

HEALTHY LONGEVITY GLOBAL COMPETITION

2020 Catalyst Awardees

Sponsor: Academia Sinica

Artificial Intelligence Assisted Early Diagnosis Mechanism for Alzheimer's Disease

Principal Investigator	Chia-Lung Liu
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Co-Investigator(s)	Feng-Jie Tsai; Mu-Liang Wang; Ting-Wu Ho

PROJECT DESCRIPTION

As the global population continues to age, the number of people suffering from Alzheimer's Disease (AD) currently accounts for two-thirds of all demented people, and it has become one of the most serious illnesses in many developed countries. AD is a degenerative and irreversible dementia. However, if diagnosed early, it can be treated early and the symptoms mitigated, which could result in substantial savings from the direct costs of healthcare and from indirect costs of family members' inability to work due to patient care. AD diagnosis is not difficult. The difficulty is to diagnose the Mild Cognitive Impairment (MCI) stage before AD. People with MCI are at high-risk to later develop into AD. The differences between MCI and Normal Cognition (NC) are very inconspicuous and difficult to be accurately distinguished by physicians. This proposal plans to diagnose AD early, and the goal is to identify the MCI stage before it evolves into AD. Early diagnosis and delaying the onset of symptoms will reduce social costs. This project innovatively applies a composite approach of using WiFi sensing based non-contact long-term tracking technology for Sleep Apnea and Artificial Intelligence (AI) and machine learning algorithms to detect variations in brainwaves to build a MCI stage detection model. This model can help doctors accurately determine the MCI stage to achieve early treatment and delayed onset of symptoms.

Dementia-MDIC Patch for Healthy People

Principal Investigator	Chen-Hsun Weng
PI Primary Affiliation	National Cheng Kung University, Medical Device Innovation Center (MDIC), Tainan, Taiwan
Co-Investigator(s)	Sing Yung Bu; Jamie Liao; Hans Chiang

PROJECT DESCRIPTION

For improving dementia care through innovative solutions, Dementia-MDIC is proud to present our project to have better the lives of seniors with mild cognitive impairments (MCI) and dementia. Our research has highlighted the potential of the use of technology and the Internet of Things (IoT) connections in reducing the need for emergency and institutionalized care for patients and caregivers. It also illustrates that there is a possibility to lessen the costs of healthcare systems increasing the healthcare systems' sustainability in the face of the world's aging population. Dementia-MDIC has developed a technological tool, which facilitates remote supports to patients affected by MCIs. This tool has the possibility to increase the chance of a more independent life, which is often an ongoing struggle for patients. Conditions such as dementia create serious consequences to the ability to maintain autonomy, as patients often become reliant on their relatives and health caregivers.

Dementia is a growing healthcare challenge in the world. It is undoubtedly going to present new challenges for the healthcare systems, surrounding communities, and society.

Development of Body Exoskeleton

Principal Investigator	Jung-Tang Huang
PI Primary Affiliation	National Taipei University of Technology, Taipei, Taiwan
Co-Investigator(s)	Chien-Hsun Wang; Chih-Ming Chuang; En-Yu Li; Pei-En Wu; Pei-Ying Chang; Ping-Lun Tsai; Po-Hsiang Chuang

PROJECT DESCRIPTION

This project will develop a High-load powered body exoskeleton device (patent pending) that is used to lift people. It also can prevent the disease of the waist (L5/S1) for people who work on a long-term job and provide a safer way to transfer elders from A to B. On the other hand, it decreases the speed of physical exertion when somebody carrying heavy objects or lifting people. It can also achieve the effect of preventive health care, improve production efficiency, and reduce costs. Based on longevity society, our exoskeleton target customers include healthcare providers, occupational safety/health purposes, logistics-last-mile delivery, consumer and recreational markets.

As a door opener, we are focusing on the healthcare provider. We are providing a solution to reducing the risk of musculoskeletal injuries. The procurement scheme is constructing with the subscription service with both hardware and management software. To the healthcare employer, our product not only protects the caregivers but also is an edge supervise solution of healthcare management—our gold triangle build-up with healthcare employers and caregivers. High-load powered exoskeleton (HLPE) makes a stepping stone into longevity society.

HLPE with Innovative Hub Servo solution, which a hub style high-torque actuator and patent-pending planetary-gear speed reducer with regional manufacturing resources in Taiwan. It gives us active and intelligent lifting torque also with a friendly price. i.e., we meet the general market.

Mechanism of Gut Microbiota-Regulated Cardiac Repair After Infarction in Aged Mice

Principal Investigator	Patrick C.H. Hsieh
PI Primary Affiliation	Institute of Biomedical Sciences, Academia Sinica, Taipei, Taiwan
Co-Investigator(s)	Byron Chen

PROJECT DESCRIPTION

Myocardial infarction (MI) remains the leading cause of mortality across all industrialized nations and the mortality rate of patients suffering from acute MI increases with age. In aged mice, the immune-inflammatory responses and cardiac repair capability decreases after MI. Moreover, a recent study shows that the gut microbial composition is capable of affecting the host immune homeostasis after MI. As an important immune modulator, we therefore hypothesized that gut microbiota may have an impact on the efficiency of post-MI cardiac repair in aged hosts. The correlation between gut microbiota and the severity of MI in aged hosts, and the mechanism(s) underlying this correlation remains unclear. Therefore, understanding how gut microbiota communicates with the aged host to protect the hearts after MI is essential. Characterizing the mechanisms underlying these effects will not only enhance our understanding of the use of antibiotics during the treatment of MI, but also allow the development of new cardiac protective therapies using probiotics or metabolite supplementation.

Targeting Dietary Restriction-Associated Gut Microbiota to Prevent and Treat Age-Related Cognitive Decline

Principal Investigator	Pei-Yu Wang
PI Primary Affiliation	Graduate Institute of Brain and Mind Sciences, College of Medicine, National Taiwan University, Taipei, Taiwan
Co-Investigator(s)	Wei-Sheng Lin

PROJECT DESCRIPTION

Cognitive decline is a critical health and social issue for aging populations in modern society. Dietary restriction (DR, 20~40% reduction in daily food intake) has long been recognized as the most effective anti-aging intervention, and while DR enhances longevity and prolongs healthy lifespan, it also has remarkable positive impacts on cognition. Because it is challenging to practice DR in our daily lives, this study aims to decipher the mechanisms underlying DR-induced benefits, and to identify potential druggable targets, providing data that will shed crucial light for the future treatment of age-related dysfunction. DR has been shown to induce altered composition of gut microbiota, which is heavily implicated in cognitive regulation, through the so-called microbiota-gut-brain axis. In this project, we hypothesize a critical role for gut microbiota in the mediation of DR-related benefits on the aging brain, and we aim to investigate the potential for this model in the prevention and treatment of age-related cognitive decline. Our goal is to identify novel probiotics, microbiota-derived compounds, and host metabolites, with the potential to mitigate cognitive aging.