

## Eyes on the next generation

Integrating a wide research reach, a young university in Taiwan has **LEVERAGED ITS MEDICAL SCIENCE STRENGTHS** to make substantial academic and social impacts.

**When Yung-Ching Wang,** founder of Formosa Plastics Group (FPG), a Taiwan-based multinational company, established Chang Gung University (CGU) in 1987, building a top university with global impact was his main aim. CGU has since built up expertise in engineering and management, which further enhanced its core programmes in medicine and biotechnology. Integrating research and education, and with an interdisciplinary approach, CGU has become a top private university in Taiwan, endowed by government agencies and enterprises, making significant societal impacts in healthcare and beyond.

### Promoting molecular medicine

Finding cancer biomarkers is essential to the delivery of precision medicine, and central to research endeavours at CGU's Molecular Medicine Research Center (MMRC). In 2016, under the guidance of distinguished chair professor, Lee Hartwell, the 2001 Nobel laureate in physiology or medicine, MMRC researchers developed a four-protein biomarker panel for oral cancer, promising for early detection using saliva samples. The

research team, led by CGU professors Yu-Sun Chang and Jau-Song Yu, used mass spectrometry for targeted protein analysis, and did case-control studies on hundreds of saliva samples to select candidate biomarkers. With the help of a biotech company for commercialisation, the finding has led to the development of an immunoassay kit and rapid strip test for oral cancer screening and detection.

Enhancing understanding of tumour biology, and responses to therapy demands integrated information at the genomic and proteomic levels. MMRC promotes data sharing and builds collaborations. In 2016 it established a formal partnership with the National Cancer Institute of the United States, and became a member in the International Cancer Proteogenome Consortium (ICPC). By sharing results, MMRC hopes that proteogenomic analysis will enable earlier cancer detection, and more reliable treatment response prediction.

### Breaking new ground for healthy ageing

Early screening and diagnosis is also the objective of CGU's Healthy Aging Research



Vice President of CGU, Kuang-Hung Hsu (seated, centre) at the inauguration of the AI Innovation Research Center

©GLOBAL VIEWS

Center. By investigating mechanisms of ageing and age-related diseases, and using health management systems, including robotic healthcare, the multidisciplinary centre attempts to develop effective prevention or intervention approaches, as well as long-term care models.

Researchers at the centre have discovered a number of metabolite biomarkers for ageing-related diseases, including metabolic syndrome and diabetes. Focusing on neurodegenerative diseases, particularly Parkinson's Disease (PD), another team used animal models and revealed how the mutation of selected genes causes the degeneration of mid-brain neurotransmitter neurons, which play an important role in reward and movement. The study

revealed a possible mechanism underlying PD.

The centre is also dedicated to improving long-term care to promote health for those with dementia. Relevant researchers found that overarching programmes combining physical and mental exercises benefit cognition and physical health of the elderly. They further identified a range of indicators, from care service to transportation, for dementia-friendly communities, informing the strategies for building a support network to help those with dementia.

### Fighting global epidemics

Infections, including hand, foot, and mouth disease (HFMD), and Ebola, pose ongoing significant public health threats, and are the focus of researchers at CGU's Research Center

for Emerging Viral Infections (RCEVI). From identifying viral pathogens during outbreaks and revealing pathogenesis, to developing vaccines and antivirals, the centre, led by CGU professor Shin-Ru Shih, aims to contribute to the control and treatment of these viral infections through bridging basic and clinical research.

Focusing on viruses responsible for severe outbreaks across Asia Pacific, RCEVI researchers have contributed to the laboratory diagnosis of picornaviruses, particularly, enterovirus A-71, known for its role in neurological diseases, and notably, HFMD in children. Their mechanistic study on viral-host interactions has led to the identification of several drug targets. They have also found a protein family that regulates

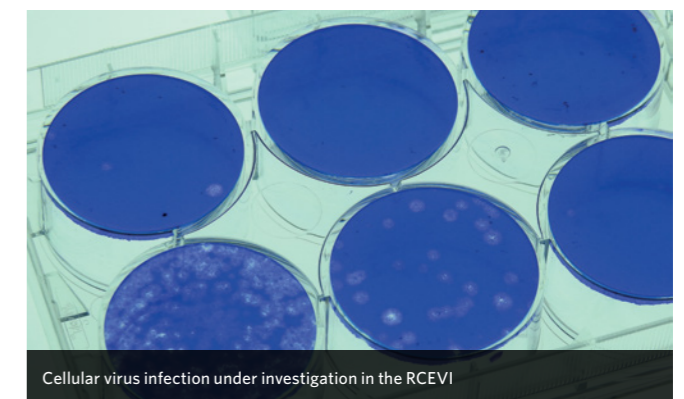
picornavirus translation, leading to improved engineering of cell lines for vaccine production. Through experiments on cells, mice, insects, and engineered organs, RCEVI is also expert at engineering recombinant viruses, which can be used as seed viruses for vaccines. One of the technologies was recently transferred to a company in Singapore for the development of multivalent enteroviral vaccines. Shih has also received many research awards for the centre's successes.

### Creating bioengineering and AI wonders

The integration of engineering and medical expertise is well represented in CGU's biomedical engineering centre, which specialises in biosensor, medical imaging and tissue engineering technologies. Led



Yung-Ching Wang, founder of Formosa Plastics Group and CGU



Cellular virus infection under investigation in the RCEVI

by Chao-Sung Lai, it focuses on designing novel medical devices and technologies to solve critical challenges in clinical diagnosis, therapies, and care.

The centre is known for using focused ultrasound to improve brain drug delivery, sharing 15% of global publications in this field. The research team, led by Hao-Li Liu, combined focused ultrasound with neuronavigation, a set of computer-assisted technologies used to guide neural surgeries for opening the blood-brain barrier. Their breakthrough allowed a non-invasive approach to deliver drugs into the brain.

In work on real-time cardiac monitoring, CGU professors, Ming-Yih Lee and Wen-Yen Lin, proposed a new system based

on mechanocardiography spectrum, focusing on the cardiac mechanic activities to provide early warnings of cardiovascular diseases.

Embracing emerging artificial intelligence (AI) technologies and in line with FPG's AI development plan, CGU established an AI innovation research centre in 2018 to develop smart medicine and manufacturing. Bridging big data, biomedical, and manufacturing industries, the centre is expected to become Asia's top multidisciplinary AI centre, and a base for cultivating science and technology talent in the field. ■



+886-3-2118800 ext. 3795, 3505  
tsuiph@mail.cgu.edu.tw  
<http://www.cgu.edu.tw/bin/home.php?Lang=en>