

PRESIDENT'S SCIENCE AWARD 2018

Team comprising:

Professor Tan Eng King

Deputy Medical Director (Academic Affairs), National Neuroscience Institute
Senior Consultant, Neurology, National Neuroscience Institute Director,
Research, National Neuroscience Institute Professor,
Programme in Neuroscience & Behavioural Disorders,
Duke-NUS Medical School Co-Director,
American Parkinson's Disease Foundation International Center of Excellence
(National Neuroscience Institute) Associate Designated Institutional Official
(Research),
SingHealth Residency Academic Vice Chair (Research), Neuroscience Academic
Clinical Program

Associate Professor Lim Kah Leong

Head, Department of Physiology
Yong Loo Lin School of Medicine
National University of Singapore
Visiting Lead Scientist, National Neuroscience Institute
Associate Professor, Duke-NUS Medical School

Professor Ng Huck Hui

Executive Director
Genome Institute of Singapore, A*STAR

Associate Professor Louis Tan

Senior Consultant, Neurology, National Neuroscience Institute
Deputy Director, Research, National Neuroscience Institute Academic
Deputy Vice Chair (Research), Neuroscience Academic Clinical Program

“For outstanding contribution in the field of Parkinson's Disease, galvanising clinical research and transforming patient care through the identification of clinical biomarkers, development of novel models and therapeutics.”

Professor Tan Eng King and team are recognised for their outstanding contributions in identifying clinical biomarkers, developing novel models and therapeutics for advancing the understanding and management of Parkinson's Disease (PD) over the last five years. Their research has facilitated partnerships with industry, clinical and research institutions and has led to enhanced healthcare policies that support improved clinical care for patients with PD in Singapore. The team's work exemplifies the concept and significance of actualising "bench to bedside", from research endeavours to clinical outcomes.

Neurodegenerative diseases pose a significant burden on our healthcare system with our rapidly ageing population. The World Health Organization (WHO) predicts that by 2040, neurodegenerative diseases such as dementia and PD will overtake cancer to become the second leading cause of death. In Singapore, more than 30% of the national burden of disease is borne by the elderly. A high proportion of years lived with disability is attributed to neurodegenerative diseases. Although not life threatening, the debilitating nature of these diseases exacts a huge toll on our healthcare system.

Recognising the challenges that PD patients face in their daily lives, the team developed an integrated research plan to improve the clinical management of PD. Through the identification of its disease burden, clinical and genetic biomarkers, the team spearheaded the development of novel disease models with probes for the testing of new therapeutic targets.

They conducted epidemiologic studies to establish disease prevalence and life time economic burden, and identified critical pharmacologic side effects that led to changes in treatment paradigm in Singapore and influenced drug regulatory changes globally. They identified monoamine oxidase inhibitors as drugs that are able to slow down disease progression, and subsequently developed a novel probe that is able to monitor the activity and act as a surrogate marker for the disease. In addition, they have also identified Asian specific genetic markers (that are present in millions of healthy individuals) that can protect against or increase the risk of the disease. This discovery allows them to screen at risk individuals for neuroprotective therapies.

The team created the world's first three dimensional midbrain organoid that produces neuromelanin, a characteristic hallmark found only in human brains. Next, they developed the PD midbrain models that harbour biomarkers and genes identified from patients. Their hallmark research culminated in the discovery of a direct pathophysiologic connection between two major proteins that are involved in both Alzheimer's disease (amyloid precursor protein) and PD (leucine rich repeat kinase 2). This link explained why these two most common neurodegenerative conditions sometimes coexist in the same patient. The novel finding has led to the experimental trial of a clinical grade drug in the human organoid model for its future evaluation in clinical trials.

In essence, the team's research has led to new treatment guidelines for PD patients, the formulation of improved healthcare policies and the development of an authentic human midbrain model, redefining the standard of care globally. The innovative scientific insights harvested from clinical disease biomarkers, serve as a crucial preclinical platform

to test newly discovered drug targets, changing the landscape for the treatment and management of Parkinson's Disease.

Professor Tan and his team's transformative contribution to the field of PD has enhanced NNI's international standing and achieved recognition from the Parkinson Foundation as an international centre of excellence. The team's individual global ranking as scientists has also risen with their outstanding efforts. Professor Tan has recently been awarded the Marsden Lectureship, one of the most prestigious global accolades, for his contribution to basic translational research in this field.

For their outstanding contributions in the field of Parkinson's Disease, galvanising clinical research and transforming patient care through the identification of clinical biomarkers, development of novel models and therapeutics, Professor Tan and team are awarded the 2018 President's Science Award.