Communication, collaboration and cooperation can stop the 2019 coronavirus

As the outbreak of a deadly new coronavirus in China and its rapid spread is rattling countries, only the collective international experience and advances derived from past outbreaks can accelerate its control.

On 31 December 2019, the World Health Organization was alerted about a cluster of pneumonia cases of unknown etiology in Wuhan, China, which prompted international concern of the potential public-health impact of an outbreak of a new virus. Those initial concerns have proven justified: at the time of this writing, it has been confirmed that thousands of people have been infected, and of those, almost 3% have died. With the now global spread of the virus, the urgency of a coordinated international response has amplified.

Within days of the initial outbreak, Chinese researchers had identified a novel coronavirus—temporarily named ‘2019-nCoV’—in samples from patients, and they made the viral sequence publicly available on 10 January 2020, after global urging. The swift identification of the new coronavirus reflects China’s investment in scientific capacity, as well as new strategies and infrastructure for public-health emergencies implemented in the country since the outbreak of the related severe acute respiratory syndrome (SARS) coronavirus in Guangdong province in 2002 (also see the [Comment by John Nkengasong](#)). However, the public release of the 2019-nCoV viral sequence was needed to empower the global community to collectively mobilize research efforts to help in the containment of this virus.

Experience gained from viral outbreaks over the past two decades has also better positioned the international response in terms of scope and speed. The SARS outbreak, which killed 774 people worldwide, and the 2012 emergence of the related coronavirus Middle East respiratory syndrome coronavirus (MERS-CoV) stimulated the development of a broad array of research tools, vaccine platforms, diagnostics and potential therapeutics that have yielded extensive scientific insights into coronavirus biology and are now being translated to the new virus. That progress, coupled with lessons learned from the outbreaks of Zika, Ebola and Chikungunya viruses, should enable rapid containment of 2019-nCoV.

Accordingly, on 13 January 2020, the Vaccine Research Center of the US National Institutes of Health communicated the 2019-nCoV viral sequence to collaborators

at Moderna, which has initiated good-manufacturing-practice production of an mRNA vaccine targeting the viral spike glycoprotein. The hope is to launch a phase 1 clinical trial in healthy people within three months. Initial phylogenetic analysis of 2019-nCoV sequences suggests there is little diversity—indicative of limited evolution—among viral isolates, which would be a potential boon to broad dissemination of a protective vaccine (<http://virological.org/t/preliminary-phylogenetic-analysis-of-11-ncov2019-genomes-2020-01-19/329>). On 23 January 2020, the Coalition for Epidemic Preparedness Innovations announced funding for Inovio Pharmaceuticals and the University of Queensland to leverage their existing platforms from MERS vaccine efforts, and separately to Moderna for its mRNA platform, to help accelerate clinical testing of a vaccine against 2019-nCoV.

Studies of SARS and MERS viruses have also suggested candidate therapeutics: Gilead Sciences is in talks with the USA and China for the possible use of remdesivir, an investigational drug that has shown efficacy in preclinical models of SARS and MERS coronaviruses. Also, investigators in China report that a clinical trial of the antivirals lopinavir and ritonavir, used to treat some patients with SARS and MERS, has been initiated in hospitalized patients infected with 2019-nCoV ([https://www.thelancet.com/journals/lancet/article/PIIS0140-6736\(20\)30183-5/fulltext](https://www.thelancet.com/journals/lancet/article/PIIS0140-6736(20)30183-5/fulltext)).

This multi-pronged approach to curtail the outbreak, strongly supported by existing R&D, is a testament to the collaborative response of international organizations and the research and clinical communities. Nevertheless, at the time of this writing, many knowledge gaps remain that must be bridged. For example, the transmissibility of the virus and full extent of the outbreak remain uncertain, as undiagnosed cases of coronavirus infection may have been mistaken for other respiratory illnesses. Moreover, whether ‘superspreaders’ exist—people capable of transmitting the virus to a larger number of contacts than average, as observed during the SARS outbreak—is unknown. Also, the true virulence of the virus is unclear: so far, most of the deaths have occurred in older people with underlying comorbidities.

While the virus resembles other coronaviruses harbored in bats, the animal host of 2019-nCoV has not been identified, nor has the mechanism by which a suspected animal virus made the jump to humans. Likewise, whether the initial infections derived from a single zoonotic transmission event or many such events has yet to be ascertained. Resolving these issues will help establish effective control measures to limit further viral transmission. However, to do so will require sharing not just knowledge but the virus itself. At the time of this writing, only China had access to the intact virus, which means that other countries would need to create it anew by reverse engineering or by isolating the virus from infected people. Although this is feasible, such barriers to complete collaboration can contribute to delays in outbreak control.

In December, 2017, Chinese researchers discovered a cave of bats harboring viruses that together contained all the genetic material needed to create a potentially deadly SARS-like virus. However, virus-surveillance efforts did not detect 2019-nCoV, and initially local authorities did not broadly acknowledge its possible health impact, despite existing knowledge of related viruses. This speaks dually to the need for continued surveillance and emergency planning, and to the importance of publicizing health outbreaks as they occur to optimize response coordination and to engage the lay community in active risk prevention, [even at early stages](#).

Public-health security transcends borders. In the face of global infectious-disease emergencies, countries have a responsibility to be transparent in their reporting and actions, both to their own populations and to the international community, in order to facilitate and accelerate cooperation that will ultimately curtail outbreaks and minimize harm. The initial global response to the 2019-nCoV outbreak illustrates the power of rapid communication and the importance of sustained research and collaborations that can be leveraged in future outbreaks. Sustained cooperation is essential to their resolution. □

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