

PRESIDENT'S SCIENCE AWARD 2020

Professor Liu Jianjun

Deputy Executive Director, Genome Institute of Singapore,
Agency for Science, Technology and Research

Professor, Yong Loo Lin School of Medicine, National University of Singapore

“For his outstanding contributions to genetic studies of Asian populations, which has advanced biomedical research and precision medicine, and benefited clinical practice in the prevention of diseases and adverse drug responses”

Professor Liu Jianjun is a leading human geneticist who studies Asian populations and has advanced the understanding of diseases and treatment outcomes among Asians through his work in the field. He is currently the Deputy Executive Director at the Agency for Science, Technology and Research's Genome Institute of Singapore (GIS) and Professor at the Yong Loo Lin School of Medicine, National University of Singapore (NUS).

The genetic diversity of humans is not only shown in the varied physical appearances of individuals, but also in their different risk levels in developing diseases, as well as their differential responses to treatment. Genetic diversity is the result of human evolution and migration and understanding it allows us to understand our history, and our health.

In the past decade, there has been a revolution in human genetic research, ranging from single gene analysis to systematic genomic studies, leading to the discovery of over 100,000 genetic variants that are related to human diseases and health. Asian populations are often understudied and this, if not remedied, would preclude Asians from enjoying the full benefits of the genetic revolution with its promise of improving health and treatments.

By collaborating with clinician scientists and many research groups in Singapore and Asia, Professor Liu has established an internationally recognised and distinctive research programme on the genetics of Asian populations. His research has not only advanced the biological understanding of diseases that are prevalent in these populations, but he has also discovered Asian biomarkers that have been translated into clinical practice and enabled the prevention of diseases and adverse drug responses (ADRs).

For example, by carrying out systematic studies of leprosy, Professor Liu has revealed the molecular mechanism by which the human immune system regulates and defends against the mycobacteria that are responsible for this infection.

One of the key drugs used for treating leprosy is dapson, and Professor Liu has also discovered that an Asian specific biomarker, HLA-B*1301, is the genetic determinant of Dapsone Hypersensitivity Syndrome (DHS), a deadly ADR associated with its use. This discovery has been successfully translated to the clinical setting with the implementation of HLA-B*1301 testing before dapson is used thereby reducing the risk of DHS.

Professor Liu was part of a team that discovered the specific risk strains of Epstein-Barr Virus (EBV) which are most strongly associated with the development of Nasopharyngeal carcinoma (NPC), a nose cancer that is endemic to South China and Southeast Asia, but very rare in other regions. These EBV risk strains were found to be much more common in NPC endemic regions and were responsible for over 80 per cent of the overall risk for developing NPC. These EBV risk strains can thus be used as biomarkers to identify individuals with high risk for NPC, which will enable early diagnosis and improved survival rates. The discovery also opens up the possibility of preventing NPC by eliminating infection with these EBV risk strains for example, through vaccination.

Professor Liu has also carried out a pioneering study where 5,000 Singaporeans were analysed by whole genome sequencing. This study revealed the genetic architecture and evolutionary history of Asian populations, created the largest genetic bank of Asian populations and piloted technologies and local infrastructure for high-throughput genome sequencing analysis, empowering further genetic studies of Asian populations. This effort was part of the initial phase of the National Precision Medicine programme in Singapore.

Besides leading a competitive research programme on Asian genetics, Professor Liu has also contributed to building technical capabilities and infrastructure for high-throughput genomic analyses in Singapore.

Professor Liu as a leading Asian genetic studies expert has published over 400 papers, including a dozen papers in top medical and scientific journals, such as New England Journal of Medicine, Cell, and Nature Genetics. With over 32,000 citations and a H-index of 81 (Web of Science 2020), Prof Liu's research is well-cited by the international research community. In recognition of his research excellence in the field, Professor Liu was awarded the "Chen Young Investigator Award" by the Human Genome Organization in 2011 and was named one of "The World's Most Influential Scientific Minds" by Thomson Reuters in 2015.