

SCOPE

LATEST NEWS & EVENTS @ NMRC

Issue 04 | April 2021

NMRC National Medical
Research Council
Singapore

P.2 Driving Clinical Research,
Innovation and Translation
with CRIS

P.3 The Fight Against
Viral Diseases

P.4 Saving Lives with a
Sound Heart



Featured

WINNERS OF THE NMEA 2020

The National Medical Excellence Awards (NMEA) recognises contributions to innovations in healthcare, patient safety standards, clinical quality, research and education towards the improvement of lives.

On behalf of MOH Senior Management, we would like to extend our hearty congratulations to all NMEA 2020 award recipients.

INDIVIDUAL AWARD



**Associate
Professor
Sum Chee
Fang**

National Outstanding Clinician Award

For his exemplary contributions and unwavering commitment to developing and advancing diabetes and endocrinology care

- Senior Consultant, Division of Endocrinology, Khoo Teck Puat Hospital
- Senior Consultant, Diabetes Centre, Admiralty Medical Centre



**Professor
Yong Eu
Leong**

National Outstanding Clinician Scientist Award

For his outstanding research in women's health and human fertility, and his exemplary leadership in innovations to improve medical care

- Senior Consultant, Department of Obstetrics & Gynaecology, National University Hospital
- Professor, Department of Obstetrics & Gynaecology, Yong Loo Lin School of Medicine, National University of Singapore



**Associate
Professor
Keson Tan**

National Outstanding Clinician Mentor Award

For his vision, passion and dedication in grooming future generations of dentists

- Senior Consultant, National University Centre for Oral Health, Singapore
- Associate Professor, Faculty of Dentistry, National University of Singapore



**Associate
Professor
Nicholas
Chew
Wuen Ming**

National Outstanding Clinician Educator Award

For his inspiring dedication and exemplary contributions in advancing graduate medical education

- Group Chief Education Officer, National Healthcare Group
- Chairman Medical Board, Woodlands Health Campus
- Senior Consultant, Department of Psychological Medicine, Tan Tock Seng Hospital



**Dr Chow
Mun Hong**

National Outstanding Clinical Quality Champion Award

For his inspiring leadership, exemplary efforts in advancing system-wide quality and safety for patients, and commitment to developing future generations of healthcare professionals

- Senior Consultant, Director (Quality Management), Chief Risk Officer, SingHealth Polyclinics
- Clinical Assistant Professor, Duke-NUS Medical School
- Vice-Chair, Strategy and Innovation, SingHealth Duke-NUS Family Medicine Academic Clinical Programme

TEAM AWARD



**Dr Chua
Mei Chien**



**Dr Pooja
Agarwal
Jayagobi**



**Ms Wong
Anng Anng**

National Clinical Excellence Team Award

For their outstanding contributions and achievements in establishing a national Donor Human Milk Bank programme for the benefit of premature and critically ill babies in Singapore

- KK Women's and Children's Hospital



BUILDING SYNERGY

DRIVING CLINICAL RESEARCH, INNOVATION AND TRANSLATION WITH CRIS

CRIS

Consortium for Clinical Research and Innovation Singapore



Business Units Under CRIS

- Singapore Clinical Research Institute (SCRI)
- National Health Innovation Centre Singapore (NHIC)
- Advanced Cell Therapy and Research Institute, Singapore (ACTRIS)
- Precision Health Research, Singapore (PRECISE)
- Singapore Translational Cancer Consortium (STCC)

The Consortium for Clinical Research and Innovation Singapore (CRIS) brings together five research platforms and programmes as business units under a single management and governance structure.

Singapore's continued investment in biomedical sciences has led to the development of national-level initiatives in the areas of research and translation into clinical applications, as well as emergent clinical services. Over the years, various research platforms and programmes have been established as part of MOH's efforts to support medical research and the translation of such research into clinical applications.

With several of such research initiatives having been established, it has become necessary to consolidate resources and create efficiencies under a single organisational structure, to allow for a single point of contact for academic and

clinical collaborations. CRIS comprises five business units, with the aim of building synergies in research efforts to promulgate strategies for clinical research and translation for Singapore.

The business units of CRIS cover a broad spectrum of activities, both in research activities and corporate functions — from clinical trials, medical technology development, precision medicine, to cell therapy manufacturing and cancer translation. With multiple entities contributing to the research efforts and staffing, from the public hospital, universities and A*STAR, this diversity is CRIS' source of strength. For more information, visit www.cris.sg.

We aim to keep Singapore competitive and at the cutting edge, for the benefit of our patients and to build a thriving biomedical research ecosystem.



Dr Danny Soon
Chief Executive Officer, CRIS
Executive Director, SCRI

Business Units at a Glance



Supports investigators in clinical trial design, grant applications, and trial execution through project and data management teams, and provides access to regional research networks.

✦ www.scri.edu.sg



Provides translational funding and strategic guidance to clinician projects in medtech and biotech which have resulted in licensing and spin-off opportunities.

✦ www.nhic.sg



Amalgamates the cell therapy labs in NUH, SGH and HSA to establish a state-of-the-art GMP facility to benefit patients and grow an industry presence in Singapore for cutting-edge therapeutic modalities.

✦ www.actris.sg



Coordinates the whole-of-government effort to implement Phase II of Singapore's 10-year National Precision Medicine programme to further enhance the precision medicine platform infrastructure in sequencing and data analytics.

✦ www.npm.sg



Brings together cancer clinical research from the two largest cancer centres — SingHealth and the National University Health System — for greater impact on patients and researchers.

✦ www.stcc.sg



BEHIND THE SCIENCE

THE FIGHT AGAINST VIRAL DISEASES

Developing Vaccines for Mosquito-Borne Diseases and Other Viruses

“*Translational research thrives in an entire ecosystem consisting of academia, start-up biotechs and big pharma R&D. Each has a unique role to play in the chain of therapeutic and vaccine translation.*”

Professor Ooi Eng Eong



Frustrated by the lack of cures for common diseases, Prof Ooi Eng Eong took it upon himself to aid in developing a better understanding of the molecular processes that lead to disease manifestation. His fight against dengue began by chance during a major dengue outbreak in Singapore in 1998. With no research laboratory working on dengue at the time, he jumped on the opportunity to pioneer local research on the disease, which then paved the way for research on related diseases such as Zika and yellow fever.

Prof Ooi's early research on dengue largely revolved around uncovering the cause of the disease's re-emergence in spite of the country's intensive mosquito control — a combination of lowered herd immunity and a shift of virus transmission from domestic to non-domestic settings which led to yearly rising numbers of adult dengue cases. These findings prompted Prof Ooi to look into the challenges of dengue vaccine development.

A major hurdle in the development of the vaccine was the potential for the antibodies produced by vaccination to worsen dengue. His laboratory thus focused on identifying the mechanisms of antibody-dependent enhancement (ADE) of dengue virus infection — a key underpinning process of severe dengue. The understanding of the mechanisms of ADE unexpectedly led to a collaboration with the Sasisekharan Lab from the Department of Biological Engineering in the Massachusetts Institute of Technology (MIT). Together, they designed and assessed the potency of candidate therapeutic antibodies against dengue and other related viruses and brought these antibodies to clinical trials. Studies on ADE and other aspects of dengue pathogenesis also opened new doors for vaccine development, including a collaboration with Arcturus Therapeutics Inc, a San Diego-based biotech company to develop a self-replicating RNA vaccine against COVID-19. This vaccine is currently in clinical trial.

A nominee for the ST Asians of the Year Award, Prof Ooi has served on Scientific Advisory Boards on dengue for various vaccines and pharmaceutical companies. His research work has been featured in over 200 publications, earning him the National Medical Research Council Clinician-Scientist Award (Senior Investigator) in 2010, 2014 and 2019. He attributes his scientific success to his team of highly trained scientists and experienced technologists, who have worked with him on his research.

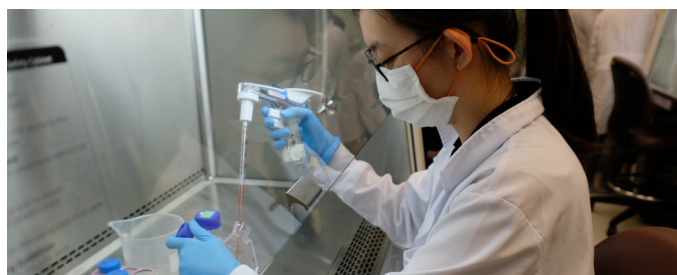
Notable breakthroughs and discoveries:

- Established an understanding of the molecular interplay for antibody-enhanced dengue infection, as well as how the infection pathway alters cellular response to infection
- Discovered the genetic changes on the dengue virus genome that impact its ability to spread and cause epidemics
- Dissected the human response to the live attenuated yellow fever vaccine, gleaming knowledge that can be used in COVID-19 vaccine development
- Co-founded Tychan Private Limited, a local clinical-stage biotechnology company that develops therapeutic antibodies for emerging viral diseases
- Co-established the Viral Research and Experimental Medicine Centre (ViREMiCS) at the SingHealth Duke-NUS Academic Medical Centre to accelerate bench to bedside translation

What Makes Work Rewarding

“Research has been an exciting and rewarding journey. Learning new things about how viruses and how our bodies defend against virus infection is always thrilling. More importantly, being able to see how our research is able to benefit the prevention and treatment of viral diseases is particularly satisfying.”

- Prof Ooi Eng Eong



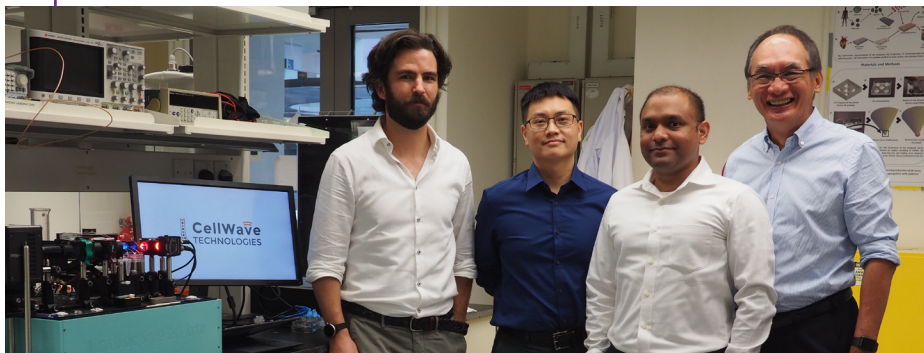
Cells are grown for use in viral infection studies which are conducted for vaccine development



FROM LAB TO LIFE

SAVING LIVES WITH A SOUND HEART

Innovation to Startup (I2Start*) Project — CellWave™: A Revolution in Single Cell Sorting



The team behind CellWave™ (from left to right): Dr. Richard O' Rorke, Assoc Prof Ye Ai, SUTD, Asst Prof. Chrishan Ramachandra, NHCS and Mr Robert Fu

Hear disease is one of the global leading causes of death today. Currently, most therapies used for heart disease are generic and could be ineffective, necessitating the need for more personalised therapies to improve clinical outcomes. With induced pluripotent stem cell (iPSC) technology, patient-specific heart cells can be generated as a humanised platform for the development of personalised therapeutics. A drawback of this technology is the mixing of heart cells with other cell types, which could hinder the interpretation of novel findings. Hence, the development of a technology that can isolate and purify heart cells would aid in the rapid development of targeted therapeutics.

A limitation to existing cell isolation tools is their inability to achieve high purity and preserve viability, especially for sensitive cell types like heart cells. This creates a bottleneck for many translational applications in both biomedical and clinical workflows. To address this problem, a team from National Heart Centre Singapore (NHCS) and Singapore University of Technology and Design (SUTD) collaborated to develop CellWave™, a benchtop-scale microfluidic fluorescence-activated cell sorting system capable of isolating heart cells from mixed cell populations, while maintaining high viability.

With CellWave™, heart cells that are targeted with specific dyes are isolated from mixed cell populations using focused sound waves — a gentler approach to conventional means, thereby preserving both viability and functionality which facilitates downstream applications. The ability to obtain pure heart cells opens avenues for regenerative medicine, deepens our understanding of disease mechanisms and facilitates high-throughput drug screening, with the ultimate aim of developing personalised therapeutics to improve clinical outcomes for heart disease.

*I2START is a tripartite partnership between National Health Innovation Centre Singapore (NHIC), Singapore MIT Alliance for Research and Technology (SMART) Innovation Centre and Enterprise Singapore (ESG) that strategically brings together funding and resources to support spin-offs from public healthcare institutions.

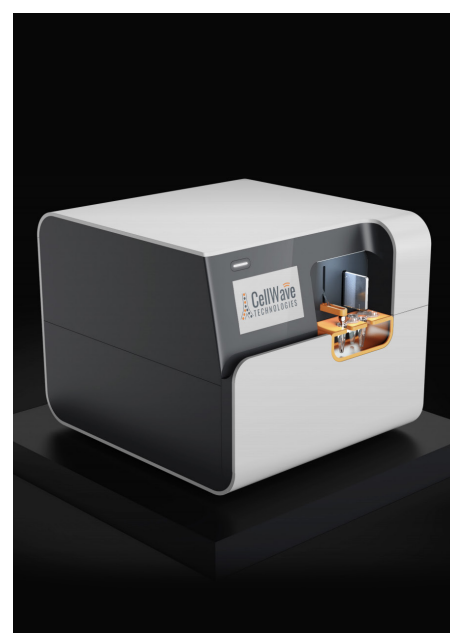
Insights from NHIC

What were the reasons behind the decision to fund this project?

CellWave™ Technology is a platform that has competitive advantages over current products which will significantly improve the workflow for many downstream applications such as cell line development, antibody discovery, precision medicine and NGS.

Are there plans for future implementations of CellWave™?

The team is planning at least three implementations of the product. The current implementation is for purifying cell samples by removing dead cells from the sample without causing damage to the live target cells. The primary target markets are service providers and laboratories doing single cell sequencing. The second implementation will enable detection and isolation of multiple cell types, with the target market being researchers in precision medicine discovery and testing. Beyond that, the company plans to implement label-free cell sorting to avoid encumbering target cells with fluorescence tagging.



The CellWave™ Technology isolates heart cells from mixed cellular populations using focused sound waves

CellWave™



Uses highly focused acoustic sound waves to gently isolate labelled target cells



Less than 4% of sorted cells are damaged



Preserves high viability of cells for downstream applications



High purity yield



Fast sorting