

## Press Release

October 30, 2018

### **The achievements of Disease-oriented research program in brain and mind sciences**

#### **Cerebellum brainwave technology highlighted by APEC for health improvement**

Taiwan has transitioned from an "aging society" to an "aged society". Although people's physical health is maintained by medicine or healthcare, the mental health is declining rapidly and irreversibly. Investigation on the pathological mechanism, diagnosis, treatment and prevention of neural diseases will make great impacts on human society. In 2017, the Ministry of Science and Technology (MOST) initiated the "Disease-oriented research program in brain and mind sciences". Through a series of cross-disciplinary brain-storming sessions, the academic community reached a consensus to focus on two topics, neural degeneration and chronic pain. Supported by MOST, the funded research teams have now made excellent achievements as shown below:

**Finding a new mechanism of acupuncture for pain relief**—Research teams of National Taiwan University and China Medical University have found that electroacupuncture at Neiguan acupoint promoted the release of endogenous cannabis to achieve analgesia. This novel analgesic effect is endorphin-independent. The research result is published in the internationally renowned journal Proceedings of the National Academy of Sciences (PNAS) in October 2018. The study clarified the neurophysiological changes of pain relief by acupuncture. The novel neural pathways identified can be drug targets for development of painkiller. This achievement has great clinical potential and has the attention by the international medical community and the media.

**Establishing a Theory of Soreness** -Soreness disturbs the daily life of patients with neuropathic and chronic pain, and causes a huge burden on medical and social resources. Although many commercially available painkiller can relieve the pain, but the soreness persists in patients. Thus, the discomfort of patients with chronic pain is very likely caused by both pain and soreness. Collaborative research teams from Academia Sinica, Taipei Medical University, Chinese Medical University, Fu Jen Catholic University and National Taipei University of Technology have proposed the Soreness Theory and proved the existence of soreness, not only pain, by animal model and clinical validation. The research team established different soreness scales for patients with fibromyalgia and lower back pain, and found that advillin protein can be used as a specific biomarker of peripheral neuralgia. The research result is published on PNAS on August 15th, 2018, and was selected as the key paper of that issue. Application for a patent is in process. This research will help Taiwan scholars lead the world in the field of soreness.

**New technology for cerebellum brainwave-** Degenerative "primary tremor" affects 4% of the population and up to one-fifth of the elderly. However, its classification is complicated. Clinical diagnosis can only be made based on the experiences of physicians. International collaborative research teams from National Taiwan University and Columbia University in the City of New York have developed a new technology to non-invasively detect brainwave from the cerebellum in clinical patients. This is the first objective biomarker for the diagnosis of primary tremor. Published in International Tremor Congress in 2018, this study has been selected as one of 13 new technologies to improve human health and as special report by the international scientific journal publisher Wiley and Elsevier. In addition, this technology was selected by MOST as one of 21 highlights of the 2018 Future Technology Expo.

**Exercise enhances spatial cognition in Alzheimer's patients-** Getting lost is

a common symptom of Alzheimer's patients. It is known that spatial cognition involves special neurons such as place cells and grid cells. The brain regions with these neurons overlap with the areas of early pathological damage of Alzheimer's disease. This may explain why early-stage Alzheimer's patients have spatial cognitive impairments such as poor sense of direction. Therefore, spatial cognition is a valuable biomarker of Alzheimer's disease. The National Cheng Kung University formed an interdisciplinary research team composed of experts in clinical dementia, sports health, aerospace, psychology, genetics and anatomy. They recruited mid-aged children of Alzheimer's parents, patients with mild cognitive impairment and mild Alzheimer's patients to participate in the study. Preliminary research, taking spatial cognition as the main target, showed that exercise intervention enhanced spatial cognition, proved by scientific evidences from structural and functional magnetic resonance imaging. This achievement helps to implement tailor-made exercise plans and also helps to identify the neurological mechanisms that cause dementia patients to get lost, hoping to eventually find cure.

The "Disease-oriented research program in brain and mind sciences" program has made remarkable achievements. To further expand cross-disciplinary cooperation and introduction of new thinking to develop innovative research and key technologies in brain and neuroscience, MOST will launch the "Taiwan Brain Technology Development and International Rising Program" in 2019. This program aims to discover the brain mystery, through cross-disciplinary cooperation between R&D experts from communication, mechanical control, clinical medicine and social science fields. This program will facilitate research and development of brain science and brain technology applications, strengthen international partnerships, and promote the development of biomedical industry.

**Media Contact:**

Dr. Ching Cheng  
Department of Life Sciences, MOST  
(886)-2-2737-7195  
[ccheng@most.gov.tw](mailto:ccheng@most.gov.tw)

■ **Finding a new mechanism of acupuncture for pain relief**

Professor Chiou, Lih-Chu

Institute of Brain and Mind Sciences, National Taiwan University College of Medicine

TEL : (886)-2-2312-3456 EXT88921 Email : [lcchiou@ntu.edu.tw](mailto:lcchiou@ntu.edu.tw)

■ **Establishing a Theory of Soreness**

Research Fellow Chen, Chih-Cheng

Institute of Biomedical Sciences, Academia Sinica

TEL : (886)-2-2652-3917 Email : [chih@ibms.sinica.edu.tw](mailto:chih@ibms.sinica.edu.tw)

■ **New technology for cerebellum brainwave**

Attending Physician Pan, Ming-Kai

Medical Research, National Taiwan University College of Medicine

TEL : (886)-2-2312-3456 EXT63178 Email : [emorymkpan@ntuh.gov.tw](mailto:emorymkpan@ntuh.gov.tw)

■ **Exercise enhances spatial cognition in Alzheimer's patients**

Professor Pai, Ming-Chyi

Department of Neurology, National Cheng Kung University

TEL : (886)-6-235-3535 EXT 5534 Email : [pair@mail.ncku.edu.tw](mailto:pair@mail.ncku.edu.tw)