Orchestrated Scientific Collaboration: Critical to the Control of MERS-CoV
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With the public riveted to the Ebola virus disease epidemic this past year, it is not surprising that the Middle East respiratory syndrome (MERS) has fallen off the radar. *Time* (1) identified the spread of the MERS virus as one of the top 10 underreported stories in 2013 and cited the low number of known reported cases as grossly understating the potential threat. Now, almost 3 years after the World Health Organization announced the first recognized human case of MERS, it has reemerged in the Middle East; however, it is overshadowed by Ebola and other new emerging infectious diseases. But with a rapidly evolving and new cluster of at least 172 cases in Korea—including 3 generations of transmission and 27 deaths as of 23 June 2015—it is imperative that we assess our progress to date in containing and understanding MERS (2).

Coronaviruses (CoVs) are responsible for a substantial percentage of all common colds (3). Until 2003, only 2 human CoVs, HCoV-229E and HCoV-OC43 (both discovered in the 1960s), had been described. That year, the severe acute respiratory syndrome CoV (SARS-CoV) emerged, and the spectrum of illness associated with CoVs expanded to include pneumonia and the acute respiratory distress syndrome. After noting the morbidity, mortality, and economic disruption that SARS caused, virologists attempted to identify and decode CoVs. Two additional human CoVs were discovered: HCoV-NL63 and HCoV-HKU1.15-17. The ongoing evolution of these viruses and the respiratory illnesses they cause suggested that CoVs might pose significant challenges to the scientific and public health communities.

In 2012, an astute microbiologist in Jeddah, Saudi Arabia, alerted the world to a novel CoV in the “beta group” that was responsible for a severe respiratory illness. Now called MERS-CoV, the disease it causes has led to substantial morbidity and mortality among reported cases. Although the clinical spectrum of MERS-CoV infection seems broader in its signs and symptoms than that of SARS, its human transmission patterns mirror SARS. Appropriate recognition and timely control of MERS are imperative before it spreads worldwide.

Three years after recognition in humans, we still have little information about the epidemiology, risk factors, transmission dynamics, and treatment of MERS. How can this be? We know from previous infectious diseases outbreaks, such as HIV, that a coordinated response that includes an integrated understanding of virologic characteristics, host response, epidemiology, and the effect of treatment rests on concerted and comprehensive research efforts and support.

The scientific community is far behind where it should be. A PubMed search on 6 June 2015 querying the number of peer-reviewed articles published worldwide relating to MERS is sobering. After nearly 33 months of known cases of MERS, 475 scientific papers have been published and only 1 (an observational study) is classified as a clinical trial. This record pales in comparison to SARS. Thirty-three months after the World Health Organization first alerted the world to SARS, 2854 total publications were available in PubMed, 33 of which were classified as clinical trials. At this point in the SARS epidemic, we had some understanding of the reservoir, knew enough about different modes of transmission to guide public policy, and had information on treatment regimens. These data drove the interventions that allowed SARS to be controlled and then eradicated.

Although the SARS-CoV and MERS-CoV and the infections they cause are similar, collaboration among the international scientific and research community could not be more disparate. The microbiologist in Jeddah who first alerted the world to MERS was dismissed for sending the virus to Dutch researchers for genome sequencing, which is a resource not available in the Kingdom of Saudi Arabia (4). This attempt at collaboration was viewed unfavorably, especially after Dutch researchers tried to patent the new virus (5). The first publication of sequencing data was delayed until more than a year into the epidemic, although advances in technology since SARS would have allowed scientists to sequence the genome in days rather than weeks. The well-orchestrated symphony of efforts that ultimately halted SARS was not mirrored in this international response effort. Instead, cooperation and collaboration for MERS has been suppressed.

Where would we be with other communicable diseases, such as HIV, if not for well-orchestrated scientific collaboration? Only 30 years after this universally fatal infection emerged, patients infected with HIV can now receive treatments that allow them to live a normal lifespan. The stunning accomplishments in HIV and AIDS research over the past 30 years were the result of open collaboration between basic scientists who made epochal discoveries and clinical investigators who translated their work into robust clinical trials that identified successful interventions for prevention and treatment.

Networks of scientists around the globe are now using the research and public health infrastructure put in place for HIV to examine and tackle other great challenges, such as hepatitis C virus, influenza, and Ebola. Scientists and health care workers in western Africa...
have embraced cooperation with the international community, and they contributed significantly to the understanding and control of Ebola. If we concern ourselves only about cases that might occur within our borders, adopting an exclusionary stance with surveillance at our points of entry, countries without the scientific resources to contain MERS-CoV will be left alone to battle a scourge.

Perhaps those of us outside the Arabian peninsula have not believed that this threat is real enough to justify mobilizing substantial resources. If so, the current cluster of MERS cases in Korea, the epicenter of which is in Pyeongtaek (home to the South Korean Navy), should serve as a serious wake-up call. Once again, nosocomial transmission is at the vanguard, as in previous MERS and SARS outbreaks (6, 7).

Currently in Korea, there is intrahospital transmission and we need detailed understanding of how this is occurring. In addition, MERS-CoV is still circulating most heavily in the Middle East, which hosts 3 million Muslim pilgrims from all over the world as they embark on the Hajj. Many Muslims travel to Mecca during the holy month of Ramadan, and travel during a MERS-CoV outbreak could facilitate spread to other, more populated geographic regions, which has occurred previously. Although there is still hope that MERS, like SARS, may disappear, cases of MERS infection have more than tripled since the end of 2013, which suggests that this is unlikely.

Thus, there is a critical need for increased coordination, data sharing, and timely analysis of information about MERS, all of which was recently accomplished in the Ebola outbreak. Just as political leaders seem to now realize the critical importance of transparency and collaboration in such situations, so too must the scientific, clinical, and public health communities. Collaboration, as in an orchestra, leverages complementary skills, stimulates alternate ways of thinking, and provides a playing field to validate findings. It is time for this orchestra to play.

References

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