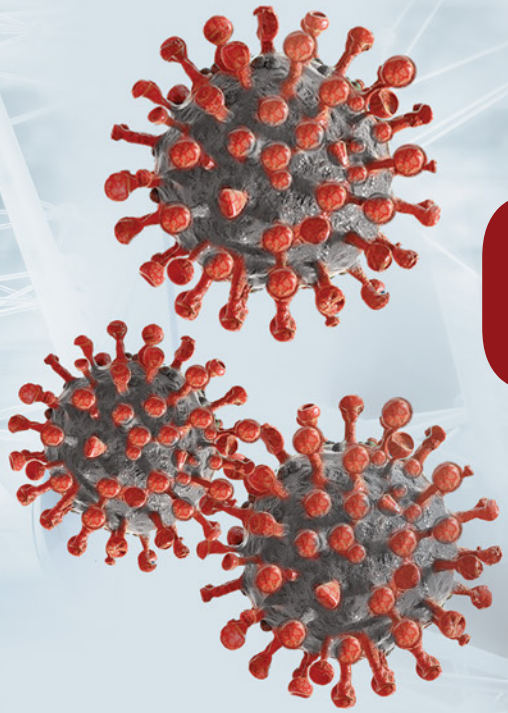

COMBATING THE COVID-19 THREAT

Text by Prof Leo Yee Sin and Adj A/Prof Matthias Paul Toh

At the time of writing, Singapore has been battling with SARS-CoV-2, the aetiologic agent of COVID-19, for almost 11 months. What is Singapore's scorecard on the global scale? Could we have done anything differently? In an earlier article published in *SMC News*, Prof Leo reflected on COVID-19 in Singapore and highlighted several key elements that placed our nation in its current state of low community transmission and modest mortality rate.

This article revisits some of the key elements in disease prevention and control in Singapore during the past year.

Singapore's effective response

First, owing to past experiences with SARS and other infectious disease outbreaks, Singapore was in a state of readiness before COVID-19 hit our shores and fortuitously, the new state-of-the-art National Centre for Infectious Diseases (NCID) building had been officially opened for four months.

Second, the healthcare system was flexible enough to respond swiftly to the unprecedented challenges of COVID-19 that spread with lightning speed, reaching a peak of 1,426 incident cases on 20 April 2020. The Singapore Expo and other large facilities were repurposed as Community Care Facilities for managing mild and recovering COVID-19 patients. This meant that we could preserve precious hospital resources for the more serious cases that might require oxygen supplementation and intensive care.

Third, Singapore adopted the whole-of-healthcare and whole-of-government response. With foresight, the Multi-Ministry Task Force was set up before Singapore received its first imported case to direct the national whole-of-government response to the COVID-19 outbreak. This allowed high-level decision-making with coordinated and consistent messaging and implementation of public policies.

Fourth, the establishment of a collaborative research platform with central coordination from the NCID. Patient samples supported viral isolation and the development of a local serology test kit that detects neutralising antibodies – the first of its kind to be licensed by the US Food and Drug Administration. Having a longitudinal research cohort allowed disease characterisation and discovery of viral shedding patterns to provide evidence-based preventive measures. Participation in international therapeutic trials gave access to new antiviral and therapeutic agents.

Last but not least, a robust public health system in surveillance, contact tracing, testing and isolation. To sum it up, community efforts plus the political will to keep the virus under check has brought us to where we are today.

The difference between SARS and COVID-19

Would SARS-CoV-2 be eradicated like SARS was in 2003? Despite both being zoonotic coronaviruses, there are several major differences that make eradication highly unlikely. In 2003, SARS rarely showed up without symptoms and the virus replicated in the lower respiratory tract with increased infectivity during the second week of illness or pneumonia phase. Fever, a symptom easily recognised at the onset of illness, provided easy identification of close contacts for quick isolation. Healthcare workers faced a high risk of infection which was mitigated by appropriate personal protective equipment. In 2020, this novel SARS-CoV-2 behaves very differently. Viral transmission occurs early during the pre-symptomatic phase and asymptomatic cases have been reported to be approximately 20% to 40%, or higher. Often, these transmissions occur in the community, particularly among households where safe distancing and universal masking are difficult to adhere to. All odds stack up against eradicating SARS-CoV-2.

The journey continues

Eleven months into the COVID-19 battle, Singapore has managed to maintain a low level of fewer than 20 daily new cases for more than ten weeks, of which most were imported. As of 1 December 2020, there were 31 cases in community care facilities and 29 in acute care settings with the majority in NCID. Healthcare is progressively returning to pre-COVID-19 levels. However, this is nowhere near the end of the COVID-19 pandemic. Cases continue to soar in many parts of the world. The US reported cumulative 13,920,038 cases, including 274,332 deaths as of 1 December 2020. Resurgences are also experienced in Asia involving countries that had done well to control COVID-19 earlier in the year, including South Korea, Japan and Hong Kong.

Singapore, like many other countries, is eager to open our economy and boost international trade and tourism. A risk-based approach has been taken, and close surveillance and monitoring are needed, along with the agility to adjust restrictive preventive measures. Singapore has 2,295 cumulative community cases detected as of 1 December 2020. The seroprevalence studies in Singapore suggested an extremely low prevalence (below 1%) that supported the limited community transmission observed, but more importantly pointed to a large population susceptible to COVID-19. There is no room for complacency in sustaining preventive measures and keeping the system ready to handle potential surges of cases.

Human coronaviruses are known to have short-lasting immunity, leading to reinfection. In August, Hong Kong published the first case of a returning resident who was infected by two different strains of SARS-CoV-2 four months apart. Several subsequent reinfection cases reported in Europe and South America confirmed that reinfection is an entity to watch out for. However, the true incidence and disease severity remain largely uncertain, given that SARS-CoV-2 is likely to stay with possible repeated recurrences.

In a short period after the emergence of SARS-CoV-2, three vaccine developers published near perfect efficacy reports of over 90%. Two of these utilise new technology using mRNA to elicit humoral and cellular immunity and the third is a platform vaccine technology using a chimpanzee adenovirus to deliver virus materials. Although none of these have been published in medical journals, the eagerness of the global community to implement large-scale vaccination programmes is palpable, particularly under the immense pressure of COVID-19. A successful vaccine may be the ultimate game changer but it is unlikely to bring us back to the pre-COVID-19 era, as the effectiveness of the vaccine is yet to be studied. Although it appears safe immediately post-vaccination in about 200,000 trial recipients, mechanisms to systematically monitor longer term safety remain a critical component.

Given that SARS-CoV-2 is likely to be present in the long-term and possibly have repeated occurrences in the human population, its longer term trajectory and viral evolution akin to the influenza virus will need to be included in the respiratory illness surveillance system. 2020 also saw a dual epidemic of COVID-19 and dengue. At its current state, NCID has fully deployed its inherent human resources, thus the beefing up of surge capacity and capability is of urgent and paramount importance.

Final thoughts

A novel infectious disease of public health importance does not respect geographical boundaries and often presents unexpectedly with dire consequences. Once again, COVID-19 has taught us, loudly and clearly, that to win the battle we need a well-coordinated and whole-of-healthcare response, not by infectious diseases alone as a medical discipline or restricted to one institution or healthcare cluster. We need to venture beyond Singapore's shores, to be well-connected within the region and internationally for self-defence against invisible invading microbes. Only as a united human race will we have the chance of winning against the invisible microbes. ◆

Prof Leo is an adult infectious disease specialist. She has led her team through multiple outbreaks in Singapore. Most recently she has successfully managed Singapore's first imported case of the monkeypox in May 2019 and is currently leading her team at the National Centre for Infectious Diseases in managing the ongoing COVID-19 pandemic.

Adj A/Prof Toh has a special interest in disease prevention and control, health promotion and primary care. At the National Centre for Infectious Diseases, he coordinates public health operations for contact tracing and leads the epidemiology team to provide insights on the global and local situation for communicable diseases, and is actively doing so during this COVID-19 pandemic.