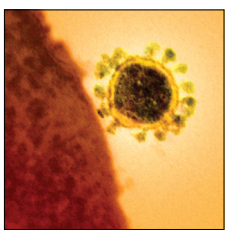
Since January 2020 Elsevier has created a COVID-19 resource centre with free information in English and Mandarin on the novel coronavirus COVID-19. The COVID-19 resource centre is hosted on Elsevier Connect, the company's public news and information website.

Spread of MERS to South Korea and China



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Published Online
June 3, 2015
http://dx.doi.org/10.1016/S2213-2600(15)00238-6

The recent report[1] of the first case of the Middle East respiratory syndrome (MERS) coronavirus infection from Seoul, South Korea, on May 20, 2015, has attracted global media attention. The patient was a man aged 68 years who had travelled to the Middle East (Bahrain, United Arab Emirates, Saudi Arabia, and Qatar) from April 18, to May 3, 2015, and developed symptoms on his return to South Korea on May 11, 2015. This case could have passed unnoticed, since individual cases of MERS have been reported from all continents without major subsequent secondary spread. However, the subsequent major outbreak in Seoul, with 30 MERS cases (two deaths) reported as of June 3, is the largest case cluster of MERS outside the Middle East and a major cause for concern. This outbreak gives us an opportunity to reflect on progress on global efforts being made to control MERS coronavirus since it was first detected in a patient who had died from a severe respiratory illness in June, 2012, in Jeddah, Saudi Arabia.[2]

While the source of infection in the index MERS patient during his stay in the Middle East is under investigation, deficiencies in control measures and in prevention of hospital infection in South Korea are most likely to have resulted in the Seoul nosocomial outbreak.

This outbreak includes at least 27 secondary cases and two tertiary cases (family members of the index case, other patients who were in the same ward and their family members, and health-care workers who had attended the index patient). Inadequate implementation of a quarantine protocol and poor public health surveillance seem to have allowed a business trip to be made by a symptomatic man aged 44 years, who was in close contact with the index patient, which consisted of travel by air from Seoul to Hong Kong on May 26, 2015, and then by bus from Hong Kong to Huizhou in southern China. He was subsequently confirmed to have MERS coronavirus infection on May 29, 2015, in Huizhou, leading to intensive contact tracing by local public health authorities and panic in the communities in mainland China and Hong Kong.[3]

Previous major nosocomial outbreaks of MERS coronavirus infection in Saudi Arabia in April and May, 2013, in Al-Hasa province,[4] and in several Jeddah hospitals in April and May, 2014,[5] were attributed to poor hospital infection control measures and showed no evidence of major viral mutations. The Korean hospital cluster[2] and the export of an active case to China[3] emphasises the importance of maintaining stringent hospital infection control and prevention measures. These measures include isolation of the index patient in a negative-pressure room or a well ventilated room, droplet and contact precaution with eye protection when caring for probable or confirmed cases of MERS coronavirus infection, and airborne precautions when performing aerosol generating procedures.[6] For the hospital infection control and isolation system to function effectively, it is important to maintain administrative controls (such as careful triage of patients, separation of potentially infectious cases from other patients in waiting rooms in the emergency area), environmental controls (such as ensuring a clean environment with adequate ventilation and spatial separation), and compliance with appropriate personal protection equipment (such as gloves, gowns, eye protection, surgical masks, and respirators).[7]

MERS had captured global attention and the media spotlight since its discovery in 2012, until it was overshadowed by the epidemic of Ebola virus disease in west Africa.[8] Over the past 3 years, MERS cases have continued to increase and, as of May 31, 2015, 1187 laboratory-confirmed cases have been recorded, with 485 deaths (40% mortality).[9] Although the great majority of MERS cases have been reported in Saudi Arabia and the United Arab Emirates, people with a history of travel to the Middle East have exported cases to Europe, the USA, north Africa, and Asia. Of major concern is that the first case of MERS was reported almost 3 years ago, and yet the disease remains a serious health threat to the global community, with many basic questions remaining unanswered.[10] Phylogenetic analysis of MERS coronavirus isolates from human beings show that camels and bats are reservoirs for MERS coronavirus, but the exact mode of transmission to human beings remains unknown and only a few people infected with MERS have had contact with camels. The absence of such crucial information has made it difficult to develop effective interventions to reduce the risk of disease transmission, define the epidemiology of the disease, and develop effective

public health control measures. Importantly, the natural history, risk factors, pathogenesis, viral virulence, viral kinetics, duration of infectiousness, protective immune responses, optimum management, and prognostic factors remain unknown. This information is required for the development and evaluation of new biomarkers, diagnostics, drugs, adjunct therapies, and vaccines.[9,10]

Similarly to other coronaviruses, MERS coronavirus is prone to mutations and can acquire an enhanced ability to be transmitted to human beings and between human beings. Such mutations would increase the risk of a pandemic, especially since several million pilgrims travel throughout the year from all continents to Saudi Arabia, with much of this travel associated with the Hajj and Umrah. Fortunately, no increase in MERS cases related to the Hajj has been reported.[11] As with Ebola virus disease, no specific or effective drug treatment or vaccine exists for MERS. Infection prevention and control measures remain crucial to prevent spread of MERS coronavirus during the mass gathering religious events[12] and to avoid secondary outbreaks in contacts.

Although Ebola virus disease arose in west Africa and MERS coronavirus in the Middle East, threats of infectious diseases with epidemic potential can arise from any other continent, as witnessed by severe acute respiratory syndrome (SARS), swine-origin influenza A H1N1, and avian influenza A H7N9. The persistence of MERS coronavirus infections in the Middle East and its continuing spread to other countries 3 years after it was first detected points to a global failure by governments and public health systems to adequately assess and respond to such threats. Proper risk assessment and communication procedures necessary to define and control the outbreaks are inadequate, and a coordinated action plan to tackle MERS is sorely needed. With increasing numbers of novel and re-emerging infectious diseases which threaten global health security,[13,14] the time has now come for governments and global public health bodies to show bold leadership by establishing national, regional and pan-continental capacities for rapid conduct of research based on equitable partnerships to generate the best evidence base for formulating effective public health, infection control and treatment interventions[14] required to effectively tackle these infections.

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We declare no competing interests.

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