THE SCOPE
LATEST NEWS & EVENTS @ NMRC
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Featured

UNDERSTANDING COVID-19, A GLOBAL PANDEMIC

Covid-19 in Singapore

- 23 JAN 20 — First imported case
- 04 FEB 20 — First local case
- FEB 2020 — Formation of RWG COVID-19 Research Fund Established First Grant Call
- MAR 2020 — Second Grant Call
- MAY 2020 — Third Grant Call

Singapore reported its first imported case of Coronavirus Disease 2019 (COVID-19) on 23 January 2020, followed by the first local case on 4 February 2020. The National Centre for Infectious Diseases (NCID), with guidance from Chief Health Scientist (CHS) Prof Tan Chorh Chuan, coordinated a national COVID-19 Research Workgroup (RWG) to swiftly identify key research areas to support the outbreak management and control in Singapore. The RWG — comprising researchers, clinician-scientists and public health experts from across a wide range of institutions in Singapore — has been working very closely with MOH and NMRC.

The COVID-19 Research Fund was then established in February 2020 to support research efforts needed for the outbreak response. The first grant call was launched in February 2020 to support COVID-19 related research in the four priority areas, namely (i) Viral transmission (e.g. viral shedding, duration); (ii) Pathogenesis; (iii) Serological test development; and (iv) Modelling. NCID was charged to collate the proposals and include researchers with relevant expertise from across the Public Healthcare Institutions (PHIs), Institutes of Higher Learning (IHLs), A*STAR and DSO, to form the best possible research team. The second grant call, which was an open grant call, was launched in March 2020 and priority of the funding support was given to areas of outbreak control or management in the four priority areas set in the first grant call. All applications received in the first and second grant call were evaluated by a review panel chaired by CHS via an expedited review process.

Our understanding of COVID-19 is still in a rudimentary stage, and a third grant call was launched in May 2020 to support research efforts to enable us to understand the virus better. We hope that our efforts will go a long way in contributing to the fight against this novel virus.

List of projects awarded under COVID-19 Research Fund first and second call.

Project Title	PI	Institution
Understanding the clinical features and immune-pathogenesis of COVID-19	Barnaby Young	TTSH
Integrating environmental, virological and population approaches to understand the transmission of COVID-19	Mark Chen I-Cheng	TTSH
Serological investigation of 2019-CoV infection	Wang Linfa	Duke-NUS
Modelling and analytics for the outbreak of the novel coronavirus in Singapore	Alex R Cook	NUS
Media communication, online falsehoods and population responses surrounding the novel coronavirus disease crisis (COVID-19) in Singapore	May Oo Lwin	NTU
Establishment of COVID-2019 animal infection models	Danielle Anderson	Duke-NUS
Investigating airway cell tropism, responses and entry receptor of COVID-19 virus (SARS-CoV-2) in elucidating its transmission and pathogenesis in the airway	Wang De Yun	NUS
Lung Organoids: A tool of the fourth industrial revolution to study COVID-19 pathogenesis	Sanjay Haresh Chotirmall	NTU
Covid-19 Virtual Disease health System Outcomes model for Singapore (CoViD- SOS)	Marcus Ong	SGH
Environmental SARS-CoV-2 surveillance in Singapore built environment	Stephan Christoph Schuster	NTU
Coronavirus disease-19: A seroepidemiology study among healthcare workers in Singapore (the COVSEP study)	Seet Chee Seong Raymond	NUS
Rapid Cellulose-Based Serological and Diagnostic Tests for COVID-19	Peter Rainer Preiser	CREATE-SMART
The SARS-CoV-2 Antibody Initiative	Paul MacAry	NUS
A Multicenter, Adaptive, Randomized Blinded Controlled Trial of the Safety and Efficacy of Investigational Therapeutics for the Treatment of COVID-19 in Hospitalized Adults	David Lye	TTSH
Using GM-CSF as a Host Directed Therapeutic against COVID-19 – A Phase 2 Investigator Initiated Trial	Jenny Low	SGH

UNDER THE MICROSCOPE

WALKING FOR FITNESS

A Randomized Trial of Economic Incentives to Promote Walking Among Full Time Employees

Physical inactivity increases risk for obesity, injuries and common non-communicable diseases. With sedentary lifestyles becoming increasingly common for office workers in developed nations, including Singapore, there is a greater need to tackle this problem.

These potential health problems often lead to additional costs for employers, such as increased medical expenditure, absenteeism and reduced productivity. The Ministry of Health's (MOH) 2010 National Health Survey showed a downward trend in physical activity levels among employees in Singapore, prompting the need to look into this growing problem.

Although health promotion programmes were offered in numerous work places, their reach and effectiveness were largely limited. Prior studies have shown that financial incentives encouraged positive health behaviour results only in the short-term. Furthermore, one third of activity trackers — a popular fitness motivation tool — were abandoned after six months.

Professor Finkelstein's team, in collaboration with the Health Promotion Board (HPB), then set out to test if financial incentives could encourage people to use their trackers and engage in more physical activity. The team targeted full-time employees, one of the least active groups of people in Singapore, according to HPB's Physical Activity Guidelines for Professionals. Beginning in 2012, the study gauged the effectiveness of a six-month financial incentive, as well as evaluated the use of activity trackers over a 12-month period.

The results of the study — one of the first studies of its kind — showed that activity trackers alone are not a sufficient motivator for most individuals to increase their activity levels, especially for longer periods. It also showed that financial incentives have to be sustained in order to promote higher activity levels and tracker usage, thus, suggesting that subsequent rescinding of such incentives may even be more demotivating than not providing any financial incentives to begin with.

Project Details

Status/Progress:
Completed

Project Investigators:
Professor Eric Andrew Finkelstein

Host Institution:
Duke-NUS Medical School

> ***"I'm grateful that several of our projects have achieved our goal of helping to fuel policy changes in Singapore that have direct impact on improving health, wellbeing and saving lives."***
>
> **Professor Eric Andrew Finkelstein**

Research Milestones

- Secured grant from MOH (2012)
- Published in The Lancet Diabetes & Endocrinology (2016)
- Suggested to HPB to incentivise the National Steps Challenge based on duration of moderate to vigorous activity instead of just step counts (2016)
- Discovered that employees are willing to support programmes with generous rewards, despite having to pay enrolment fees and published a paper in Applied Health Economics and Health Policy (2017)

BEHIND THE SCIENCE

GOING BEYOND SKIN DEEP

Three-Dimensional Histology, Non-Invasive Skin Imaging and Dissolving Microneedles for Keloids, with Adjunct Associate Professor Tey Hong Liang

> *"I hope that our research can alleviate suffering for people afflicted, at the individual and population level."*
>
> **Adjunct Associate Professor Tey Hong Liang**

As a dermatologist, Prof Tey has seen numerous patients suffering from long-term skin problems, with itch being the most prominent complaint in chronic skin diseases. Determined to improve outcomes and quality of life for his patients, Prof Tey and his team aimed to enhance diagnostic techniques and clinical management.

3D Histology of Skin's Nervous System

With a focus on the skin's itch nervous system, the team delved into research on 3D histology of the skin's nervous system. Using a 3D histological imaging technology developed through a collaboration with Dr Ng Lai Guan from Singapore Immunology Network (SIgN), A*STAR, the team identified and provided novel insights into the 3D neuroanatomy of the skin's nervous system, as well as the 3D pathology of the nervous system in diseased skin.

As skin is opaque, traditional histology is performed on thin 2D sections of skin, resulting in loss of information. Using chemicals for optical clearing, light is allowed to pass through the skin, facilitating 3D visualisation, which provides clinicians with 50 to 100 times more information than traditional histology. This advances patient care through an enhanced understanding of nerve architecture and how it changes in a diseased state.

Apart from the 3D imaging technology developed by NSC and SIgN, Prof Tey and his co-workers in Nanyang Technology University (NTU) also developed a 3D analytical software for images acquired through high-definition Optical Coherence Tomography (HD-OCT). The latter is a non-invasive imaging device that allows clinicians to perform in-vivo bedside imaging of the skin. Infra-red light penetrates the skin deep into the dermal layer, allowing skin tissues to be studied in their live environment, without being subjected to processing. Using in-vivo skin imaging, the team has identified the mechanism behind hypohidrosis - a condition which affects patients' abilities to sweat.

Dissolving Microneedles for Keloid Scars

Keloid scars are often unsightly, itchy, painful, and in some cases, even affect joint function. Treatment involves painful monthly triamcinolone injections by skin doctors/nurses, which usually deters patients, especially children who are unable to handle the pain.

Prof Tey and his team came up with a novel, painless treatment for keloid scars. The method utilises triamcinolone-embedded dissolving microneedles — about a hundred times smaller than conventional needles — which patients are able to self-administer via one-time use patches. Patients who are unable to receive the conventional treatment of injection can now have a treatment option.

Notable breakthroughs and discoveries:

- Identified the mechanism behind hypohidrosis, a group of idiopathic and untreatable conditions, and instituted and patent filed effective treatments
- Developed an innovative pain-free treatment for keloid scars
- Developed 12 products, with 10 active patent filings and two spin-off companies

What Makes Work Rewarding

I am grateful and heartened to see our efforts to improve clinical practice bearing fruits, and our patients with various conditions are now experiencing much better clinical outcomes.

The HD-OCT imaging modality allows non-invasive imaging and repeated in-vivo analysis of the skin

FROM LAB TO LIFE

BETTER ASTHMA CONTROL WITH THE WHIZZ

Innovation to Develop (I2D) Project: Intelligent Spacer for the Treatment of Childhood Asthma

A child using the Whizz under the supervision of a caregiver, showing optimal inhalation is being achieved

Singapore has one of the highest childhood asthma prevalence rates in the world, with one in five children diagnosed with asthma. Often, asthma is poorly controlled, leading to asthma attacks that can interrupt sleep, limit physical activities, impact school or workdays, and in the worst cases, result in emergency room visits, eventually followed by hospitalisation.

Noticing a treatment gap in supporting asthma management for a vulnerable group of patients — children and the elderly — Prof Hugo van Bever, Senior Consultant at the Paediatrics Department at National University Hospital, together with Medical Engineering Research and Commercialisation Initiative (MERCI), National University of Singapore, came up with a solution, the Whizz. Licensed to start-up company Meracle Pte Ltd, the Whizz is an intelligent spacer that provides real-time feedback to patients to adjust their inhalation technique immediately, such that it is within the optimal window for medication delivery to the lower airways. Furthermore, the Whizz is brand and inhaler agnostic, thus simplifying user experience while not limiting doctors' decisions on prescriptions. This solution becomes even more compelling in the context of the COVID-19 pandemic, as early indicators show some COVID-19 patients suffering from permanent lung function reduction, which would require chronic treatment with inhaled medication.

With correcting techniques ensuring effective treatment, the device allows patients to be more proactive while also relieving caregivers of this responsibility. Patients will also potentially spend less on urgent care if they are able to manage their symptoms well. The Whizz also provides doctors with accurate data on patient compliance and adherence to proper inhalation techniques, allowing them to evaluate the effectiveness of the prescribed medication and improve quality of care. Nurses will also be able to free their time for other areas of patient care instead of asthma management training. Effective treatment at home also reduces hospital visits, reducing strain on healthcare budgets.

Benefits of the Whizz

Reminders improve patient compliance

LED indicators indicate optimal delivery of medication

Insights from NHIC

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

The team behind the Whizz has shown their commitment in working towards solving an unmet clinical need. Two solution segments available in the market today — regular spacers and connected inhalers — are unable to address problems with inhalation techniques and compliance, especially among children and the elderly. The Whizz simplifies medication protocol, providing reminders and confirmation of intakes, as well as real-time feedback that medication is optimally delivered into the patients' lungs.

Are there plans for future implementations of the Whizz?

Meracle Pte Ltd has licensed the technology in a worldwide, exclusive agreement, with plans to market the Whizz in ASEAN and Europe, followed by the rest of the world. The Whizz will first be marketed to children and the elderly, who are most vulnerable to wrong techniques and poor compliance, followed by the wider adult population, ensuring effective inhalation of medication for all.

The Whizz is paired with a mobile application via Bluetooth for reminders and updates

This newsletter is brought to you by National Medical Research Council. For queries, please email MOH_NMRC_Admin@moh.gov.sg.