KMU Newsletter

Kaohsiung Medical University, Taiwan

Kaohsiung Medical University

Kaohsiung Medical University has been a cornerstone of medical education and healthcare innovation in southern Taiwan for over seven decades. Rooted in a strong tradition of social responsibility, the university was established with a clear mission to address regional healthcare needs while cultivating medical professionals of both technical excellence and ethical integrity. From its earliest days, KMU has embraced a people-centered philosophy, integrating humanistic values into medical training and emphasizing the vital role of medicine in serving society.

Over the years, KMU has continuously evolved in response to global developments in medicine and public health. The university has expanded its academic scope to encompass interdisciplinary research, advanced clinical training, and international collaboration across the health sciences. With state-of-the-art facilities and a growing global network, KMU remains committed to advancing medical knowledge, improving patient care, and nurturing future leaders who will contribute meaningfully to healthcare systems both in Taiwan and beyond.

To recognize the outstanding research contributions of young faculty members, KMU introduced the Young Outstanding Research Award for the first time at this year's anniversary celebration. Among the many distinguished scholars, Professor Kumar stood out with his profound academic achievements and interdisciplinary research contributions, earning the honor for the year 2025. Professor Kumar has long been dedicated to the fields of nanotechnology, analytical chemistry, and medical diagnostics, and was listed among the top 2% of scientists worldwide. His research accomplishments have been widely recognized both domestically and internationally, including the 2023 KMU–NSYSU Joint Research Excellence Award.

Professor Kumar established the Nano and Green Analytical Technology Lab, which is committed to developing rapid, sensitive, and environmentally friendly analytical methods for clinical biological samples, pharmaceutical analysis, and environmental monitoring. His work emphasizes not only innovation but also sustainability, integrating nanotechnology with green chemistry to create practical and forward-looking sample pretreatment techniques. In recent years, he has further advanced research in breathomics, analyzing volatile biomarkers in human breath to explore the potential of noninvasive early cancer detection, underscoring his significant contributions to the advancement of medical diagnostic technologies.

1.You were honored with the first-ever "Young Outstanding Research Award" presented by KMU. What does this award mean to you personally?

Receiving KMU's first-ever "Young Outstanding Research Award" is a significant milestone achievement for me. It is not only a recognition of my past research efforts, but also an encouragement to continue pursuing innovative, interdisciplinary work that bridges nanoscience and green analytical technology for real-world applications.

I sincerely thank KMU for providing the research platform and funding, and I also thank my colleagues, research scholars, and students for their tremendous support. This award also strengthens my commitment to cultivating a research environment where young scientists can grow, collaborate, and make impactful contributions to society.

2.How would you explain the value of "nano and green analytical technology" to the general public? Could you share a simple example or analogy that helps people better understand its importance?

To recognize the outstanding research contributions of young faculty members, KMU introduced the Young Outstanding Research Award for the first time at this year's anniversary celebration. Among the many distinguished scholars, Professor Kumar stood out with his profound academic achievements and interdisciplinary research contributions, earning the I often describe “nano- and green-analytical technology” as an interdisciplinary science that makes analytical and diagnostic procedures simpler, faster, cleaner, more precise, and more sensitive while using fewer sustainable resources and keeping costs low.For example, if we want to diagnose viral or bacterial infections in our body. Patients need to visit a medical or clinical laboratory, undergo blood collection, and sometimes wait several days to receive the medical report, and they have to pay a high cost.

In recent years, thanks to advances in nanoscale materials and green analytical innovations, many diagnostic procedures have become as simple as using a quick screening kit at a very low cost. Just a drop of saliva, urine, or blood is enough, and results can appear within minutes, without the need to visit a laboratory and at very low cost.This transformation illustrates the true value of nano- and green-analytical technology - It converts complex laboratory procedures into smart, rapid, and eco-friendly diagnostic solutions that enhance accessibility, sustainability, and everyday healthcare at low cost.

3.During your research in breathomics, were there any major findings or unexpected results that particularly surprised or impressed you?

In our ongoing research on breathomics, we analyze exhaled human breath to identify and quantify a wide range of volatile organic metabolites produced by different metabolic pathways in the body. Human breath contains not only basic air constituents but also thousands of volatile organic compounds (VOCs) that reflect real-time cellular and biochemical processes. This makes breath a promising non-invasive biosample, offering an alternative to traditional invasive samples such as blood or tissue. As we continue developing nanomaterial-assisted breathomics using advanced analytical instrumentation for the screening and diagnosis of cancers, metabolic disorders, and infectious diseases, several findings have been particularly surprising.

One of the most striking discoveries is how subtle metabolic changes within the human body can appear in the breath within minutes. We observed distinct VOC patterns not only across disease states but also under external influences such as diet, medication, and psychological

stress. This highlighted how breath composition is far more dynamic and responsive than we previously understood. Another impressive moment was the identification of unique VOC signatures associated with early-stage cancers. These early biomarkers emerged long before conventional clinical indicators, strongly reinforcing the potential of breathomics as a non-invasive and highly sensitive tool for early disease detection.

Overall, these discoveries demonstrate that human breath functions as a rich, real-time biological window, capable of revealing physiological changes much earlier than many traditional biomarkers-underscoring the transformative potential of breathomics in future healthcare for various disease diagnosis at low cost.

4.Breathomics is regarded as a promising direction for future noninvasive diagnostics. What are the most challenging aspects in both current research and practical clinical applications?

There are several significant challenges: standardization of the diagnostic protocol is necessary because human breath varies with environment, lifestyle, and sampling method. Developing unified protocols is essential. Sensitivity and specificity are also major concerns, as disease-related VOCs are at extremely low concentrations and require advanced instruments to detect reliably. Clinical validation is more important because it requires large-scale cohort studies to translate research findings into clinically accepted biomarkers.

Practical barriers – Turning a complex laboratory method into a user-friendly clinical tool requires engineering, medical collaboration, and policy support. Although challenging, these barriers motivate us to continue advancing breathomics toward real-world medical applications.

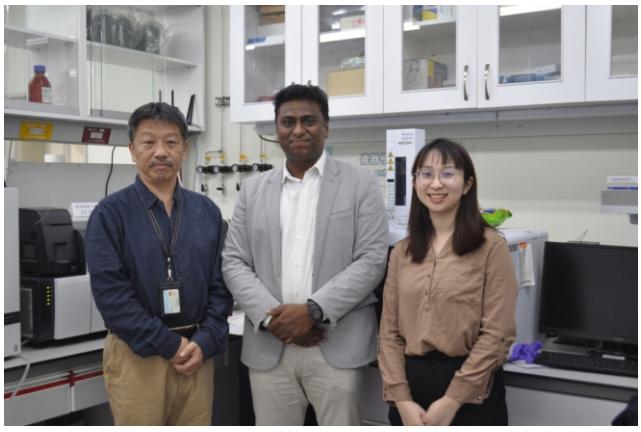
5.If additional resources or supportive policies were available, what large-scale project or cross-disciplinary research initiative would you most hope to pursue?

If additional resources or supportive policies were available, I would most like to establish a National-Level Volatomics Research Center - a comprehensive interdisciplinary platform dedicated to advancing non-invasive diagnostics and precision medicine.

This center would integrate several key components:
State-of-the-art analytical technologies, including GC×GC-MS/MS, GC-TOF/MS, and real-time VOC sensing systems AI-driven biomarker discovery platforms for rapid and accurate identification of disease-specific signatures Extensive clinical collaborations across cancer, metabolic diseases, infectious diseases, and other major health challenges Sustainable sample-collection systems, such as nano-engineered sorbent tubes, green sampling devices, and wearable breath samplers By consolidating expertise from chemistry, nanotechnology, engineering, medicine, and data science, this national center would significantly accelerate Taiwan's leadership in non-invasive diagnostic innovation. It would also foster a sustainable, high-impact research ecosystem capable of contributing to global healthcare, environmental monitoring, and next-generation biomedical technologies.

For more details, please check the following links:

https://kumarslab.wixsite.com/kumarslab
https://scholar.google.com/citations?user=MAEkJ20AAAAJ&hl=en



Hepatobiliary and Pancreatic Medicine Team

Abstract

In line with the World Health Organization's goal of eliminating viral hepatitis as a public health threat by 2030, the Taiwanese government established the National Hepatitis C Virus Elimination Office at the end of 2016. In recent years, the Hepatobiliary Division at Kaohsiung Medical University Hospital (KMUH) has actively promoted the diagnosis, referral, and treatment of Hepatitis C virus (HCV) as well as associated researches in order to accomplish the national goal in Taiwan.

Using the international strategy of "micro-elimination" of HCV, the team has improved internal hospital processes for screening, diagnosing, and referring patients. Externally, we have led initiatives targeting highprevalence regions, dialysis centers in southern Taiwan, remote and mountainous areas, outlying islands, and marginalized populations such as prison inmates and individuals with psychiatric disorders.

Read more

In-Hospital HCV Elimination：

1.1 Established Taiwan's first HCV reflex testing system, significantly improving HCV molecular diagnostic rates. This pioneering approach became a reference for screening reimbursement by the National Health Insurance and Health Promotion Administration.

1.2 Introduced an electronic reminder and automatic referral system for HCV testing among patients with diabetes, chronic kidney disease, or abnormal liver function. Also promoted mobile HCV testing units and screening for inpatients. These efforts earned the National Health Promotion Administration's Outstanding Award for Hepatitis B and C Screening and the Taiwan Sustainability Action Silver Award for Best Action Plan.

Outreach HCV Elimination：

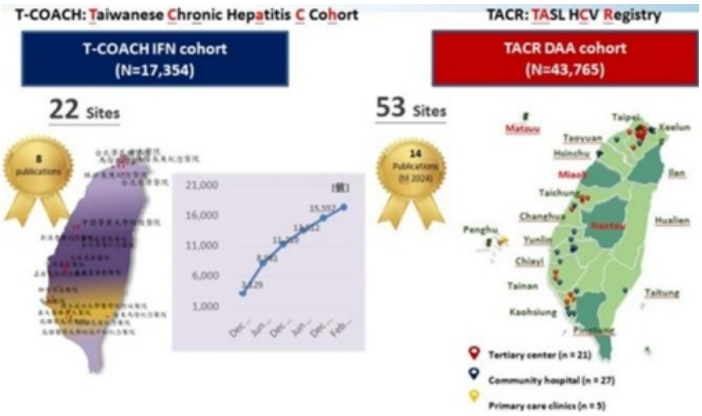
2-1 We conducted large-scale outreach screening and onsite treatment for over 2,000 healthcare staff and uremic patients on maintained hemodialysis in 22 dialysis centers across Kaohsiung City, Pingtung County and Tainan City. This was the world's first HCV micro-elimination campaign targeting high-risk dialysis patients, published in the top-tier journal Gut and honored with the National Quality Label in 2021 and 2022.

2-2 We developed a two-stage community screening model in Zihguan, the area with the highest HCV prevalence in southern Taiwan, screening over 5,000 residents and maintaining permanent outreach clinics. Even during the COVID19 pandemic, services continued ninterrupted for two years, receiving the National Quality Label in 2020 and 2021.
2-3 We established HCV SOPs in indigenous areas, enabling Taoyuan District in Kaohsiung to become the first mountain village with the highest HCV prevalence to achieve localized micro-elimination of HCV in Taiwan.

Application and Highlights

Our team has played a pivotal role in liver disease research and was entrusted by the Taiwan Association for the Study of the Liver (TASL) to develop national treatment guidelines for HCV. We also participated in APASL (Asian Pacific Association for the Study of the Liver) guideline formulation. Beyond clinical services and teaching, the team has actively engaged in community and rural service, fulfilling the social responsibility of a university hospital.

Due to these efforts, the team and its members have earned numerous accolades, including: SNQ National Quality Labels (2021–2023)、Prof. Wan-Long Chuang – APASL Outstanding Mentor Award (2018)、Prof. Ming-Lung Yu – TASL Special Contribution Award (2023), 20th Yung、Shin Lee Tian-Teh Medical Technology Award, APASL Achievement Award (2025), Global Top 2% Scientist (2022–2023)、Prof. Chia-Yen Dai – TSAA Taiwan Sustainability Action Award (2024),33rd Medical Dedication Award (Welfare Foundation), Kaohsiung Medical Association Gao-Xing Award (2023)



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Kidney multiome-based genetic scorecard reveals convergent coding and regulatory variants

Abstract

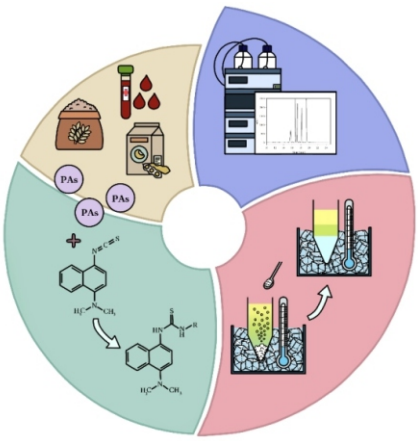
This study aims to develop a rapid and environmentally friendly method for the detection of polyamines, enabling the quantitative analysis of polyamine levels in blood and food samples.

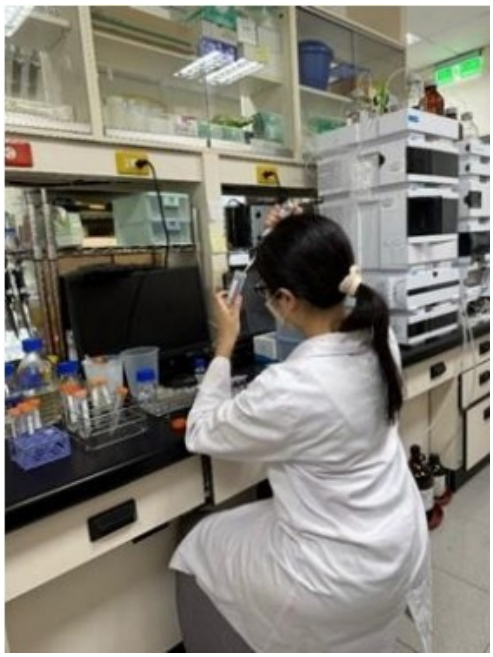
Read more

Polyamines are cancer biomarkers. If cancer patients consume foods containing high concentrations of polyamines for a long time, the proliferation and migration of cancer cells will increase. The present invention is to develop a rapid and environmentally friendly polyamine detection method to measure the content of polyamines in blood and food. In this reagent kit, polyamines react with derivatization reagents within seven minutes and are extracted using ice-bath-effervescence-assisted salting-out extraction. Finally, polyamine derivatives in blood and food samples are successfully detected using capillary liquid chromatography coupled with ultraviolet light detection.

Application and Highlights

Industrial-academic patent applications-this research has been published in the Journal of Chromatography A (2025, 1747, 465807) and has been granted a Taiwan patent, with a US patent application pending.





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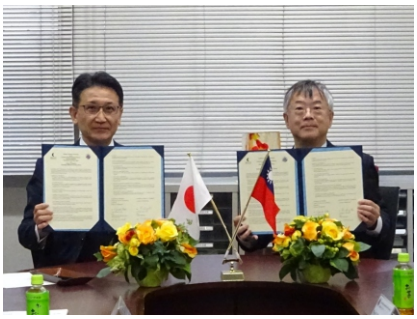
Kaohsiung Medical University, Taiwan

KMU Signs Collaboration Agreement with Kumamoto University, Deepening Taiwan-Japan Ties and Opening a New Chapter in Medical Education

In recent years, KMU has actively advanced its internationalization strategy, progressively expanding opportunities for students to engage in overseas clinical electives and research exchanges. Recently, KMU President Dr. Ming-Long Yu led a delegation to Japan's Kumamoto University, where he and Kumamoto University President Prof. Hisao Ogawa signed a Academic Exchange and Cooperation Agreement. Simultaneously, the deans of both universities' medical schools formalized a Student Exchange Agreement, marking the beginning of a new era of collaboration in medical education, clinical training, and research, and establishing a significant milestone for Taiwan-Japan medical exchanges.

Kumamoto University has a rich history and is renowned as the alma mater of Dr. Shibasaburo Kitasato, often referred to as the "Father of Modern Medicine in Japan," whose groundbreaking contributions in infectious diseases and public health laid the foundation for Japanese medical research. Dr. Kitasato is also featured on the current 1,000-yen banknote. Current President Prof. Hisao Ogawa, formerly Chairman of the National Cerebral and Cardiovascular Center in Japan, exemplifies Kumamoto University's leadership in clinical research. This collaboration also strengthens the longstanding ties between Kaohsiung and Kumamoto, which have been sister cities since 2017, reflecting the enduring friendship between Taiwan and Japan.

The two universities will also leverage their complementary strengths in infectious disease and virology research. Kumamoto University hosts Japan's leading Human Retrovirus Infection Research Center, internationally recognized for its work on HIV-1, HTLV-1, and HBV, while KMU has established robust research capabilities in infectious diseases and virology. The partnership is expected to foster closer collaboration in both basic and clinical research, jointly advancing the prevention, treatment, and medical innovation for major infectious diseases. In addition, preliminary discussions have been held on implementing a dual-degree program, aimed at further strengthening research linkages and talent development models, creating forward-looking opportunities for training advanced international healthcare professionals. KMU emphasized that it will continue to expand its partnership with Kumamoto University, building a globally influential platform for medical education and research, broadening students' global perspectives, and promoting shared progress in medicine, health, and social welfare between Taiwan and Japan.



KMU Hosts Inter-University Cricket Tournament, Bringing Together International Faculty and Students from Four Universities

In KMU recently hosted its first-ever Cricket Sports Day and Fun Games, organized by the International Student Club. The event drew enthusiastic participation from international faculty and students from National Cheng Kung University, National Sun Yat-sen University, and National Kaohsiung University of Science and Technology. Cricket, a widely celebrated sport in countries such as India, the United Kingdom, Australia, and Pakistan, carries deep cultural significance and strong emotional ties for many international students. The event aimed to provide overseas students in Taiwan with an opportunity to reconnect with a familiar sport from home while fostering cross-cultural interaction. Organizers also expressed hopes of developing the event into an annual campus tradition.

The tournament welcomed more than 80 international faculty members and students from countries including India, Pakistan, Indonesia, and the Czech Republic. A total of seven teams competed in a series of spirited matches, showcasing impressive athletic skills, teamwork, and sportsmanship. The competition also helped raise awareness and appreciation of cricket and diverse sports cultures within the campus community.

Student representatives from the organizing club shared that the event was designed to help international students relive their home countries' national sports while strengthening interpersonal connections. Participants offered positive feedback, with many expressing hopes for a larger-scale event in the future and suggesting that it be held more frequently to further unite the international student community.

KMU noted that the university will continue to advance its internationalization efforts and support international student organizations in organizing inter-university and cross-cultural exchange activities. Through sports, cultural engagement, and community interaction, KMU aims to strengthen connections among students from diverse backgrounds, foster a sense of belonging for international students in Taiwan, and cultivate a more inclusive and globally minded campus environment.

KMU Showcases Nine Innovative Technologies at Taiwan Healthcare+ Expo, Highlighting Biomedical Innovation Driven by Academic–Clinical Integration in Southern Taiwan

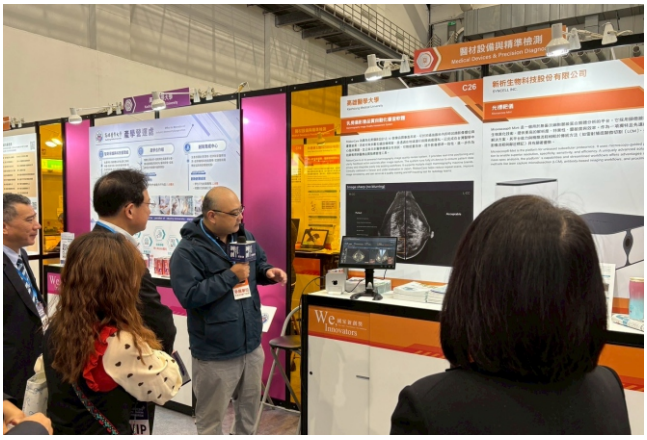
The 2025 Taiwan Healthcare+ Expo was held from December 4 to 7 at the Taipei Nangang Exhibition Center, where KMU presented nine innovative technologies spanning new drug development, smart medical devices, and clinical artificial intelligence. The exhibition demonstrated KMU's integrated biomedical research and development capabilities and underscored the growing momentum of academic–clinical collaboration in southern Taiwan. On December 6, KMU also hosted the KMU SPARK and National Innovation Award Achievement Presentation at the exhibition venue, showcasing the innovation capacity and translational outcomes cultivated through the SPARK Program in recent years.

KMU Vice President Dr. Yu-Li Huang noted that the university has actively advanced the Ministry of Science and Technology–supported SPARK Program, with the goal of establishing a value-added biomedical translation hub in southern Taiwan. By integrating campus-based research with the clinical environments of its affiliated medical institutions, KMU has developed the most comprehensive biomedical innovation pipeline in the region. To date, the program has facilitated the establishment of one pharmaceutical startup and three medical device startups, while multiple technologies have secured major government funding or completed successful technology transfers. These efforts have significantly accelerated the translation of research outcomes into clinical applications and industrial deployment, injecting new momentum into the biomedical industry in southern Taiwan.

Beyond pharmaceutical innovation, KMU has also demonstrated strong capabilities in smart medical devices and clinical AI. Among the featured technologies, Professor Chih-Kuang Wang's team developed a bio-ceramic bone graft substitute using 3D additive manufacturing, capable of replicating the porous structure of natural bone while enabling customized designs for bone defect treatment. Professor Hao-Yun Kao and Professor Chi-Ming Chu jointly developed a Smart Dynamic Cardiac Function Assessment System, which integrates wearable sensing technology with a cloud-based platform to enable real-time cardiac monitoring, enhancing safety in exercise assessment and clinical care. Meanwhile, Professor Shu-Bin Huang and Professor Chia-Yang Lee's team introduced a second-generation

hormone therapy decision-support system, which analyzes blood RNA data using a proprietary algorithm to predict treatment responses in prostate cancer patients with an average accuracy of 87.25%, supporting personalized clinical decision-making. Additionally, a team led by Professor Ming-Ju Tsai successfully transferred an AI-powered Endotracheal Tube Position Alert System, which automatically detects tube placement on chest X-rays, significantly reducing the risk of dislodgement and related complications in critical care settings.

KMU emphasized that several of the showcased technologies have already completed technology transfer or led to the successful establishment of startup companies, reflecting the university's maturity in integrating basic research, clinical collaboration, and industrial application. Looking ahead, KMU will continue to advance the SPARK Program by strengthening clinical linkages, promoting technology transfer, and facilitating connections with venture capital. Through these efforts, the university aims to accelerate the commercialization of innovative technologies, drive the upgrading of the biomedical industry in southern Taiwan, and enhance Taiwan's global competitiveness in biomedical science and healthcare technology.



Academician Kung-Yee Liang Delivers Inspiring Lecture at KMU, Sharing an Intellectual Journey that Enlightens Students

KMU held a Presidential Lecture today (16), featuring Academician Kung-Yee Liang of Academia Sinica as the distinguished speaker. In his lecture titled "Reflections on My Intellectual Journey," Academician Liang traced his academic path from mathematics to biostatistics and public health, and later to leadership roles in higher education and public service. Drawing on his profound scholarship and extensive practical experience, he encouraged faculty and students to uphold independent thinking and sound value judgment in an era of rapid technological change, while balancing professional excellence with social responsibility.

Academician Liang is an internationally renowned expert in biostatistics and public health. He currently serves as an Honorary Research Fellow at the National Health Research Institutes and Chun-Yu Chair Professor at Feng Chia University, and previously taught at Johns Hopkins University in the United States. He has also served as President of National Yang Ming University and Director of the National Health Research Institutes. In 1986, during his tenure at Johns Hopkins University, Academician Liang and his colleagues introduced the Generalized Estimating Equations (GEE), a methodology that has since been widely applied in clinical trials and public health research worldwide. GEE has been incorporated into major statistical software packages, including R, STATA, SAS, and SPSS, and has had a lasting impact on both research methodology and practical applications.

During the lecture, Academician Liang emphasized the importance of building a strong foundation during one's university years, drawing from his own experiences in academia and public administration. He stressed that education should extend beyond technical expertise to include character development, humanistic concern, and a commitment to public values. Addressing the rise of artificial intelligence and big data, he advised students to leverage technology as a tool to enhance efficiency and insight, while remaining vigilant in preserving critical thinking and sound judgment, so as not to lose sight of social responsibility and concern for humanity amid an overwhelming flow of information. He further encouraged students to remain humble, reflective, and positive, to embrace challenges with courage, and to act with sincerity and integrity in forging their own paths. As a message of encouragement, he inscribed the words "Perseverance and Moral Courage" on the KMU College board, expressing his hopes for students to face the future with determination and conviction.

KMU President Dr. MING-LUNG YU noted that the university is committed to nurturing medical and healthcare professionals who combine professional competence with humanistic care and a strong sense of social responsibility. He remarked that Academician Liang's lifelong dedication to academic research, talent cultivation, and public service provided invaluable guidance for students in their academic exploration and career planning. More importantly, the lecture prompted young people to reflect on the public role and social responsibility of intellectuals, describing it as "a learning experience marked by both depth and warmth."

KMU also stated that it will continue to invite influential role models from various fields to deliver campus lectures. Through the sharing of real-life experiences and open dialogue, the university aims to broaden students' perspectives and interdisciplinary thinking, supporting them in shaping sound values and life direction while advancing professionally, and guiding them toward a path of growth that integrates self-fulfillment with social engagement.

KMU Achieves Major Breakthrough in Innovation, Winning 13 National Innovation Awards

KMU demonstrated a significant leap in innovation capacity at the 22nd National Innovation Awards 2025, securing a total of 13 honors, including three Academic Research Innovation Awards and ten Clinical Innovation Awards. The awarded projects span a wide range of fields, including novel drug development, smart healthcare, advanced medical devices, artificial intelligence (AI), and clinical care. These achievements underscore KMU's long-term commitment to biomedical research, clinical translation, and medical innovation, while highlighting southern Taiwan's growing influence in the national biomedical innovation landscape.

The National Innovation Awards are among Taiwan's most prestigious honors in the biomedical and healthcare sectors, with evaluation criteria focusing on technological originality, clinical or market applicability, and tangible contributions to industry and society. Leveraging its comprehensive medical system and robust clinical service capacity, KMU is able to respond directly to frontline clinical needs, transforming real-world medical challenges into innovative research solutions. Through interdisciplinary integration and rigorous clinical validation mechanisms, the university accelerates technology maturation and implementation, fostering a clinical needs–driven medical innovation ecosystem.

In the Academic Research Innovation Award category, KMU's three winning technologies showcased strong research depth and commercialization potential. The team led by Professor Ming-Chung Chou developed an Intelligent Chest and Abdominal X-ray Imaging and Diagnostic System, capable of predicting optimal imaging parameters to reduce unnecessary radiation exposure while improving image quality and diagnostic efficiency. Professor Yi-Ching Lin's team introduced Drug-Impaired Driving Detection 2.0: A Saliva-Based Rapid Screening System for Etomidate, the first of its kind in Taiwan, enabling detection within ten minutes and strengthening public safety and drug-impaired driving prevention. Meanwhile, Professor Chia-Lin Kao's team presented a High-Efficiency Specialized Peptide Synthesis Technology, characterized by high yield, quality, stability, and an environmentally sustainable process, with broad applications in biomedical research and industrial development.

KMU noted that the 13 award-winning achievements are built upon extensive clinical experience and strong interdisciplinary integration derived from its comprehensive healthcare system. Several of these innovations have already completed multi-national patent portfolios. Looking ahead, the university will continue to deepen collaboration with industry partners, accelerate technology translation and clinical implementation, and build an internationally competitive medical innovation ecosystem—creating greater healthcare value and expanding opportunities within the biomedical industry.

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