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Commentary

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SARS, MERS and COVID-19—new threats; old lessons

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Contrary to the widespread optimism of the mid-20th century, infectious diseases will never be relegated to history by antimicrobials and vaccines. 'New' human pathogens have emerged at intervals throughout human history but, until recently, emerging infectious diseases often remained unrecognized, and their causes unknown, long after they had become widespread. Now, scientists can often characterize emergent pathogens with astonishing speed, using next-generation sequencing and bioinformatics. In December 2019, in Wuhan, China, only a few days elapsed between collection of respiratory specimens from patients with viral pneumonia of unknown aetiology and the publication of the genome of the novel beta-coronavirus (now called SARS-CoV-2) that caused it.[1] This led to rapid development of a diagnostic polymerase chain reaction (PCR) test and implementation of targeted containment measures. One might expect these technological advances, along with lessons from two previous novel coronavirus disease outbreaks—severe acute respiratory syndrome (SARS), in 2003 and Middle East respiratory syndrome (MERS), in 2012—to contribute to rapid control of the latest one, COVID-19. But, as Peeri *et al.*[2] note in this issue, although there are similarities between SARS-CoV, MERS-CoV and SARS-CoV-2, there are key differences between the corresponding diseases, the global milieux into which they have emerged and international responses, that limit the relevance of lessons from previous outbreaks.

SARS-CoV, MERS CoV and SARS-CoV-2, like most emerging human pathogens, are zoonotic viruses that have 'spilled over' from animals and acquired the ability to spread, person-to-person, with variable efficiency. SARS-CoV was first implicated in human disease in China in 2002, linked epidemiologically to wild animal trading and detected in several wild animal species, before being traced to a reservoir in bats.[3] Early COVID-19 cases were linked to the Huanan Wholesale Seafood Market, in Wuhan, which sold a variety of wild animals. No specific animal source was identified, but the genetic similarity between SARS-CoV-2, SARS-CoV and SARS-like bat coronaviruses, suggest that bats are the likely reservoir of SARS-COV-2, as they are, also, of MERS-CoV; the usual intermediary source of MERS, for humans, is domestic camels.[4]

In 2003, the Chinese government was criticised for its delayed reporting of an outbreak of viral pneumonia in Guangdong province to the World Health Organization (WHO). By the time the WHO was notified in March 2003, 4 months after the outbreak started, there were 300 known cases and a Chinese doctor, visiting from Guangzhou, had infected 16 fellow guests in a Hong Kong hotel, thus triggering global dissemination of SARS to 29 countries.[5] This contrasts with the more timely notification of a cluster of pneumonia cases in Wuhan on 31 December 2019. Although, in retrospect, the first cases had occurred in early December, there was understandable delay in recognizing a small number of serious respiratory infections as an outbreak, in the midst of a seasonal influenza epidemic. However, the report closely followed a 'leak', on 30 December, when a young Chinese doctor, Li Wenliang, warned a small group of colleagues by private WeChat

message, about several cases of a SARS-like illness. A few days later he was detained for 'spreading rumours' and made to sign a statement promising to cease 'illegal activities'. Nevertheless, Li continued to speak out about the need for greater transparency, until his death from COVID-19 on 7 February.[6]

On 23 January 2020, the Chinese government introduced control measures designed to limit spread of the disease, including travel bans to halt the expected mass population movements during Lunar New Year celebrations, along with social distancing policies, isolation of cases and quarantine of suspected contacts.[7] By then, COVID-19 had spread widely within Hubei province, but much less so in other provinces and very little internationally. Of nearly 43 000 laboratory-confirmed cases, to 11 February, there were only 466 outside mainland China, mostly in people who had left Hubei province before travel restrictions were imposed.[8] Daily reports of new cases in China plateaued between 23 and 27 January and have been declining since, but by early March case numbers were rising rapidly around the world.

By 9 March, there were more than 114 000 laboratory-confirmed cases, including nearly 34 000 in 112 countries outside mainland China, with several reporting significant community transmission (https://www.worldometers.info/coronavirus/). The crude case fatality rate (CFR) was 3.4% but, considering limited testing capacity in many countries, and the likely substantial numbers of undiagnosed cases, the true CFR is predicted to be <1%.[8] Population-based serological surveys will be needed to estimate the true infection prevalence and CFR.

It was clear early on that COVID-19 was very different from SARS and MERS. Although presenting symptoms are similar—fever and cough, progressing to pneumonia in severe cases, with poorer outcomes associated with older age and comorbidities—SARS and MERS were/are much less transmissible but more likely to be severe or fatal than COVID-19. The spread of SARS was controlled by July 2003, 7 months after it began, with a total of 8096 cases and 774 (9.6%) deaths. There have been multiple MERS outbreaks since 2012, mainly in Middle Eastern countries; most have begun with a primary case, acquired from a camel, followed by secondary person-to-person spread. Altogether, 2494 MERS cases and 858 (34.4%) deaths, have been reported, worldwide. The high proportion of healthcare workers affected by SARS (21%[9]) and MERS (34% of secondary cases[10]) has not been a feature of COVID-19; until 11 February 11, only 3.8% of confirmed COVID-29 cases in China and 0.05% of deaths have been in healthcare workers.[8]

Has the global community failed to heed the lessons of previous outbreaks? There are still many unanswered questions, but current widespread community transmission of COVID-19, in many countries, indicates that it cannot be eradicated (like SARS) or limited to modest outbreaks (like MERS). In the absence of a vaccine, public health measures may, at best, delay transmission. How rapidly it spreads will depend on how conscientiously members of the public and hospital workers observe well-established infection prevention and control (IPC) principles—hand hygiene, cough etiquette, social distancing and, in healthcare settings, isolation of affected patients and appropriate use of personal protective equipment (PPE).

The rapid dissemination of COVID-19-related information via the internet has been almost overwhelming and a mixed blessing. Timely scientific, clinical and epidemiological data are invaluable to policy and decision makers, but an 'infodemic' of false information, especially via social media, has fuelled conspiracy theories, public alarm, stigmatization of affected communities and escalating economic costs disproportionate to health risks, significant though they are. Although China's response was not unduly delayed this time, all governments would be wise to heed, rather than silence, warnings from astute clinicians, like Dr Li, who are often the first to recognise a disease cluster. There is a long way to go and much to learn before the end of COVID-19.

Conflict of interest

None declared.

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