



National Centre for
Infectious Diseases

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MEDIA RELEASE

**THREE NATIONAL-LEVEL SEROEPIDEMIOLOGICAL STUDIES TO DETERMINE
LEVEL OF COVID-19 INFECTION IN SINGAPORE**

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Singapore, 29 April 2020

1. The COVID-19 Research Workgroup has commissioned three seroepidemiological studies for a start to determine the proportion of the population infected by COVID-19 and to understand how different segments of Singapore's population, such as frontline healthcare workers, have been affected by SARS-CoV-2.
2. The Workgroup was set up in January 2020 to produce studies relevant to understanding COVID-19 transmission in Singapore. Chaired by National Centre for Infectious Diseases' (NCID) Executive Director Professor Leo Yee Sin and advised by Ministry of Health (MOH) Chief Health Scientist Professor Tan Chorh Chuan, the Workgroup comprises members across public healthcare institutions, Ministry of Health, DSO National Laboratories and the Agency for Science, Technology and Research (A*STAR). (See **Annex 1** for composition of Workgroup.)
3. Seroepidemiology – the use of antibody-based tests to identify which population segments have been exposed to an infectious disease, and in what proportion – is a well-established tool for managing infectious diseases. In the context of COVID-19, seroepidemiology is valuable for:
 - Accurately comparing data across different groups of people (age or geographic region), which enables within country and also international-level comparisons to understand factors which determine the effectiveness of COVID-19 control measures in the long haul.
 - Providing information to identify which proportions of the population remain susceptible to being infected, and would benefit from a vaccine, once future research determines the kind of antibodies that protect against future infection.

- Giving insight into underdiagnosed mild cases – often young, healthy individuals – such as the extent to which such cases are underdiagnosed, and how they may contribute to the spread of COVID-19.
4. “Rigorous research is critical to ensuring a coordinated, effective national-level outbreak response. In the case of COVID-19, of which much remains unknown, a swift response in clinical aspects as well as research is especially crucial to outpace the virus’ rapid spread,” said Professor Leo Yee Sin, Executive Director, National Centre for Infectious Diseases and Chair of the COVID-19 Research Workgroup.
 5. All studies are based on standardised tests of blood samples for antibodies to SARS-CoV-2, which are carried out at a single laboratory at Duke-NUS Medical School. This allows valid comparisons across different populations despite different sampling methods. Studies were planned in January 2020, soon after COVID-19 started spreading outside China.
 6. The studies are being coordinated by Dr Mark Chen, Head, NCID Research Office. To-date, National University Hospital (NUH), KK Women’s and Children’s Hospital (KKH), National University Polyclinics (NUP) and National Healthcare Group Diagnostics (NHGD) have all contributed samples to the national effort. (See [Annex 2](#) for list of contributors to the three studies.)
 7. Dr Chen said, “We have been greatly encouraged by the whole-hearted support from multiple healthcare providers to participate in this national effort to understand how COVID-19 spreads. These healthcare providers have gone the extra mile to collect samples and enrol participants from their respective institutions amidst increased workloads and operating requirements during this COVID-19 pandemic.”

STUDY ON COVID-19 EXPOSURE AND INFECTIONS AMONG SINGAPORE HEALTHCARE WORKERS

8. A seroepidemiological study is underway at NCID, Tan Tock Seng Hospital and NUH co-led by Dr Sapna Sadarangani, Infectious Diseases Consultant, NCID, Dr Mark Chen and Associate Professor Raymond Seet, Senior Consultant, Department of Medicine, NUH to assess the extent of COVID-19 exposure and infections amongst healthcare workers in Singapore. This is one of the first COVID-19 seroepidemiological studies on healthcare workers in the world. Envisioned as a longitudinal study over six – 18 months from study enrolment (contingent on the pandemic’s development), frontline staff in direct contact with COVID-19 patients, hospital staff working in non-COVID-19 patient care, as well as support staff, will be followed up on after voluntary enrolment. This will help evaluate the impact of varying degrees of exposure and whether the current measures to protect healthcare workers are adequate.
9. To-date, close to 1,100 healthcare workers have been enrolled in the study. Samples have been tested for antibodies against SARS-CoV-2 at Duke-NUS Medical School.

10. We now have the initial results from COVID-19 antibody testing at the enrolment/first visit time-point (conducted between February and early April 2020). Despite some staff having worked with COVID-19 patients for at least two months prior to the time of blood taking, our analysis suggests that none of these workers had antibody results indicative of COVID-19 infection at the time that they joined the study. This provides strong evidence that infection control and prevention procedures in Singapore's public hospitals have been adequate to protect frontline healthcare workers.
11. The study follow-up is expected to be till third quarter of 2021. The results of the study will be shared with MOH as well as the local and international infection control and prevention community, to further improve upon current protection measures for healthcare workers.
12. Co-Project Lead, Associate Professor Raymond Seet said, "We are heartened to learn that Singapore's efforts to protect healthcare workers were effective. As we are still in the early phase of the pandemic in Singapore, all healthcare workers should continue to use the appropriate Personal Protective Equipment at work and take active measures to prevent acquiring the virus from the community."
13. The study will soon be extended to other healthcare institutions including several other public sector hospitals, polyclinics and private sector primary care providers.

STUDY ON RESIDUAL SERA

14. NCID and Duke-NUS Medical School are collaborating on a seroepidemiological study to measure how widespread COVID-19 infection is in the community. This is particularly so given how some infections are mild or even without symptoms especially for children. This comparable way of measuring exposure to COVID-19 in both adults and children hopes to ensure that the measures in place in Singapore are also protecting children.
15. Studies are based on leftover blood samples from persons who had their blood taken as part of routine care. Samples studied include those from both male and female patients, and span both child and adult age groups. The blood samples, obtained from NUP, NUH and KKH were collected anonymously – but grouped by ages (20 – 29 years, 30 – 39 years, etc.) – to test if adults are more likely to carry antibodies than children.
16. While the method of using leftover samples has been used to assess levels of antibodies in other infectious diseases such as measles, dengue and Influenza A (H1N1), this is the first time it is being done for COVID-19.
17. This is an ongoing study and results from the first study show that of 774 residual samples tested (across both children and adults). None had antibody levels meeting our criteria to be considered as positive for COVID-19 infection. This demonstrates that COVID-19 exposure in the community is extremely uncommon,

indicating no widespread community transmission as of the last two weeks of March 2020.

18. "There was always a concern that surveillance systems would miss children who do not present with any symptoms. This important study confirms that the burden of COVID-19 in children remains low," said Dr Yung Chee Fu, Consultant, Infectious Disease Service, Department of Paediatrics, KK Women's and Children's Hospital.
19. Professor Wang Linfa, Director, Emerging Infectious Diseases Programme, Duke-NUS Medical School said, "At this critical juncture, it is important to know the extent of COVID-19's exposure in the community, given potential asymptomatic infection and herd immunity. We are extremely happy to participate in this collaborative study with our newly-developed seroepidemiological test, and believe it will be one of many studies needed in coming months to better understand COVID-19 and local control measures."

STUDY OF PERSONS AT HIGH-RISK OF COVID-19 EXPOSURE

20. To estimate the number of asymptomatic COVID-19 infections there are, and determine exposure risk factors for COVID-19, NCID is reaching out to about 2,000 household and close contacts of COVID-19 positive persons to conduct a seroepidemiological study.
21. Improved understanding of asymptomatic COVID-19 infections can facilitate more effective transmission risk assessments and estimations of fatality rates. In addition, exposure risk factors for COVID-19 can offer insight into the nature of transmission, informing guidance and policies to stop its spread. Results of this study are anticipated to be available in two months.
22. Participation involves answering a risk questionnaire (on the phone or online via Gov.sg) and donation of a blood sample for SARS-CoV-2 antibody testing using the test developed by Duke-NUS Medical School. Results from about 300 participants are now available. These show that 2.5 per cent had antibodies which clearly indicate that they were infected with COVID-19, despite not having a positive test during the time they were quarantined. In combination with the 2.7 per cent who tested positive for the virus during their quarantine, this indicates that about 5 per cent of household members were eventually infected after the initial COVID-19 case from that household was diagnosed. Of these, half would be asymptomatic or minimally symptomatic
23. Project Leads Associate Professor Ng Oon Tek and Dr Kalisvar Marimuthu, Senior Consultants, NCID said, "Understanding the exposure risk factors and prevalence of antibodies among symptomatic and asymptomatic COVID-19 close contacts will provide much-needed information for COVID-19 prevention policies."

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About the National Centre for Infectious Diseases

The National Centre for Infectious Diseases (NCID) is a purpose-built facility designed to strengthen Singapore's capabilities in infectious disease management and prevention. NCID houses clinical services, public health, research, training and education and community engagement functions under one overarching structure. In addition to the clinical treatment of infectious diseases and outbreak management, the expanded roles and functional units of NCID include the National Public Health and Epidemiology Unit, the National Public Health Laboratory, the Infectious Disease Research and Training Office, the Antimicrobial Resistance Coordinating Office, and the National Public Health programmes for HIV and Tuberculosis. Benchmarked to international standards and best practices for treatment and safety, NCID will better enhance Singapore's ability to respond effectively to infectious outbreaks.

Visit www.ncid.sg for more information.

ANNEX 1: LIST OF MEMBERS IN THE COVID-19 RESEARCH WORKGROUP

S/N	Name	Designation / Affiliation
1	Professor Leo Yee Sin (Chair)	Executive Director, NCID
2	Associate Professor David Lye Chien Boon (Deputy Chair)	Director, Infectious Disease Research and Training Office (IDRTO), NCID
3	Professor Tan Chorh Chuan (Advisor)	Chief Health Scientist, MOH
4	Associate Professor Tan Say Beng	Covering Executive Director, National Medical Research Council (NMRC), MOH
5	Dr Seet Hun Yew Benjamin	Group Chief Research Officer, National Healthcare Group (NHG)
6	Associate Professor Raymond Lin	Director, National Public Health Laboratory, NCID
7	Professor Wang Linfa	Director, Emerging Infectious Diseases Programme, Duke-NUS Medical School
8	Professor Laurent Rénia	Executive Director, Singapore Immunology Network (SIgN), Agency for Science Technology and Research (A*STAR)
9	Professor Lisa Ng	Senior Principal Investigator, SIgN, A*STAR
10	Associate Professor Alex Cook	Vice Dean (Research), Domain Leader (Biostatistics and Modelling), SSHSPH, NUS
11	Dr Sebastian Maurer-Stroh	Deputy Executive Director (Research), Bioinformatics Institute, A*STAR
12	Associate Professor Tan Boon Huan	Programme Director, Biological Defence, DSO National Laboratories
13	Dr Danielle Anderson	Scientific Director, ABSL3 Laboratory, Duke-NUS Medical School
14	Professor Paul Anantharajah Tambyah	Senior Consultant, Division of Infectious Diseases, NUH Head, Pandemic Preparedness Research Coordinating Office (PPRCO), NCID
15	Dr Barnaby Edward Young	Head, Infectious Disease Research Clinic, NCID
16	Dr Mark Chen I-Cheng	Head, NCID Research Office, NCID
17	Associate Professor Tan Yee Joo	Associate Professor, Department of Microbiology and Immunology, NUS Yong Loo Lin School of Medicine, NUHS
18	Professor Ng Huck Hui	Assistant Chief Executive, Biomedical Research Council, A*STAR
19	Associate Professor Justin Chu Jang Hann	Director, BSL-3 Core Facility, NUS
20	Associate Professor Yeo Tsin Wen	Associate Professor, Infectious Diseases, Nanyang Technological University Lee Kong Chian School of Medicine / Deputy Head, PPRCO, NCID

ANNEX 2: LIST OF CONTRIBUTORS TO THREE SEROEPIDEMIOLOGY STUDIES

S/N	Name	Designation / Affiliation
1	Associate Professor Ng Oon Tek	Senior Consultant, NCID
2	Dr Kalisvar Marimuthu	Senior Consultant, NCID
3	Dr Sapna Pradip Sadarangani	Consultant, NCID
4	Associate Professor Angela Chow	Head and Senior Consultant, Department of Clinical Epidemiology, TTSH
5	Dr Mohammad Yazid bin Embarak	Senior Scientific Officer, Infectious Diseases Research Training Office (IDRTO)
6	Dr Tun Linn Thein	Research Fellow, IDRTO
7	Dr Lew Yii Jen	Chief Executive Officer and Family Physician, Senior Consultant, NUP
8	Dr Meena Sundram	Dr Meena Sundram, Family Physician, Senior Consultant, NUP
9	Dr Franco Wong	Family Physician, Consultant, National University Polyclinics, NUP
10	Associate Professor Kenneth Chang Tou En	Head and Senior Consultant Department of Pathology and Laboratory Medicine, KKH
11	Dr Yung Chee Fu	Consultant, Infectious Disease Service Department of Paediatrics, KKH
12	Mr Setoh Weng Sung	Principal Medical Laboratory Scientist Department of Pathology and Laboratory Medicine, KKH
13	Associate Professor Raymond Seet	Senior Consultant, Department of Medicine, NUH
14	Professor Dale Fisher	Senior Consultant, Department of Medicine, NUH
15	Professor Ho Khok Yu	Senior Consultant, Department of Medicine, NUH
16	Dr Nancy Tee	Dr Nancy Tee, Senior Consultant, Department of Laboratory Medicine, NUH
17	Professor Linfa Wang	Director, Emerging Infectious Diseases Programme, Duke-NUS Medical School
18	Assistant Professor Danielle Andersen	Emerging Infectious Diseases programme, Duke- NUS Medical School
19	Dr Wan Ni Chia	Research Fellow, Emerging Infectious Diseases programme, Duke-NUS Medical School
20	Dr Tyrone Goh	Senior Director, National Healthcare Group Diagnostics (NHGD)
21	Ms Lim Soh Har	Executive Director, NHGD
22	Ms Serene Kho	Head, Laboratory Services, NHGD