

Ending HIV and its stigma in Singapore: The ambitious goal of the National HIV Programme

HIV & AIDS awareness

By Associate Professor Sophia Archuleta, Director and Adjunct Assistant Professor Wong Chen Seong, Deputy Director, National HIV Programme at NCID

HIV has become a simple condition to treat. Anti-retroviral therapy (ART) may not eliminate the infection, but suppression of the virus is highly effective at preventing its most serious consequence – AIDS. There is also now incontrovertible evidence that successful treatment makes it impossible for the virus to be transmitted to others through sex. This paradigm is now known as Undetectable = Untransmissible, or U=U.

The result of this is that with effective ART, people living with HIV can expect to live healthy, happy and productive lives. HIV is no longer a life-limiting diagnosis, and with access to treatment, people living with HIV are no different from people living with other chronic diseases like diabetes and hypertension.

Achieving this for all people living with HIV in Singapore is at the core of the National HIV Programme (NHIVP). This means providing patient-centred, evidence-based care for people living with HIV in Singapore. But the goals of HIV care go beyond the prolonging of life, to include the assurance of quality of life, so it also means challenging the stigma and discrimination which continues to affect the health and wellbeing of the individual, as well as for the community as a whole.

Our vision requires a concerted and multi-disciplinary effort involving professionals and community stakeholders alike. One of the core values guiding HIV care is that people living with HIV should be treated with dignity and respect, and the NHIVP aims to reduce HIV-related stigma and discrimination in Singapore by raising awareness of key messages.

Firstly, people at risk of infection need to come forth for testing, and if tested positive, to receive treatment and stay in care. We believe this is best achieved through increasing knowledge and awareness of HIV/AIDS, and reducing the stigma associated with the disease – something that the NHIVP will seek to achieve through our educational and outreach activities aimed at healthcare workers and members of the public alike.

Secondly, we strongly feel that people living with HIV should be treated fairly and equally in all domains. Their rights to employment, education, access to care, sexuality and service to society should be protected.

Thirdly, prevention of HIV infection is also of vital importance, and we pursue this through traditional and innovative prevention strategies alike. Close co-operation between care providers, community-based organisations with a focus on HIV, policy-makers and public institutions, academics and researchers, and, most importantly, affected populations is needed to ensure the continued success of HIV care programmes in Singapore. This lies at the heart of the mission and vision of the NHIVP.

With the engagement and support of our stakeholders and partners, we have an ambitious goal: ending HIV in Singapore in our lifetimes!

Invitation to NCID Official Opening Community Open House

7 September 2019, Saturday
Screening Centre, NCID

<https://bit.ly/2JrthkZ>

Tuberculosis

Are we winning the war?

By Associate Professor Cynthia Chee, Senior Consultant and Director of the Tuberculosis Control Unit and Director, Singapore TB Elimination Programme at NCID and Professor Leo Yee Sin, Executive Director of NCID

TB, an airborne infectious disease caused by the bacteria *Mycobacterium tuberculosis*, has afflicted man for millennia. It has claimed over a billion lives in the last 200 years, more than any other infectious disease in history. The World Health Organization (WHO) declared TB a global emergency in 1993. Despite this, 25 years on, TB is reported by the WHO as the leading cause of death globally from a single infectious agent, with an estimated 1.6 million deaths and 10 million persons afflicted in 2017.

Why is TB still a major global health threat today?

The highest priority in TB control is the early detection and successful treatment of persons with active, infectious TB to cut the chain of transmission in the community. Treatment of active TB disease however is difficult for many patients as it requires strict adherence to multiple drugs for six to nine months, failing which patients risk remaining infectious, developing drug resistance and future relapse.

Many countries where TB is an endemic struggle with inadequate healthcare infrastructure and systems, making the prompt diagnosis and successful treatment of active TB disease difficult. Even in developed countries, lack of political will in implementing programmatic public health measures impede progress in TB control.

The next priority in TB control is contact investigation to trace close contacts of infectious TB patients to detect and treat latent TB infection or active TB in these persons. This requires the cooperation of the TB patient in accurately identifying his or her close contacts, and that of the identified contacts to undergo testing and treatment if indicated. This resource intensive activity is accorded high priority in low TB incidence, high income countries but is a challenging undertaking for the overburdened, underfunded TB programmes of developing countries.

Over the last 20 years Singapore's national TB programme has implemented three key interventions to reduce the threat from TB in Singapore: Directly Observed Therapy (DOT); close surveillance of treatment progress and outcomes of all patients with active TB infection; screening close contacts and treating those with latent TB infection.

These measures have helped to reduce our TB rate from 58/100,000 population in 1998 to a historical low of 35/100,000 population in 2007. This trend reversed in 2008 and our rate has remained at ~40/100,000 population since. This is 10 times higher than that of the United States, Canada, Australia and New Zealand.

The obvious question is why our TB rate has not continued to decline over the past decade. We believe multiple factors account for this. Most important is the ongoing evolution in Singapore's demographics i.e. an aging population. Many older adults acquired a latent TB infection in the 1950s and 60s when Singapore's TB rate was very high (~300/100,000 population). The influx of permanent and transient migrants from high TB incidence countries also now form an increased pool of persons with latent TB from which active TB cases arise. A survey by the National University of Singapore reported latent TB prevalence of almost 30% in persons older than 70 years old, and in citizens and PRs originating from nearby high TB prevalence countries, as compared to ~5-10% among younger local-born Singapore residents.

We also believe that the stagnation in our TB rate is due to on-going community transmission resulting from delay in TB diagnosis amidst a backdrop of urban, high density living. Data from the national TB registry shows that almost one in five infectious TB cases had more than three months of cough before they were diagnosed. It is also the experience of the TB Control Unit that patients with infectious TB are reluctant to identify their close contacts who are not their household or family members. For the TB rate to be further brought down in Singapore, a concerted effort to address these issues is required.

How can the community help in the fight against TB? TB disproportionately affects the poor and disadvantaged in society and too often, the diagnosis of TB carries with it fear of stigmatisation, loss of livelihood, and rejection by family, colleagues and friends. Financial and non-financial barriers to early diagnosis of TB must be removed. The community can show its support for the TB patients by encouraging and facilitating adherence to DOT. The community should also appreciate TB patients for identifying their close contacts. Ultimately, this will be in the interest of the local and global community.



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We have been progressively opening our doors at NCID since late November last year starting with our Specialist Outpatient Clinic.

The clinic was soon followed by the opening of cohort and negative pressure wards in December. Thereafter other units including the administrative and public health offices, National Public Health Laboratory, research and clinical laboratories, operating theatres, ICUs and Screening Centre were progressively commissioned and operationalised. I am happy to share that since May this year, NCID has been fully operational with new and enhanced outbreak facilities designed to strengthen Singapore's capabilities in infectious disease management and prevention.

In this issue, we showcase the integrated clinical expertise and outbreak surveillance at NCID through our Special Precaution Area, High Level Isolation Unit and National Public Health Laboratory.

We also bring you two opinion pieces. The first on why tuberculosis rates in Singapore have remained stagnant and how the community can help in the fight against TB. And the second on how the National HIV Programme aims to reduce HIV-related stigma and discrimination in Singapore.

This is the second issue of NCID News. Produced twice a year, NCID News brings you the latest developments in infectious diseases. Our next issue out in January 2020 will share with you more information. Keep a look out for it.

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BUILDING ON SINGAPORE'S OUTBREAK CAPABILITIES

By Emma Seow, Manager, Executive Director's Office at NCID

Effect of carbapenem resistance on outcomes of bloodstream infection caused by Enterobacteriaceae in low-income and middle-income countries (PANORAMA): a multinational prospective cohort study

Much of what is known about the consequences of bacterial resistance to antibiotics comes from high-income countries which have more resources available for bench and bedside research. The PANORAMA study was designed and implemented by Dr Marimuthu Kalisvar, Senior Consultant, NCID, Dr Andrew Stewardson, Monash University, Melbourne and Prof Stephan Harbarth, Geneva University Hospital, Switzerland, to fill in this knowledge gap by studying the effects of infections with carbapenem resistant bacteria on patient outcomes in low-middle income countries (LMICs).

Consecutive patients with carbapenem-resistant Enterobacteriaceae (CRE) (n=123) and carbapenem-susceptible Enterobacteriaceae (CSE) (n=174) bloodstream infections were recruited from 10 countries in Africa, Asia, South America, and Eastern Europe. Patients with infection from a CRE required longer hospital stays and had almost a 70% increased probability of death. Sequencing of the bacterial genomes revealed significant differences between the resistance genes of CRE bacteria circulating in LMICs compared to high-income countries.

NCID shares the hope of the investigators that this data will inform global estimates of the burden of antimicrobial resistance and reinforce the need for better strategies to prevent, diagnose, and treat CRE infections in LMICs. The PANORAMA study was published in The Lancet Infectious Diseases, June 2019.

NCID's swift and targeted response to Singapore's first imported case of monkeypox

The imported case of a monkeypox virus infection in May this year was an early test of how NCID plays a key role in managing infectious disease outbreaks – from patient care, to screening of contacts and public education.

After recognition of a possible unusual infection by the emergency department, in consultation with NCID clinicians, the patient was immediately admitted to our isolation facility. Patient samples were collected and sent to the National Public Health Laboratory (NPHL) located within the NCID building. Within 30 hours of admission, our team at NPHL had performed a molecular test for orthopoxvirus and Electron Microscopy (EM) for swift confirmation of the monkeypox pathogen.

A crucial aspect of efficient outbreak management is high level of awareness, having the knowledge and technological capabilities, and expertise to detect and confirm previously unknown or rare pathogens. NPHL is the only facility for virus diagnosis in Singapore and one of a network of specialised EM labs in the world trained and prepared to look at Risk Group 3 (RG3) and emerging infectious disease (EID) agents.

The success of NCID's infrastructure and capabilities are dependent on the expertise and domain knowledge of our healthcare professionals to address new bio threats and EIDs. NCID's multi-disciplinary team of clinical professionals, scientists and operations specialists demonstrated how we are well-equipped with the necessary skills to protect Singapore from infectious diseases.



NPHL staff performing test for Monkeypox virus

In 1962, Australian immunologist and virologist Sir Macfarlane Burnet stated, "By the end of the Second World War it was possible to say that almost all of the major practical problems of dealing with infectious disease had been solved". At the time, control and prevention measures had greatly decreased the incidence of many infections, while anti-microbials and vaccines offered further hope. Sir Macfarlane's optimistic statement seemed well founded.

Fast forward to the 21st century, and the emergence or re-emergence of infectious diseases, including Ebola, Zika, avian flu, Monkeypox, Middle East Respiratory Syndrome Coronavirus (MERS-CoV) and the H1N1 flu pandemic. While some of the major practical problems dealing with infectious diseases have indeed been solved, new problems have emerged as a result of changes in human behaviour, economic development, international trade and microbial adaptation.

The first line of defense against infections is a country's public health system's capacity to detect and promptly control infectious disease outbreaks. As the country's premier outbreak facility, the NCID building was thoughtfully designed to ensure the safety of patients, staff and the community and to shoulder infectious disease outbreak responses for Singapore. This meant that the clinical capabilities, outbreak surveillance and research capabilities not only need to be first-rate, but integrated as well.

Outpatient clinical services for outbreaks

Clinic J, located at Level 1 of NCID, provides one-stop holistic, integrated and multi-disciplinary specialist services, caring for infectious disease outpatients. A triaging system is in place to ensure that all patients entering the clinic undergo pre-consult screening. Patients identified as requiring isolation precautions are then escorted to a Special Precaution Area (SPA) while regular patients will proceed with their consultation as per normal. Once a patient is isolated in SPA, all services will be rendered within the area to minimise patient movement, including the consultation and other diagnostic and treatment services. Staff caring for patients within SPA will need to wear Personal Protective Equipment (PPE) and adhere to appropriate precaution measures when attending to patients.



Special Precaution Area comprises a contact precaution zone and respiratory precaution zone for patients requiring isolation

Inpatient facilities for outbreaks

The High Level Isolation Unit (HLIU) is a specialised bio-containment unit sited within NCID to safely contain High Level Isolation Pathogens (HLIP), including viral haemorrhagic fevers such as Ebola, smallpox or other biothreat agents, and novel pathogens. The unit was carefully designed with a dedicated on-site laboratory for convenient processing of patient samples and macerators and hydrogen peroxide vapourisers for specialised decontamination and waste management. Further to that, each room in the HLIU is capable of providing ICU-level care and is equipped with ventilators and dialysis capability. Patient and staff flow and movement was also thought out to ensure that clean and dirty flows are kept separate.

More important than the facilities and equipment is the core team of infectious disease and ICU doctors, nurses and healthcare workers who have been specially trained in biosafety and the usage of PPE to care for patients.



Staff donned in PPE testing out equipment during a HLIU training drill

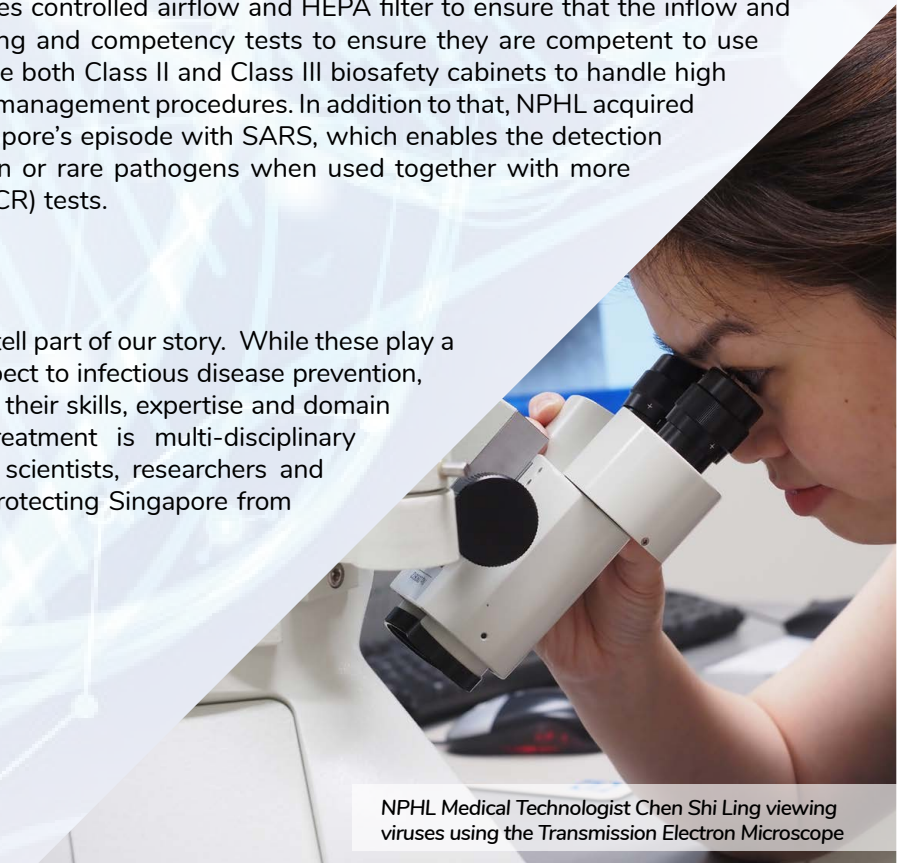
Capabilities in place for surveillance and monitoring of new and emerging high-risk pathogens

The National Public Health Laboratory (NPHL), formed in 2007, provides specialised laboratory services to track changes in existing organisms, detects new and re-emerging pathogens and provides surge capacity in response to outbreaks. NPHL also collaborates with the World Health Organization and international partners on the development of diagnostic tests, and has been involved in investigations for a number of recent outbreaks including Chikungunya, H1N1 and Zika.

With NPHL located in the same building as NCID's clinical laboratories, research units, clinicians and epidemiologists, NCID is better able to combat outbreaks and epidemics as a coordinated multi-disciplinary team. NPHL's facilities include a Biosafety Level 3 Reference Laboratory (BSL3 lab) which is a specialised high biocontainment facility laboratory that is designed to accommodate RG3 pathogen surveillance and diagnostic work. To ensure the safety of BSL3 lab staff and the community, the design of the facility includes controlled airflow and HEPA filter to ensure that the inflow and outflow of air is safe. Staff undergo rigorous training and competency tests to ensure they are competent to use Personal Protective Equipment (PPE), and to operate both Class II and Class III biosafety cabinets to handle high risk materials, including decontamination and waste management procedures. In addition to that, NPHL acquired a Transmission Electron Microscope following Singapore's episode with SARS, which enables the detection and early identification of new, previously unknown or rare pathogens when used together with more precise tests such as Polymerase Chain Reaction (PCR) tests.

The faces behind our facilities

Our infrastructure, equipment and technologies only tell part of our story. While these play a key role in defining Singapore's capabilities with respect to infectious disease prevention, more important are the healthcare professionals and their skills, expertise and domain knowledge. Infectious disease prevention and treatment is multi-disciplinary and physicians, nurses, allied health professionals, scientists, researchers and operations specialists all have their role to play in protecting Singapore from infectious diseases.



NPHL Medical Technologist Chen Shi Ling viewing viruses using the Transmission Electron Microscope



NPHL staff donned in PPE undergoing training to handle high-risk materials in Class III Biosafety Cabinet