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INFECTIOUS Disease Intelligence

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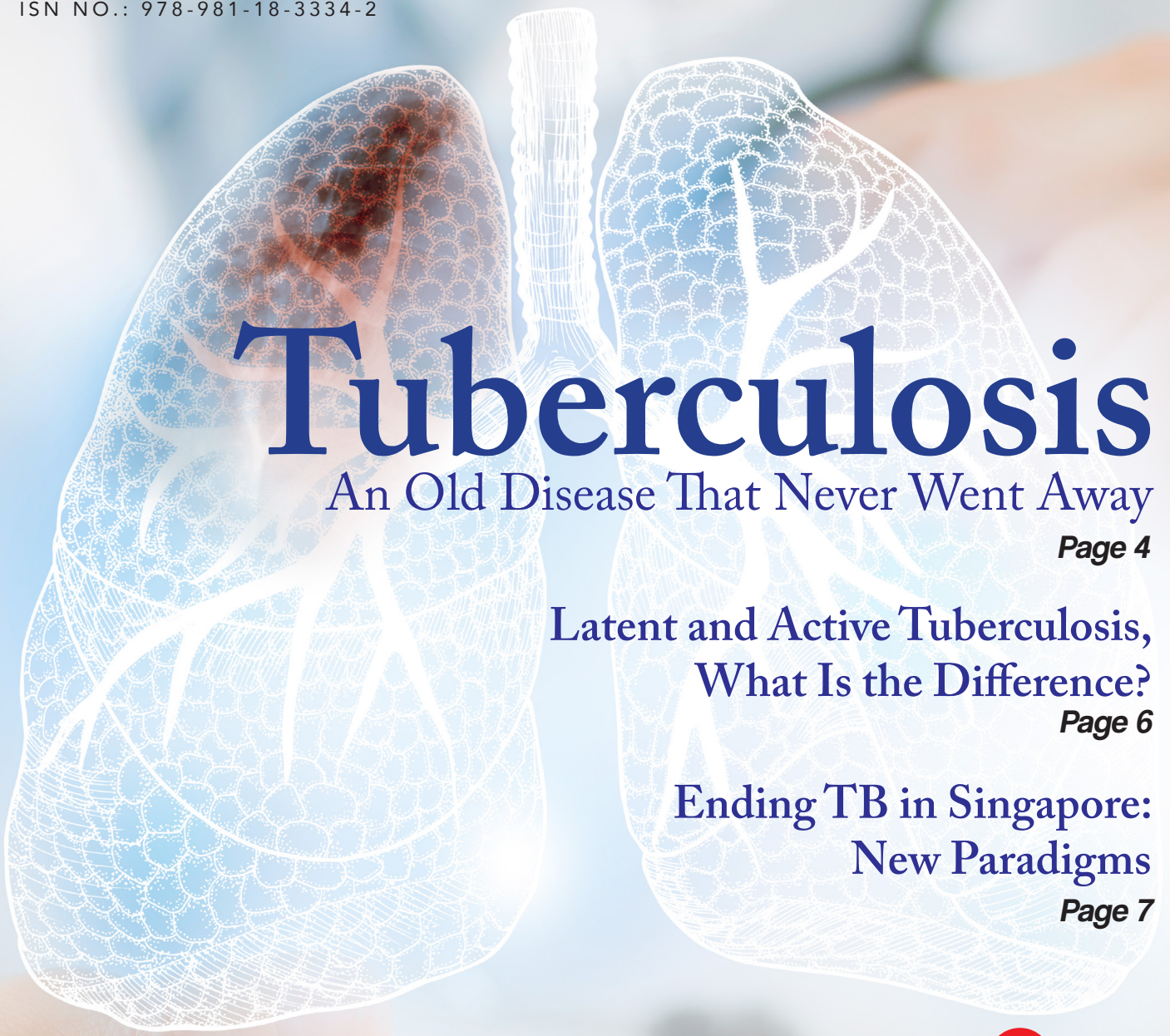

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DO YOU HAVE ANY IDEAS OR SUGGESTIONS?

Your views are important to us. Please contact us at **IDintelligence@ncid.sg**

Editor's Note

Welcome to the inaugural issue of *Infectious Disease Intelligence*, which is a fresh revamp from *NCID News* to morph as a regular bulletin for the medical and public health community, and a trusted information source for the general public. By infectious disease intelligence, we refer to all the activities related to early identification of infectious health threats, their verification, assessment and investigation in order to recommend appropriate measures to control them.

Our editorial committee welcomes to the team Assoc Prof Matthias Toh from the National Public Health and Epidemiology Unit and Dr Tan Seow Yen from the Infectious Disease Research and Training Office. We see potential for *Infectious Disease Intelligence* to be a useful platform that explores thematic infectious disease issues and provides holistic education to serve the needs of our community. Besides content creation and development, we seek your ideas and suggestions for improvement.

This edition brings together professional contributions on tuberculosis and dengue, and news stories including a feature on our opening of The NCID Gallery. You will also find our 2022 training courses in Outbreak Alert and Response offered by the Singapore Field Epidemiology Training Programme. Thank you for your continued support. Articles, anecdotes, and snippets to encourage scientific literacy continue to be most welcome.

2021 turned out to be yet another highly eventful year of change. Strong, trusted and united in keeping Singapore safe from infectious diseases (with many COVID-19 issues making headline news), NCID has been working doubly hard to safeguard health and wellbeing in our community. In this traditional festive season, we wish you all good cheer and a blessed new year ahead. Gong Xi Fa Cai!

Steven

Launch of INFECTIOUS Disease Intelligence

Message from **Prof Leo Yee Sin**,
Executive Director,
National Centre for Infectious Diseases

It is well quoted that "infectious diseases respect no boundary". Indeed, no one is spared as evident from the current COVID-19 pandemic. Effort from everyone is needed to counter the onslaught of disease transmission. The entire community is an important partner in the fight against infectious diseases. In line with our continued efforts to connect with the community, provide knowledge on preventing the spread of infectious diseases, and build community preparedness and resilience for future outbreaks, we have enhanced *NCID News* into *Infectious Disease Intelligence* to fill the gap in sharing of information related to infectious diseases for the general public.

The past two years has been nothing short of extraordinary as we face one of the greatest tests of resilience, perseverance and adaptability brought about by COVID-19. Global deaths from the pandemic have already crossed the five million mark. This disease highlighted once again a critical lesson to the world: unknown pathogens and emerging infectious diseases will continue to pose global health threats.

Amidst adversity, there is growth and good news. Such an unprecedented pandemic has also expedited the advancement of science and medicine, evident from the speed of vaccine development. We must draw on lessons from infectious diseases past and current to chart our path in the perennial battle against unknown pathogens. To counter these threats, we need to strengthen existing partnerships and international networks, and to share knowledge and new findings.

Infectious Disease Intelligence will be a timely periodical to support NCID's holistic education outreach to the community with the aim to become a trusted information source on infectious disease matters for public health professionals, scientific community, for schools and other institutions, and the community-at-large. This new initiative aims to create a platform for knowledge sharing by multiple agencies, providing opportunities for cross-fertilization of ideas and exchanging of different perspectives with one aim – to strengthen our ability to confront infectious disease challenges. One example would be the contribution from One Health agencies on thematic issues such as food safety and antimicrobial resistance.

Communication is key to good public health implementation, and good public health practices should start from young. Likewise, we encourage young professionals with keen interest to contribute articles in using this platform to build their scientific writing techniques and public communications skillsets in this regard.

We hope that readers will find this periodical an interesting and informative read.

Photo credit:
NUS Office of Alumni Relations

Universal whole genome sequencing by the National Public Health Laboratory

Tuberculosis

An Old Disease That Never Went Away

By **Dr Deborah Ng**, *Deputy Director,* and **Assoc Prof Jeffery Cutter**, *Acting Director of the National Tuberculosis Programme, National Centre for Infectious Diseases*

World Tuberculosis Day is observed internationally on 24 March each year. Through this article, let us take a look at how we can draw lessons from the latest pandemic COVID-19 to manage the world's oldest pandemic – tuberculosis.

In 2019, there were about 10 million cases of tuberculosis (TB) reported worldwide. Despite being both preventable and curable, TB remains the leading cause of death from a single infectious agent globally.[1] While countries have been putting in efforts to end TB, progress has been slow with only 9% reduction in the global TB incidence rate between 2015 and 2019, falling short of more than half the target of 20% set for 2020.[1]

The situation today

2020 proved to be a challenging year, with the global COVID-19 pandemic overwhelming many countries and economies. Efforts to accelerate TB control globally were significantly hampered by COVID-19, and it still threatens to derail the progress that countries have made towards ending TB. According to the World Health Organization's (WHO) Global Tuberculosis Report 2020, there were significant reductions

in notification of TB cases.[1] High burden countries for TB, specifically India, Indonesia and the Philippines, reported 25% to 30% drop compared to the same six month period in 2019. This reduction in case notification would likely lead to delayed diagnosis, increased transmission in the years to come, delayed treatment, and eventually cause a rise in deaths due to TB.

While the incidence rates of TB in Singapore have dropped from over 300 per 100,000 since the 1960s, the rates have not declined substantially over the last 15 years, ranging between 33 and 41 cases per 100,000 resident population since 2006.[2] This highlights the need for renewed effort and commitment towards reducing TB. As TB had been common in Singapore until the 1970s, many older Singaporeans would have been exposed to TB and acquired latent TB then. This is reflected in the high proportion (71.9%) of TB cases who were 50 years old and above, among the new cases notified in 2020.[3] Persons with latent TB do not exhibit symptoms and are not infectious, but one in 10 may progress to active TB during their lifetime. Delayed diagnosis among persons with TB has also contributed to these stagnating rates. This is in part due to delays in seeking medical attention by persons with symptoms, leading to ongoing transmission. In other instances, patients may seek medical attention, but the diagnosis may be missed by their clinician, especially among patients who 'doctor-hop'. Clinicians may initially prescribe antibiotics that lead to a temporary resolution of their symptoms, but recurrence of symptoms may lead them to seek an opinion from another doctor, who is unaware of the history. Without the complete clinical picture, it would affect the early diagnosis of TB.

'Teaching an old dog new tricks'

During the onset of COVID-19, we saw how widespread messaging is important in educating the community about health-seeking behaviour and good respiratory hygiene measures. Similarly, these measures are necessary to break the chain of transmission of TB. As such, ongoing education is important to maintain these good practices, and to serve as a reminder that TB is still endemic in Singapore.

During the pandemic, persons admitted to hospitals for suspected or confirmed COVID-19 infection would typically have a chest X-ray taken. As such, there were some who were opportunistically diagnosed with TB. The diagnosis of TB can be easily missed even by clinicians, especially if the patient does not have prolonged symptoms or only has subtle changes on their chest X-ray. It is therefore important to maintain a high index of suspicion among persons presenting with prolonged cough, or unexplained persistent changes on their chest X-ray.

The use of digital platforms increased exponentially during COVID-19 as people increasingly began to work from home and with meetings held virtually. TB treatment also went online with the use of video-observed therapy (VOT) successfully implemented for selected patients with TB. Persons with TB are typically required to take their medications in front of a healthcare worker as part of the course of treatment, also known as directly observed therapy (DOT). However, this places an onerous burden on persons with TB, especially those who are working as they may face pressure from their employers and colleagues when taking time off work for these daily visits. The use of VOT reduced travelling time and time off from work for patients, and also offers greater flexibility and privacy. While DOT remains the gold standard for treatment administration, it is likely that the use of VOT will continue to increase. During the circuit breaker period, site visits which are an essential part of TB contact tracing, were greatly affected due to the restrictions in movement and closure of many workplaces. This in turn led to the implementation of virtual site visits, which allowed contact tracing to continue effectively.

Even with the COVID-19 outbreak in Singapore, the National TB Programme remained committed to its goal of detecting and treating TB in Singapore by ensuring continuity of services. In November 2020, the programme moved towards whole genome sequencing (WGS) of all TB positive cultures in Singapore to study and detect genetic linkages in the laboratory. WGS results enable the National TB Programme to conduct more targeted epidemiological investigations. This narrows down the individuals for investigation and helps guide contact tracing and interviews conducted by the National TB Programme to sieve out information more rapidly and accurately, for example through social activities such as similar hobbies. The additional information has helped to improve mapping of TB clusters and made contact tracing of TB clusters such as the Singapore Pools Bedok Betting Centre more comprehensive while optimising the use of resources.

Singapore took a Whole-of-Government and Whole-of-Nation approach in managing COVID-19. If we apply the same principles to control TB, with the primary goal of ending TB in Singapore, we can be confident to see a reduction in the incidence in the years to come.

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Latent and Active Tuberculosis, What Is the Difference?

By **Dr Tan Seow Yen**,
Head, Training and Education Office,
Infectious Disease Research and Training Office,
National Centre for Infectious Diseases

While tuberculosis (TB) and humans have coexisted for thousands of years, the understanding of the pathophysiology of TB continues to evolve. While the classical model of distinct latent and active forms of TB disease are well known to most, it is increasingly understood that the complex bacterial and host dynamics result in the pathology of TB disease falling on a spectrum.[1]

Nonetheless, the notion that certain cases of untreated latent TB can progress to active TB still holds true. Overall, without treatment, about 5% to 10% of infected persons will develop TB disease at some time in their lives.[2] About half of those people who develop TB will do so within the first two years of infection. For persons whose immune systems are weak, especially those with untreated human immunodeficiency virus (HIV) infection, the risk of developing TB disease is considerably higher than for persons with normal immune systems. When the TB bacteria overcome the defences of the immune system and begin to multiply, it results in the progression from latent TB to active TB. Some people develop active disease soon after infection, while others progress to active disease later when their immune system becomes weak.

There are considerable differences between the two conditions. In terms of symptoms, persons with latent TB do not feel sick and do not have any symptoms, while most persons with active TB experience symptoms, which generally include unexplained weight loss, loss of appetite, night sweats, fever, fatigue and chills. Depending on site of infection, the symptoms experienced by the person could vary, such as prolonged cough, or coughing up blood in persons with pulmonary TB; and back pain in persons with spinal TB.

Persons with latent TB infection are not infectious and cannot spread TB infection to others. However, for active TB, only infections of the lungs and larynx (voice box) is contagious and capable of spread to others.

A latent TB infection is often diagnosed in an asymptomatic individual, who has either a skin test or blood test result indicating infection. It is normal that the chest X-ray would not show indication of infection, and the sputum tests for TB are expected to be negative. In short, aside from the positive blood or skin test, there are no symptoms and signs of active disease. The diagnosis of active TB is made, when there are symptoms and signs of active disease, and a positive test results which can be a sputum sample showing growth of the bacteria, or a positive nucleic acid amplification test.

There are treatments available for both active and latent TB, although the treatment regimen used are slightly different. Treatment of latent TB aims to prevent the progression to active TB, and usually involves a single drug, taken for a duration of a few months. Treatment for active TB is generally more intense, requiring the use of multiple drugs (mostly consisting of four drugs), and the treatment course is generally longer.

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Ending TB in Singapore: New Paradigms

By **Dr Deborah Ng**, Deputy Director, and **Assoc Prof Jeffery Cutter**, Acting Director of the National Tuberculosis Programme, National Centre for Infectious Diseases

The DOTS strategy

After the World Health Organization (WHO) declared tuberculosis (TB) a global emergency in 1993, it launched the Directly Observed Therapy Short Course (DOTS) as its strategy for controlling TB. The DOTS strategy was a comprehensive strategy that aimed to ensure care to most people with TB disease presenting to primary care health services, and was composed of five main prongs:[1,2]

1. Government commitment to ensuring sustained, comprehensive TB control activities;
2. Case detection by sputum smear microscopy among symptomatic patients self-reporting to health services;
3. Standardised short-course chemotherapy using regimens of six to eight months for at least all confirmed smear-positive cases, including DOT for certain categories;
4. Regular uninterrupted supply of all essential anti-TB drugs;
5. Standardised recording and reporting system that allows assessment of case-finding and treatment results for each patient and of the TB control programme performance overall.

The need for a new strategy

One of the key aspects of this strategy included case detection by sputum smear microscopy among symptomatic patients. However, the stagnating rates of TB globally led stakeholders to re-examine the effectiveness of this strategy. In fact, findings show that while the DOTS strategy improved overall treatment success, it had no effect on case detection.[3] As a result, the WHO devised a new strategy in 2015, termed the 'End TB Strategy', adopted by the World Health Assembly in 2014, with the aim of ending the TB epidemic by the year 2030.[4] As part of this new strategy, it was recognised that the focus on smear-positive cases alone was insufficient to reduce TB incidence. The strategy was therefore expanded to include not only systematic screening of contacts, but also high risk groups, and the need to scale up preventive treatment (PT) among persons at high risk of TB.

The strategy also set out intermediate milestones, setting the targets of a 20% reduction in TB incidence rate, 35% reduction in TB deaths and having zero catastrophic costs by 2020. According to the Global TB report 2021, there has only been a 11% reduction in TB incidence rate, 9.2% reduction in TB deaths, and 47% of people with TB still facing catastrophic costs worldwide.[5] While some setbacks in achieving these targets have been contributed by the COVID-19 pandemic, it is essential to know if the strategies that have been laid out can achieve the desired targets in mind.

New paradigms

But the question is, what are these strategies and what needs to be changed? First, a paradigm shift in our understanding of TB is needed. In recent years, the definition of TB infection has evolved from a dichotomy of active and latent TB to a continuum of TB disease, whereby there are populations of persons with subclinical TB who may have no or unrecognized symptoms, but still potentially infectious.[6] While these groups may not be highly infectious, they represent a gap in current public health strategies that need to be addressed, in order to achieve the target of ending TB.

The second is to adjust existing public health strategies. In order to achieve this ambitious goal of reducing the TB incidence by more than a thousand fold from 1,280 cases per million in 2010 to one case per million globally by 2050, new strategies must be deployed. Short of an effective vaccine, it is essential to maximize the use of all available tools that we have now in our armament to achieve these goals. A modelling study by Dye et al[7] found that only a combined approach of targeting active and latent TB could produce a synergistic result to help achieve the goal of TB elimination. This means effective treatment of active TB with early case detection and high diagnostic accuracy, combined with the widespread scale up of PT.

Locally, contact tracing is already being expanded to screen more contacts, detect more cases of latent tuberculosis infection (LTBI) and treat them. This has been complemented by the use of whole genome sequencing to carry out targeted mass screening exercises where clusters of TB cases have been detected. As our knowledge and understanding of TB continues to evolve, and we continue to update our strategies to reflect the changing tides, we can look forward to bring an end to this epidemic in Singapore and worldwide eventually.

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Spread Awareness, *Stop Resistance!*

By **Dr Lee Tau Hong**, Head,
Ng Hui Min, Senior Executive,
Nazlin Binte Saiful Hazhar,
Executive and **Astrid Khoo**, Asst Director,
Antimicrobial Resistance Coordinating Office,
National Centre for Infectious Diseases

Antimicrobial resistance a top 10 global public health threat

Around the world, antimicrobials such as antifungals, antivirals and antibiotics, are used in human and animal health, livestock and environmental sectors. The overuse and misuse of antimicrobials has accelerated the emergence and spread of antimicrobial resistance (AMR). This has resulted in AMR rates outpacing the development of new antimicrobials, leading to infections becoming difficult to treat, and associated with higher medical costs, morbidity and mortality.

For this reason, the World Health Organization (WHO) has declared AMR as one of the top 10 global public health threats facing humanity. It is estimated that if nothing is done, AMR could cause up to 10 million deaths worldwide per year by 2050.[1]

"Spread Awareness, Stop Resistance" was the theme for World Antimicrobial Awareness Week (WAAW) 2021 from 18 to 24 November, which aims to encourage people to spread awareness about AMR, share stories of its consequences and demonstrate how the actions of individuals, families, professionals and communities can contribute to, and also be a solution to the problem of AMR.

Increasing public awareness and understanding of AMR

The Health Promotion Board (HPB) leads the efforts in increasing public awareness of AMR. In its 2021 AMR campaign key message "To fight viral infections, you need time, not antibiotics", it aimed to bring to the public's attention that antibiotics are unable to help them recover faster if they have a viral infection such as the flu or COVID-19.

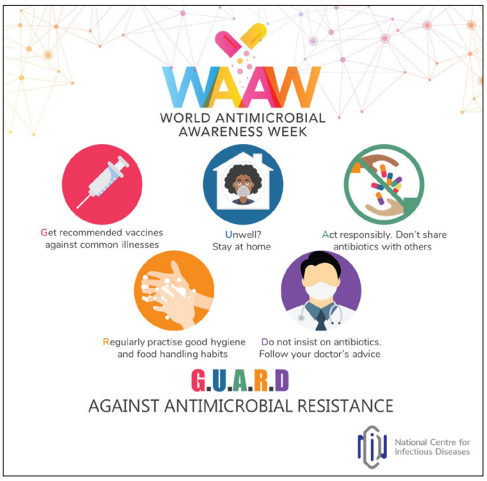
Singapore adopts a multi-sectoral One Health approach to tackling AMR. This year, representatives from the human and animal health sectors, Dr Lee Tau Hong, Head, Antimicrobial Resistance Coordinating Office (AMRCO), NCID and Dr Kelvin Lim, Director, Veterinary Health Management Branch, Animal and Veterinary Service, National Parks Board were interviewed on radio station CNA938 Health Matters programme. Speaking collectively, they shared on Singapore's ongoing multi-pronged approach to dealing with AMR which includes education efforts, surveillance initiatives, research, infection prevention and control, and optimisation of antimicrobial use, and the ways in which all can play their parts to combat AMR.

"There are simple and yet effective actions that we can do to combat AMR. Such as, maintaining good hygiene practices by washing our hands frequently, staying home when we are feeling unwell to prevent the spread of illnesses to our loved ones and to others in the community... (and) ensuring our vaccinations are up-to-date to boost our immunity and to prevent illnesses," said Dr Lee Tau Hong.

Strengthening AMR education efforts for healthcare professionals

Part of our efforts to keep professionals up-to-date on AMR issues and appropriate utilisation of antimicrobials includes organising regular continuing professional education (CPE) events. AMRCO, in collaboration with NCID Nursing and with the support from the Training and Education Office under the Infectious Disease Research and Training Office of NCID, organised the inaugural Continuing Nursing Education Webinar on AMR on 2 November 2021. The webinar series comprised four talks which were led by an infectious disease physician, antimicrobial stewardship (ASP) pharmacist and NCID nurses. The speakers introduced the concept of AMR, the relevance of ASP, the importance of infection prevention in bedside nursing, as well as nurses' roles in community ASP, and was followed by a panel discussion. A total of 353 participants attended the webinar, and a post-assessment survey revealed that participants' knowledge of AMR, ASP and infection prevention and control practices increased substantially after attending the webinar.

In addition, the second WAAW Inter-Hospital Webinar Series, was held throughout November. It was organised by AMRCO in collaboration with seven public hospitals – Alexandra Hospital, Changi General Hospital, Khoo Teck Puat Hospital, National University Hospital, Ng Teng Fong General Hospital, Singapore General Hospital and Tan Tock Seng Hospital, and were attended by more than 2,300 participants in total. The series took place as lunch time talks by infectious disease specialists and ASP pharmacists who shared on the latest developments in multi-drug resistance infections, appropriate prescribing practices and antimicrobial stewardship.



AMR Social Media Post

AMR graphics and messaging for healthcare professionals

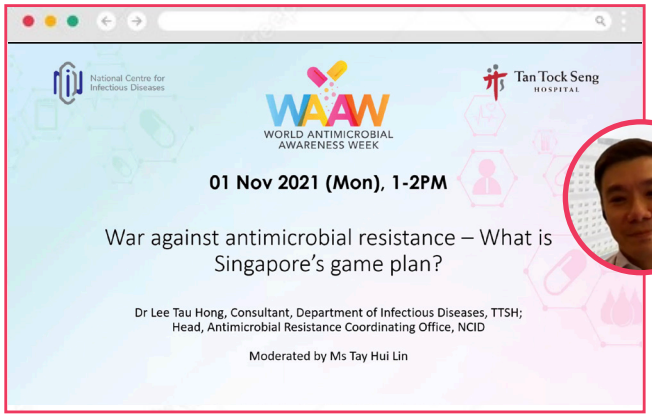
World Antimicrobial Awareness Week (WAAW)

Held annually, the WAAW aims to increase awareness of global AMR and encourage best practices among the public, healthcare workers and policy makers to prevent further emergence and spread of AMR.

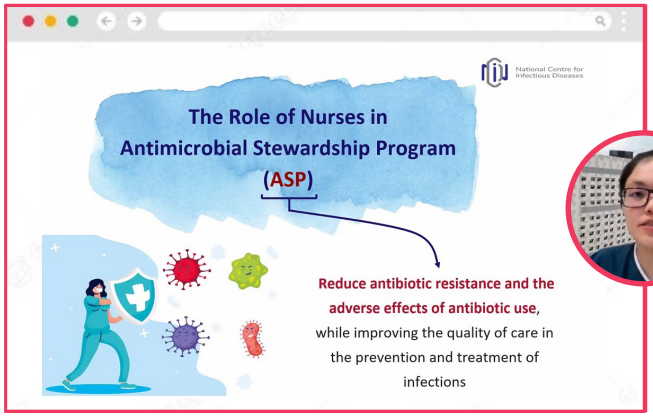
In its third year, the AMR social media campaign focused on messages relating to why AMR is a global public health concern, what the public can do to play their part, and the importance of vaccination. This year's campaign consisted of six posts which were featured on the social media pages of the National Healthcare Group, Tan Tock Seng Hospital, Health Promotion Board and Pharmaceutical Society of Singapore. A special highlight was the inclusion of three winning entries in the form of two social media graphics and one animated video from the Antimicrobials: Handle With Care Competition (AHWCC). The competition, targeted at youths aged 13 to 25, aimed to raise awareness through the designing of graphics and videos centred on AMR.

AMRCO supported WAAW activities in the public hospitals by providing WAAW and NCID-branded souvenirs such as hand sanitisers, face mask holders and wallet tissue packets, as well as magnetic pin badges and coasters which featured the winning designs from AHWCC. AMRCO also developed AMR contents and graphics for healthcare professionals that were disseminated to public hospitals, and were featured on their intranet pages and premises. The message was to urge prescribers to use antimicrobials appropriately and to educate their patients on infection prevention.

Lastly, National University of Singapore (NUS) Saw Swee Hock School of Public Health, in collaboration with Singapore General Hospital and regional partners including NCID, produced a video that explains how AMR develops and why antibiotics fail to work on drug-resistant bacteria.



WAAW Inter-hospital Webinar Series



Continuing Nursing Webinar on AMR

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NCID Commemorates Its Second Anniversary With Launch of The NCID Gallery

By **Low Sim Yee**, *Assistant Manager, Corporate Communications, National Centre for Infectious Diseases*

The NCID Gallery was officially opened on 7 September 2021 by Mr Heng Swee Keat, Deputy Prime Minister and Coordinating Minister for Economic Policies during the centre's second anniversary celebration. The new gallery is part of NCID's efforts to strengthen its engagement with the public for an informed community with deep understanding on infectious diseases. It aims to be a resource for schools and the public to learn about infectious diseases in Singapore and understand the importance of public vigilance to prevent infections.

Among the exhibits is a timeline of infectious diseases which outlines key milestones Singapore has witnessed in tackling infectious diseases for over one century, from 1913 when the first infectious diseases hospital in Singapore was opened till the present. In recent years, Singapore has learnt to live with malaria, dengue and also managed the SARS outbreak. This puts us in better stead in the management of COVID-19 and to tackle diseases of the future. As the world continues to battle COVID-19, the opening of The NCID Gallery is timely and highly relevant.

Professor Leo Yee Sin, Executive Director of NCID said, "SARS-CoV-2 is here to stay and the threat of new SARS-CoV-2 variants and unknown pathogens are a reality that we need to contend with. As Singapore prepares to progressively transition to COVID-19 endemic phase and to take on future challenges of countering unknown emerging pathogens, measures to defend and protect ourselves from these pathogens require the efforts and resilience of everyone in the community. Thus, providing knowledge on preventing the spread of infectious diseases and building community preparedness for outbreaks are key aspects of public education. The NCID Gallery is one avenue for us to work hand in hand with the community."

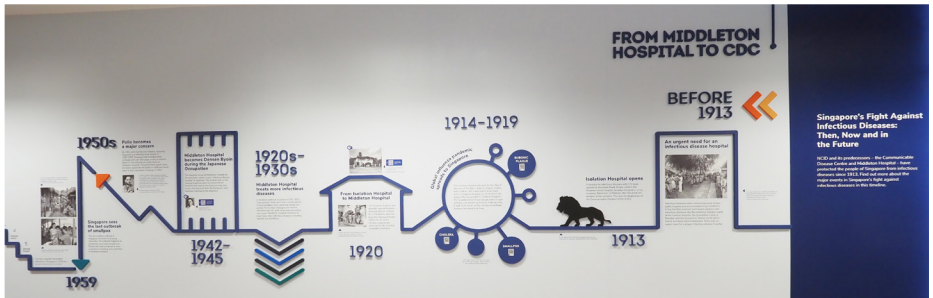
The public plays a key role in breaking the chain of transmission of infectious diseases. The responsibility in curbing the spread of viruses does not rest on the shoulders of public healthcare institutions alone, but requires the collective effort of everyone in the community. The NCID Gallery is one such avenue to forge a strong connection with the public and is an extension of NCID's efforts to engage with the community. Under NCID's training and education function, public education programmes are conducted to increase community awareness of infectious diseases that continue to pose significant risk to public health and have significant impact on the well-being of the population. These include dengue, human immunodeficiency virus (HIV), influenza and COVID-19.

The NCID Gallery

consists of four zones:

Zone 1

Introduction to NCID and how it has been set up to manage both endemic and emerging infectious diseases



Zone 2

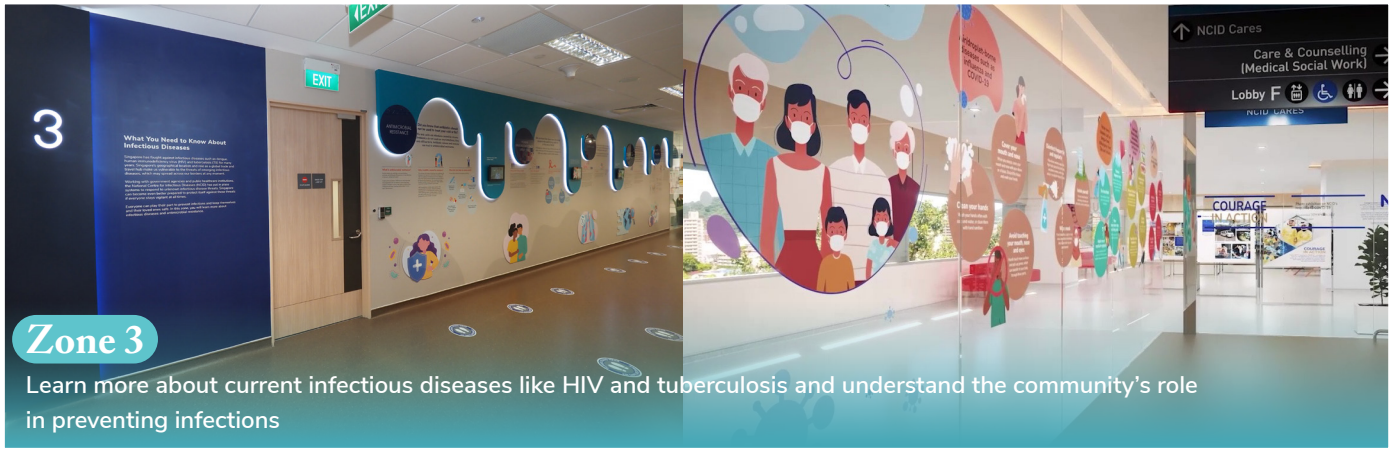
History of infectious diseases in Singapore and the management of such diseases at the time, chronicled through a timeline since 1913

NCID GALLERY OPENING HOURS:

Monday to Friday
8.30am to 4.30pm
Admission is free.*

*Entry to the NCID Gallery may be adjusted according to NCID's prevailing policy on visitors during COVID-19.

SCAN TO WATCH THE VIDEO ON THE NCID GALLERY



Zone 3

Learn more about current infectious diseases like HIV and tuberculosis and understand the community's role in preventing infections

Zone 4

Special six-month photo exhibition which highlights NCID's efforts on the frontline against COVID-19, covering patient journey, diagnostic testing and surveillance, research milestones, staff training, outreach to the community and stories from NCID staff.

Zone four also includes information on NCID's local and global partnership networks which are key to NCID's collaborative approach in managing infectious diseases.

Epidemic *Dengue* in Singapore During COVID-19 Pandemic

By **Jacqueline Teoh**,
Senior Epidemiologist,
National Public Health and Epidemiology Unit,
National Centre for Infectious Diseases

Despite intensive vector control, there has been a significant increase in the number of dengue cases in recent years. In fact, in 2020, a resurgence of epidemic dengue was observed during the COVID-19 pandemic with the highest ever annual incidence reported in Singapore.

We had seen a drastic drop in dengue cases in 2017 and 2018. However, the number of dengue cases recorded in 2019 exceeded the total number of cases in 2018. A sharp upward trend was observed in 2020 and reached its peak in July 2020. A total of 35,315 dengue cases were reported in 2020, almost two times the number for 2019. The incidence rate (IR) of 621 per 100,000 population, was higher than the annual IRs reported from 2014 to 2019. The upward trend in dengue cases and incidence rate coincided with the increase in the population of the Aedes aegypti mosquito since 2017. Last year, the National Environment Agency (NEA) found 23,400 mosquitoes breeding habitats.[3,5]

In 2021, the number of dengue cases has remained relatively stable for the first six months of the year (Figure 1).

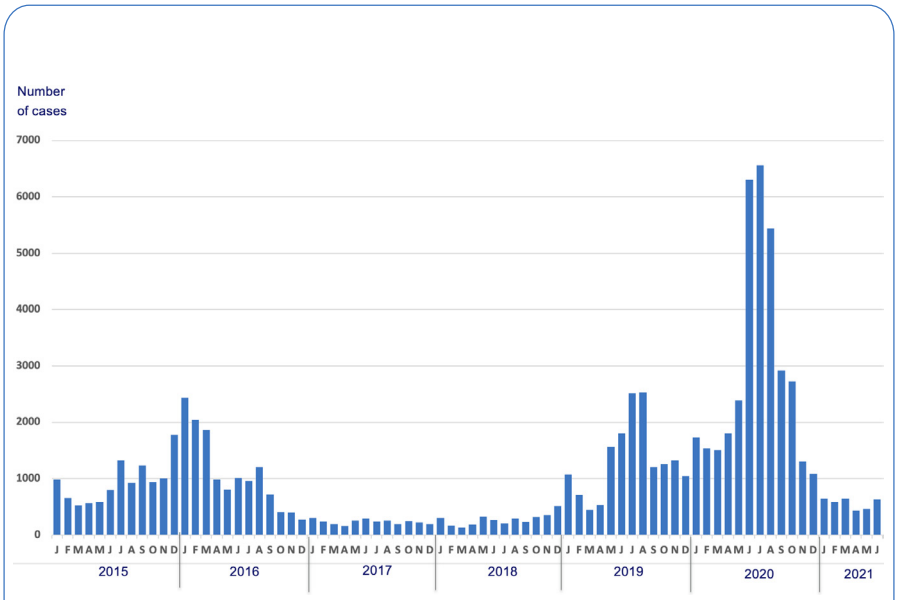


Figure 1: Dengue Surveillance in Singapore, 2015 - 2021

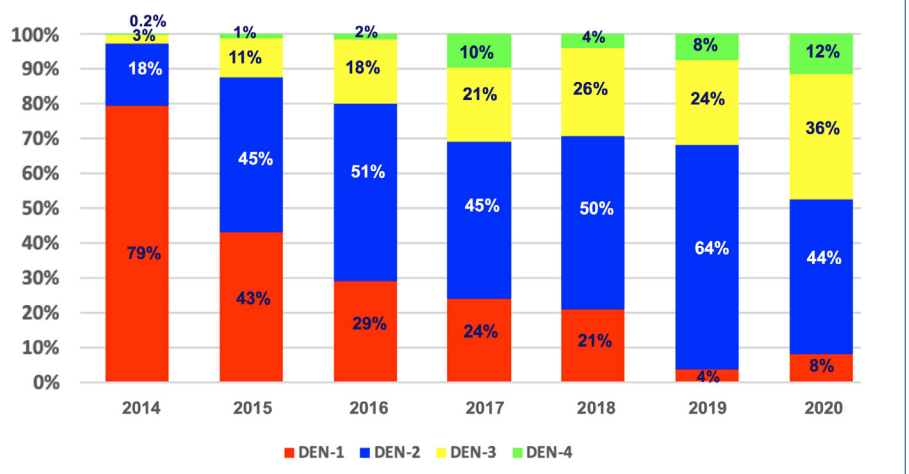


Figure 2: Surveillance of Dengue Virus Serotypes, 2014 - 2020

Why Singapore suffered the largest dengue outbreak in 2020 despite vector controls

Singapore is an ideal environment for mosquito breeding with high temperatures and high humidity. It is a densely populated city with a total land area of 728.6 square kilometres and over 5.6 million people, and building boom and population growth have caused the increase in dengue cases. Three million of Singapore residents live in HDB flats and this increased human population density aided the spread of dengue.[4]

Between 2014 and 2017, there was a general trend of decline in dengue case numbers but rose steeply from 2018 to 2020. In 2014, the predominant serotype was DEN-1 (79%) but switched to DEN-2 from 2015 onwards (45%). Although DEN-2 continued to be the predominant serotype in Singapore from 2015 to 2020, the proportion of DEN-3 and DEN-4 cases had increased from 2014 (3%, 0.2%) to 2020 (36%, 12%) (Figure 2). It was found that during the dengue outbreak in 2020 amidst COVID-19 pandemic, there was a change in circulating dengue virus strains. The rise of DEN-3 and DEN-4 contributed to the largest dengue epidemic, with a total of 35,315 cases and 32 deaths. Neither DEN-3 nor DEN-4 infected large numbers of people in the past. Vast majority of nonimmune population would be susceptible to DEN-3 and DEN-4, which contributed to more infections by these serotypes.[5]

The most prominent environmental factors associated with dengue cases are humidity and warmer temperatures. The higher temperatures observed in 2019 and 2020 are a major concern of climate change in Singapore. In 2020, the mean relative humidity was >75% and four spurts (>80%) were observed in January, June, September and November. The first half of 2020 was hotter than the 30-year average, but it ended with lower temperature in June. Over the course of the year, the minimum temperature ranged from 23.1°C to 27.1°C (median = 25.5°C). The maximum temperature varied from 29.1°C to 33.5°C (median = 31.7°C). In addition, the peak of the dengue epidemic period was around June to August during the rainy season. Rainfall occurs all year round in Singapore, with peak rainfall and the highest monthly number of rainy days usually observed during Northeast Monsoon season from November to January.[6]

Dengue transmission in or near homes is another critical factor for dengue outbreak. The increase in work-from-home as part of COVID-19 safe management measures in 2020 increased the risk of bites by dengue-carrying Aedes species mosquitoes, which more commonly occurred at home.[1] Increase in number of indoor larvae breeding also contributed to the surge in dengue cases.[2]

Residents need to do their part to prevent mosquito breeding in their homes by doing the Mozzie Wipeout, as the most effective measure for keeping the mosquito population low is through detecting and removing mosquito breeding habitats. Fogging is only effective if mosquitoes come into direct contact with the chemical. This is in line with the NEA recommendations for vector control. Owners of premises are encouraged to ensure good housekeeping practices and undertake vector control measures such as checking their homes frequently for stagnant water and emptying any tools that collect water. Residents residing in dengue cluster areas, should carry out the three protective actions of 'Spray, Apply, Wear' which are – to spray insecticide targeting dark corners around the house, apply insect repellent and wear long-sleeve tops and long pants.[7,8]

References

1. *Lim et al. Impact of Sars-CoV-2 interventions on dengue transmission. PLOS. 29 Oct 2020.*
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6. *Air Quality and Climate 2015-2021. SingStat Table Builder. Department of Statistics Singapore.*
7. *NEA. Prevent Aedes Mosquito Breeding. Dengue & Zika. 29 April 2021.*
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Tuberculosis (TB)

WHO SHOULD NOTIFY
Medical Practitioners

HOW TO NOTIFY
Submit MD532 Notification of Tuberculosis Form via CDLENS (http://www.cdlens.moh.gov.sg) or fax (6221 5528/38/67)

NOTIFIABLE DISEASE:
YES

WHEN TO NOTIFY
On clinical suspicion or upon laboratory confirmation

NOTIFICATION TIME LINE
Within 72 hours

CAUSATIVE AGENT

***Mycobacterium tuberculosis* complex (most commonly *M. tuberculosis*, rarely *M. bovis* or *M. africanum*).**

INCUBATION PERIOD
Weeks to years.

Persons with latent tuberculosis infection (LTBI) are asymptomatic and have no clinical manifestation of active tuberculosis (TB). Approximately 10% of immunocompetent adults with LTBI will progress to active TB, and half of them do so in the first two to three years following infection. In immunocompromised patients (e.g. HIV infection, transplant patients, diabetes mellitus) and very young children, the risk for developing active TB is even higher.

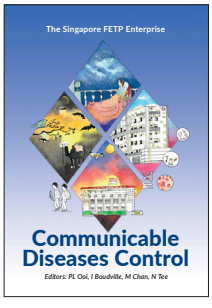
INFECTIOUS PERIOD
Considered infectious when sputum is bacteriologically positive and the patient is untreated. Can be considered non-infectious after two weeks of effective therapy for drug-susceptible pulmonary TB.

Multi-drug resistant TB (MDR-TB), i.e. TB resistant to rifampicin and isoniazid, the two key first-line anti-TB drugs, may require a longer period of effective therapy before cases become non-infectious.

Non-pulmonary tuberculosis (except for laryngeal TB) is not infectious.

TRANSMISSION
Airborne transmission. Rarely through ingestion of unpasteurised milk (*M. bovis*).

EPIDEMIOLOGY
TB is a major cause of death and disability in many parts of the world, especially in developing countries. In Singapore, TB incidence rates remain at approximately 34 cases per 100,000 population in 2020. Efforts have been stepped up in contact tracing and treatment of active and latent TB infections.



SCAN ME!

Editor's Note:

Excerpt taken from Communicable Diseases Control, a practical handbook on infectious diseases of public health importance in Singapore. The PDF copy of this 372-page book is downloadable from the NCID website via this QR code.

Professional Certification in Outbreak Alert and Response

Calling All Applicants!

Overview

The Singapore Field Epidemiology Training Programme (S-FETP) completed four runs of its flagship foundational course in 2020 and 2021, benefiting over 100 participants comprising field investigators, staff from One Health agencies, and front-liners from nine public agencies. They have gained basic insights and built competencies such as how to apply an evidence-based holistic approach in public health practice and outbreak management, and how to explain transmission dynamics in the emergence of unusual events and epidemics.

Master classes 2022, to be conducted by experienced trainers from NCID and NUS Saw Swee Hock School of Public Health in collaboration with the National Parks Board, are now open for application.

APPLIED EPIDEMIOLOGY AND RAPID RESPONSE COURSE

Eligibility to apply
Recommended for all medical, nursing, veterinary, scientific, operations or public health officers who are keen to serve in the field as rapid response team members. You must have some public health experience, assess your aptitude and suitability for the course, and obtain clearance from your supervisors and HR.

Dates: 9 Jul-13 Aug 2022
[run on six Saturdays, 9-5pm]
This is a foundational course which provides training on the fundamentals of applied epidemiology and public health practice:

1. Rapid epidemiological response and contact tracing
2. Outbreak investigation and management
3. Public health surveillance and bio-surveillance

Candidates who complete the course satisfactorily will be awarded with the NUS-NCID Certificate of Competence in Applied Epidemiology and Rapid Response.

FOR MORE DETAILS

S-FETP is a founding member of the ASEAN+3 (Japan, China, South Korea) field epidemiology training network. Its curriculum is modelled after the US CDC's Epidemic Intelligence Service training and enhanced to address our unique urban health security. Those interested may seek details from Programme Director, **Assoc Prof Steven Ooi** at **steven_pl_ooi@ncid.sg**.

ELEMENTARY FIELD EPIDEMIOLOGY METHODS COURSE

Eligibility to apply
Recommended for officers who have obtained the Certificate of Competence in Applied Epidemiology and Rapid Response and are keen to develop more proficiency with outbreak alert and response operations in the field, and have support from your supervisors and HR.

Dates: 28 Feb-4 Mar 2022
[run on five consecutive days, 9-5pm]
This course complements the basic course and provides training on elementary methods in field epidemiology and risk analysis:

1. Eco-epidemiology of emergencies and emergent threats
2. Quantifying the threats (field and lab analytics)
3. Community and socio-cultural determinants

Candidates who complete the course satisfactorily will be awarded with the NUS-NCID Certificate of Competence in Elementary Field Epidemiology Methods.

The two courses are stackable to achieve comprehensive and practical One Health outbreak management proficiencies. Participants who successfully complete both competency certifications will be awarded with the NUS-NCID Professional Certificate in Outbreak Alert and Response.

24 March 2022
World TB Day

Tuberculosis (TB) is one of the oldest known *infectious diseases*. It is caused by *Mycobacterium tuberculosis*, whose discovery was announced on 24 March 1882 by Dr Robert Koch. Its discovery allowed work to commence towards the control of this deadly disease.

Every year, we recognise World TB Day on 24 March to raise awareness on the devastating health, social and economic consequences of TB, and pledge our efforts towards ending TB globally.

Today, TB is treatable and curable. If left untreated, you risk infecting your loved ones at home and those whom you are in close contact with. Get screened if you develop symptoms of TB or are contact traced, so that treatment may be started early.

INFECTIOUS
Disease Intelligence

ABOUT US

Infectious Disease Intelligence is published in February and August by the National Centre for Infectious Diseases, Singapore. Readership includes the general public, college students, undergraduates, physicians, epidemiologists, microbiologists, laboratorians, researchers, scientists, and public health practitioners.

A downloadable electronic format is provided free of charge at our website: **www.ncid.sg/IDintelligence.** The material in *Infectious Disease Intelligence* may be reproduced with proper citation of source as follows: [Author]. [Article title]. *Infectious Disease Intelligence* [Year]; [Vol (Number)]:[inclusive page numbers]

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For more information on NCID, visit **www.ncid.sg.** For comments and feedback on *Infectious Disease Intelligence*, please email **IDintelligence@ncid.sg**

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