

Transmissibility of Middle East Respiratory Syndrome by the Airborne Route

TO THE EDITOR—Hospital outbreak is one of the defining epidemiologic characteristics of Middle East respiratory syndrome coronavirus (MERS-CoV) infection [1, 2]. During the Korean MERS-CoV outbreak in 2015, almost all case patients were infected at hospitals, and the 5 largest clusters of the hospital outbreaks accounted for 83% of all cases [3–5]. However, it remains to be determined whether these outbreaks were due to contact with infectious droplets or inhalation of infectious droplet nuclei.

In a recent article in *Clinical Infectious Diseases*, Kim et al [5] reported that viable MERS-CoV was isolated from 19 environmental samples, including 4 air samples. Two of the 3 patients were receiving mechanical ventilation when air samples were taken, but the other patient (patient 3) did not undergo any aerosol-generating procedures. The isolation of MERS-CoV from multiple air samples, especially from the corridor air (hospital B, patient 3), raises concern about possible airborne transmission of MERS-CoV.

However, the characteristics of the environmental isolates seem to differ from those of the clinical isolate. First, the immunofluorescence (IF) study showed few IF-positive cells in cultures of the air and surface samples but widespread IF-positive cells in culture of the positive control virus (clinical isolate of MERS-CoV/Korea/KNIH/002_05_2015) (*Supplementary Figure 3B*) [5]. Second, for the IF study, the cells inoculated with the environmental isolates were harvested after 7 days in culture, whereas the cells inoculated with the clinical isolate were harvested after 2 days in culture. These findings suggest that the environmental isolates have a limited capacity for replication.

Third, the sequence similarities of the spike gene from the 19 environmental isolates ranged from 97% to 100% (*Supplementary Figure 2*). Considering the small size of the target region (nucleotides 22 300–22 682), one would expect

a sequence similarity of 100%. Indeed, a recent study showed that the nucleotide substitution of MERS-CoV during the Korean outbreak was very rare (3.78×10^{-6} per site per day), and no nucleotide substitution was observed in the target region [6]. In contrast, the 8 MERS-CoV isolates (NOs. 64, 65, 66, 68, 69, 71, 72 and 75) from the same room (hospital B, patient 3) had diverse similarity in the target region. Therefore, both the genotypic and the phenotypic characteristics of the environmental isolates are not in line with those of the clinical isolates. Further studies are needed to fully characterize the environmental isolates.

To assess the possibility of airborne transmission, we also need to know the amount of virus in the air samples. The authors collected 1000 L of air for the virus culture study, a volume equivalent to what a resting person inhales for >120 minutes. However, we do not know the amount of MERS-CoV in the samples. Until we fill all the knowledge gaps, we should remember that the mere presence of MERS-CoV in the air is not directly translated into airborne transmission.

Note

Potential conflict of interest. Author certifies no potential conflicts of interest. The author has submitted the ICMJE Form for Disclosure of Potential Conflicts of Interest. Conflicts that the editors consider relevant to the content of the manuscript have been disclosed.

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