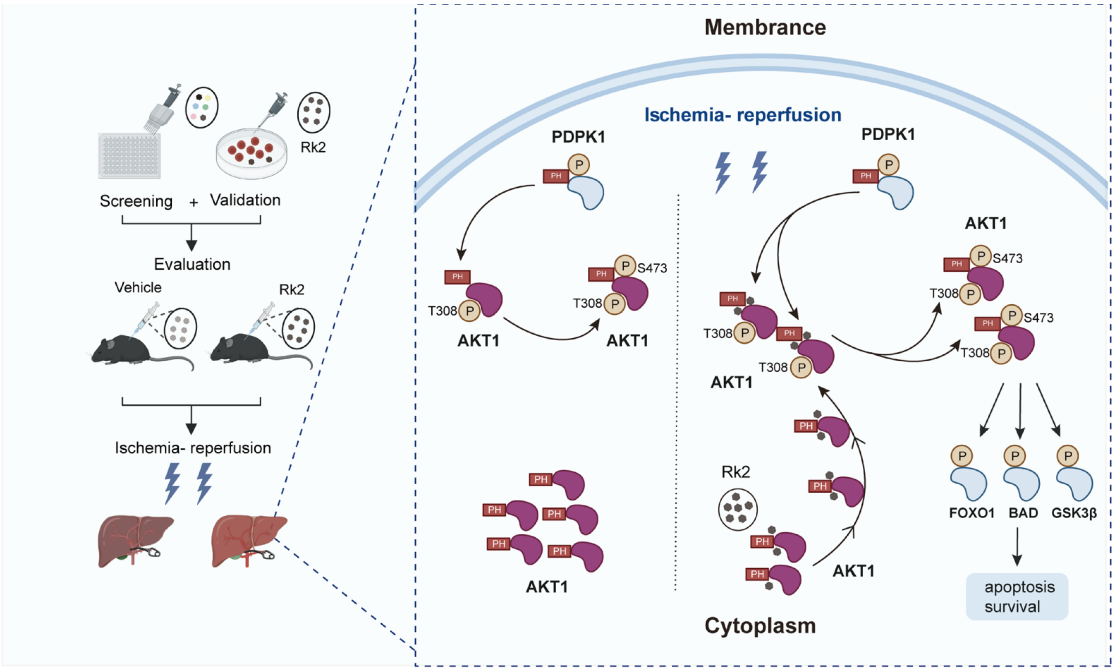
Discovery of furanodienone (FDN), a ginger-derived compound, as a highly selective pregnane X receptor (PXR) agonist

Elucidating the intricate interactions between proteins and unidentified small-molecule ligands is essential for advancing our understanding of biological processes and developing novel therapeutics. However, conventional approaches are frequently limited by high false-positive rates, low throughput, and restricted applicability. To address these challenges, an international research team led by Prof. Shengpeng Wang (ICMS), in collaboration with scientists from the University of Toronto and Lanzhou University, employed nuclear receptor-wide affinity purification-untargeted mass spectrometry (APUMS) coupled with mass spectrometry-guided natural product discovery. This innovative approach identified 5E,9E-furanodienone (FDN), a ginger-derived compound, as a highly selective pregnane X receptor (PXR) agonist. The APUMS method demonstrated exceptional selectivity and an extremely low false discovery rate. Crystallographic analysis revealed that FDN occupies only a partial region of the PXR ligand-binding pocket (LBP) while enabling synergistic binding with steroids in adjacent pockets, thereby modulating PXR activity. In vivo studies showed that oral FDN administration, either alone or in combination with 17β-estradiol (E2) or 17α-ethinylestradiol (EE2), effectively ameliorated inflammatory bowel disease (IBD) without activating PXR in primary hepatocytes, compromising liver function, or inducing significant adverse effects. Notably, FDN exhibited PXR-dependent anti-inflammatory effects with colon-specific targeting, highlighting its therapeutic precision. The study further demonstrated that co-activation with steroid agonists enhances FDN's binding affinity and target gene induction, suggesting its potential for improved activity, efficacy, and safety in clinical applications. These groundbreaking findings have been published in the prestigious journal *Nature Communications*.

Nature Communications, 2025; 16: 1280.

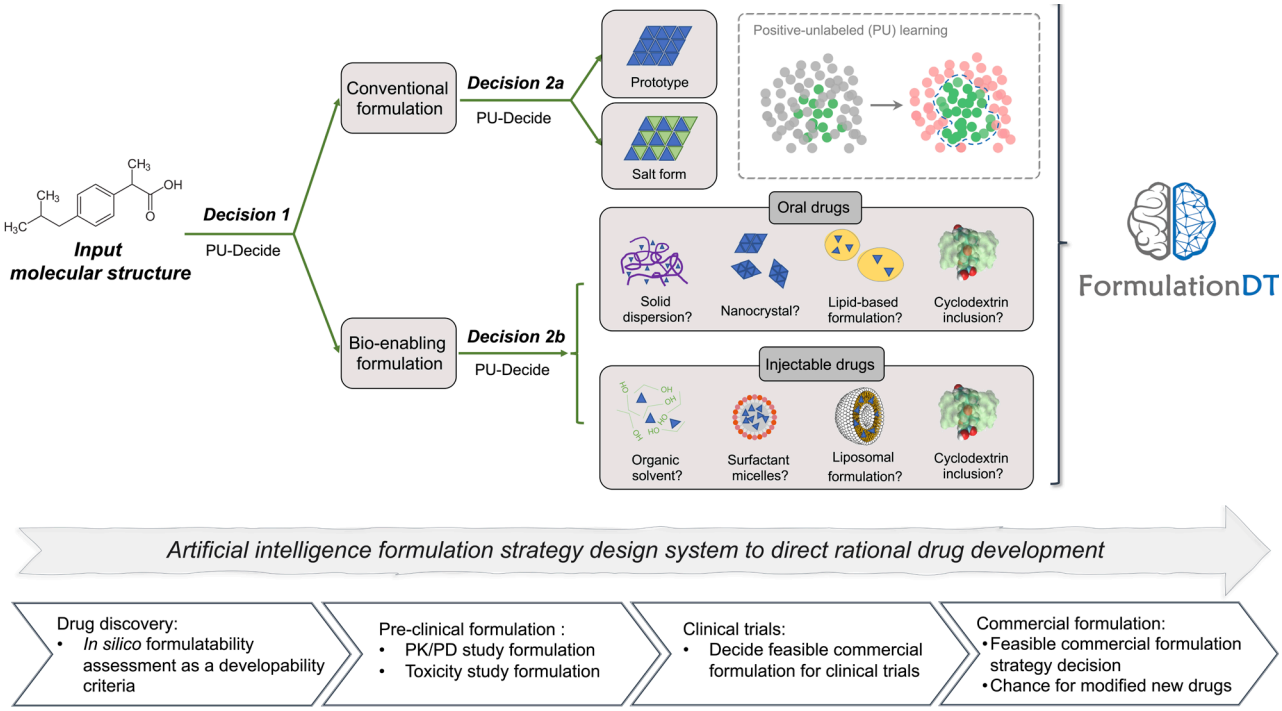
Ginsenoside Rk2 alleviates hepatic ischemia/reperfusion injury by enhancing AKT membrane translocation and activation

Hepatic ischemia-reperfusion injury (IRI) poses a significant threat to clinical outcomes and graft survival during hemorrhagic shock, hepatic resection, and liver transplantation. Current pharmacological interventions for hepatic IRI are inadequate. A research team led by Jianbo Wan, professor at ICMS, in collaboration with research teams from Wuhan University and State Key Laboratory of New Targets Discovery and Drug Development for Major Diseases, has identified ginsenoside Rk2 (Rk2), a rare dehydroprotopanaxadiol saponin, as a promising agent against hepatic IRI through high-throughput screening. Rk2 significantly reduced inflammation and apoptosis caused by oxygen-glucose deprivation and reperfusion (OGD/R) in hepatocytes and dose-dependently protected against hepatic I/R-induced liver injury in mice. Integrated approaches, including network pharmacology, molecular docking, transcriptome analysis, and isothermal titration calorimetry, along with experimental validation, demonstrated that Rk2 protects against hepatic IRI *in vitro* and *in vivo* by targeting and activating the AKT signaling pathway. Mechanistically, the findings of this study indicated that Rk2 directly binds to AKT1, facilitating its translocation from the cytoplasm to plasma membrane. This process markedly enhanced AKT interaction with PDPK1, promoting the activation of AKT1 and its downstream signaling. The research results have been published in the journal *Medcomm*.



A schematic diagram of pharmacological effects and molecular mechanisms of ginsenoside Rk2 in alleviating hepatic ischemia/reperfusion injury.

Medcomm, 2025; 6(1): e70047.



A schematic diagram of the first data-driven and knowledge-guided AI platform for formulation strategy design

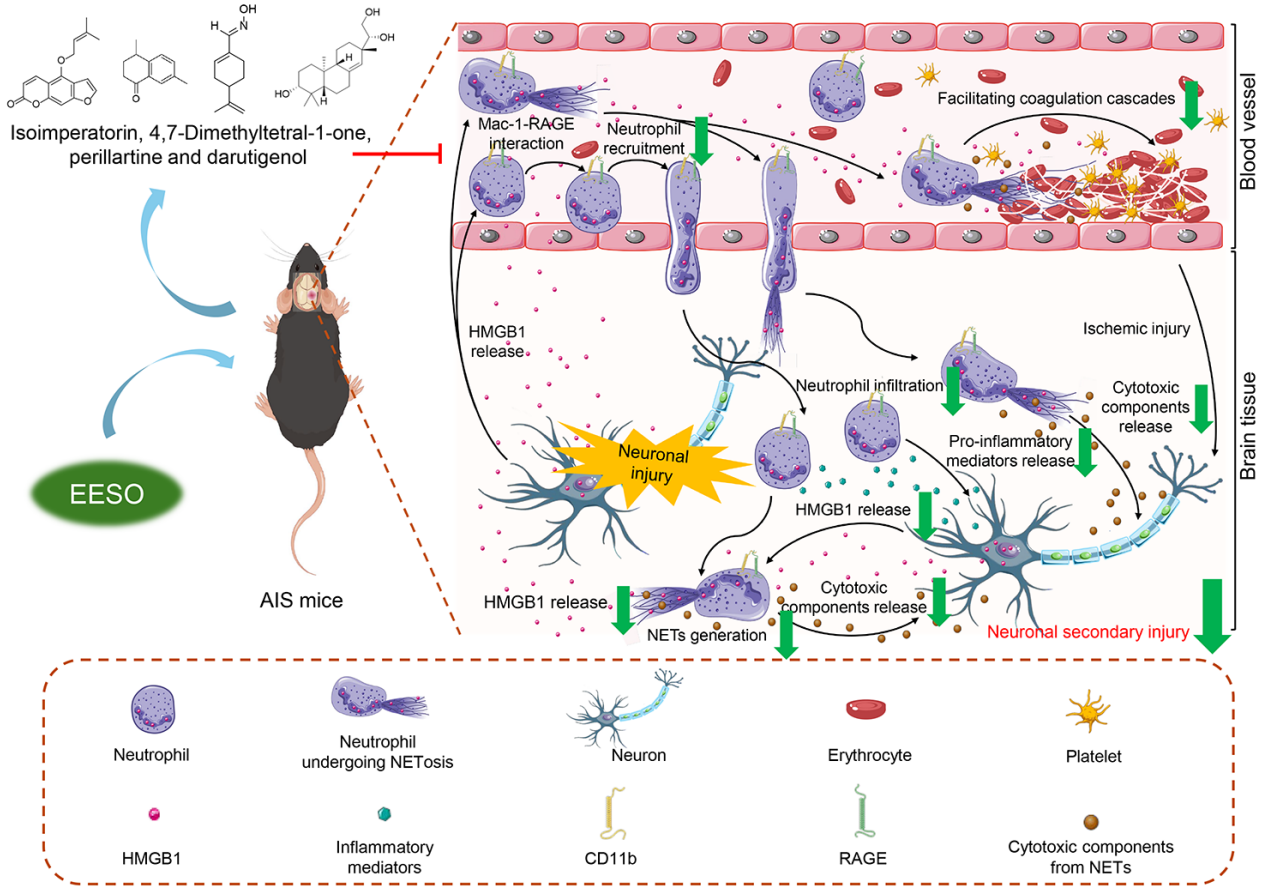
AI-directed formulation strategy design initiates rational drug development

Rational drug development would be impossible without selecting the appropriate formulation route. However, pharmaceutical scientists often rely on limited personal experiences to perform trial-and-error tests on diverse formulation strategies. To overcome this challenge, the team led by Prof. Defang Ouyang at ICMS has developed the first data-driven and knowledge-guided AI platform named FormulationDT for rational formulation strategy design. Learning from approved drugs, FormulationDT devised a comprehensive formulation strategy design system containing 12 decisions for both oral and injectable administration. Utilizing a partially supervised learning framework, FormulationDT trains 12 high-performance and interpretable classification models to enable AI-driven formulation strategy design. By integrating domain expertise, FormulationDT is now accessible through a user-friendly web platform. Moreover, its value has been demonstrated through applications in proteolysis targeting chimeras and recent drug approvals. Built upon the collective wisdom of global drug development experts and cutting-edge AI algorithms, FormulationDT holds great promise for reducing risk, improving efficiency, and enhancing quality throughout drug development lifecycle. The research has been published in the internationally renowned journal *Journal of Controlled Release*.

Journal of Controlled Release, 2025; 378: 619-636.

Siegesbeckia orientalis ethanol extract alleviates neutrophil-involved neuronal inflammatory injury poststroke

Dr. Yonghua Zhao's group from ICMS and the Sate Key Laboratory of Quality Research in Chinese Medicine published a research article uncovering a new mechanism related to ameliorative effects of *Siegesbeckia orientalis* extract on neuronal inflammatory injury poststroke. This work endowed scientific connotation for the employment of Chinese Medicinals treating ischemic stroke. The study indicates the administration with ethanol extract of *Siegesbeckia orientalis* L. (EESO) alleviated neuronal inflammatory injury poststroke via suppressing neutrophil infiltration and neutrophil extracellular traps (NETs) generation. HMGB1 is a key regulated factor for neutrophil migration and NETs generation, and the results of CETSA suggested that active compounds of EESO-containing serum could directly bind to neuron-derived HMGB1, as well as blocked the interaction between RAGE and CD11b driven by HMGB1 to suppress neutrophil migration and NETs generation. Moreover, by the analysis of components absorbed in the blood, molecular docking study and in vitro verification experiment, active compounds, including isoimperatorin, were main therapeutic effective material foundation. The work has been published in the *Phytomedicine* affiliated to highly reputable journal of integrative & complementary medicine.



Active components of EESO targeted HMGB1 to block the CD11b-RAGE interaction, thereby alleviating secondary neuronal injury triggered by neutrophil migration and NETs generation.

Phytomedicine, 2025; 139: 156541.

Rising Stars

The Institute of Chinese Medical Sciences (ICMS) is proud to highlight the remarkable achievements and potential of two of its rising faculty members, Dr. He Song and Dr. Chihua Li. Both researchers bring exceptional expertise and innovative approaches to their respective fields, contributing significantly to the advancement of Chinese medicinal, biomedical and pharmaceutical sciences.

Dr. He Song: bridging structural biology and traditional Chinese medicine

Dr. He Song, an Assistant Professor at ICMS, has established himself as a leading figure in structural biology and its application to Traditional Chinese Medicine (TCM). After earning his Ph.D. from Mississippi State University in 2013, Dr. Song conducted postdoctoral research at the National Cancer Institute (NIH), where he specialized in the structural analysis of RNA-processing proteins and structure-based drug development. His academic journey continued at the University of California, Los Angeles (UCLA), where he made significant contributions to structural biology as a research associate.

Since joining ICMS at UM in 2023, Dr. Song has focused on integrating structural biology into TCM research. His work aims to identify novel bioactive compounds, elucidate disease mechanisms, and bridge the gap between traditional remedies and modern drug discovery. His research encompasses pharmaceutical development, pharmacology, and natural product biosynthesis. His team successfully resolved the cryo-EM structure of helical Zingibroside R1 nanofibrils, uncovering their antifungal properties and achieving the first high-resolution structural characterization of a naturally occurring chemical assembly. Additionally, he identified a key regulator of articular chondrocyte fatty acid metabolism and joint homeostasis, providing a foundation for structure-based drug development targeting osteoarthritis. His research also extends to bile acid metabolism, focusing on key enzymes involved in bile acid biosynthesis, which contributes to the sustainable production of pharmaceutical-grade bile acids.

Through interdisciplinary techniques, Dr. Song is propelling pharmaceutical sciences forward, fostering the modernization and global integration of TCM. His innovative approach positions him as a rising star in the field, with the potential to make transformative contributions to drug discovery and development.

Rising Stars

Dr. Chihua Li: integrating epidemiology and Chinese medicine research

Dr. Chihua Li, as Assistant Professor at ICMS, is a distinguished researcher specializing in life-course epidemiology, with a focus on cardiometabolic and neurodegenerative diseases. Dr. Li earned his bachelor's degree from Beijing Institute of Technology in 2012 and completed his master's and PhD degrees at Columbia University. Following his postdoctoral training at Columbia, the University of Michigan, and Johns Hopkins University, he contributed to over five NIH-funded R01 projects on aging and chronic disease.

In 2024, Dr. Li joined ICMS at UM. Dr. Li's research employs epidemiological methods, integrating large-scale population studies with multi-omics data and causal inference techniques to systematically examine how adverse exposures across the life course influence healthy aging. Building on this foundation, he is developing tools to assess peripheral immune function and biological aging, enabling more solid evaluations of immune health at both individual and population levels. His work further explores the mechanisms through which immune aging contributes to chronic disease progression. In terms of applied research, Dr. Li actively promotes the integration of epidemiological methodologies into TCM research, employing scientific approaches to quantify the effects of TCM on immune aging and chronic disease. He utilizes immune dysregulation and biological age assessment tools to study how TCM modulates immune function, delays immune system aging, and contributes to chronic disease prevention and management. By integrating modern epidemiological methods with classical TCM principles, he aims to uncover the biological mechanisms underlying TCM's role in promoting healthy aging, providing scientific evidence for TCM research and evidence-based medical practice. Furthermore, he plans to combine epidemiological research with pharmaceutical regulatory science to support TCM-based health interventions with robust scientific evidence, thereby informing public health policy and advancing the precision application of TCM.

Through this interdisciplinary research, Dr. Li seeks to modernize the role of TCM in health sciences, offering innovative solutions to address the global challenge of population aging.

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