Environmental Science and Pollution Research (2021) 28:58812–58813
https://doi.org/10.1007/s11356-021-16472-z

LETTER TO THE EDITOR

Letter to the editor "Investigation of SARS-CoV-2 in hospital indoor air of COVID-19 patients' ward with impinger method"

Fazel Mohammadi-Moghadam[1] · Sara Hemati[1]

Received: 7 June 2021 / Accepted: 6 September 2021 / Published online: 13 September 2021

The *Environmental Science and Pollution Research* recently published an article entitled "Investigation of SARS-CoV-2 in hospital indoor air of COVID-19 patients' ward with impinger method," in which the sampling methodology of this article is debatable.

As known, COVID-19 is an infectious disease caused by severe acute respiratory syndrome (SARS-CoV-2) (Hemati et al. 2021). Rapid spread of the virus around the world shows that identification of transmission routes plays a vital role in controlling the disease (Razzini et al. 2020; Tan et al. 2020; Van Doremalen et al. 2020). The airborne transmission of SARS-CoV-2 is still controversial, and outbreak of extreme deadly virus SARS-CoV-2 has affected the whole world. Hence, the identification of standard methods for sampling and determination of the virus in air is very important (Ratnesar-Shumate et al. 2021). In this regard, various sampling methods like impinger, PTFE filters, gelatin filers, and cyclones have been applied to SARS-CoV-2 detection (Rahmani et al. 2020). Recently, many studies have used the impinger technique in different conditions for SARS-CoV-2 detection in air (Faridi et al. 2020, 2020, Ratnesar-Shumate et al. 2021, Rahmani et al. 2020).

In the Faridi et al. (2020) study, in early phase of the COVID-19 pandemic, an impinger containing 20 mL DMEM with flow rate of 1 L/min during 1 h was used for air sampling, and they did not detect any SARS-Cov-2 virus in the indoor air samples (Faridi et al. 2020). However, given the low sampling time (60 min), it is possible that virus may have been present below the limit of detection for assay.

However, Masoumbeigi et.al (2020) did not detect any SARS-CoV-2 PCR positive in the air using impinger technique by the following condition: flow rate 5 and 40 $L.min^{-1}$, sampling time 20 and 15 minutes, and 7 mL of transmitting media (Masoumbeigi et al. 2020).

Ratnesar-Shumate et al. (2021) investigated the performance of commercially available low-flow aerosol sampling devices to collect SARS-CoV-2. They used glass impinger and midget impinger in 5.5 and 0.9 flow rates (L/min), respectively. These results are needed to express the interpretation of studies in which SARS-CoV-2 are measured in aerosols (Ratnesar-Shumate et al. 2021). Schuit et al. (2021) used AGIs and midget impingers for sampling aerosols containing Ebola virus operated at 6 L/min and 1 L/min flow rates, respectively (Schuit et al. 2021).

The original paper (Vosoughi et al. 2021) claims that all the air samples were negative in terms of SARS-CoV-2 by an impinger containing 15 mL of culture medium with a flow rate of 28 L/min and sampling time of 50–60 min. In view of this, we thank the authors for their contribution to the scientific literature on the matter. However, despite this gratitude, we believe that the air sampling method from Vosoughi et al (2021) is fundamentally flawed and is not transparent for other researchers.

One of the main reasons that all samples were negative in the Vosoughi et al (2021) study can be resulted from high flow rate. Moreover, they did not mention that air sampling was performed before or after disinfection in the hospital wards. Additionally, in this study, the type and volume of the impinger are not specified. Based on our knowledge and experience, by applying 28.3 $L.min^{-1}$ flow rate, the culture medium will be instantly sucked from inside the impinger into the sampling pump. In the Vosoughi et al (2021) study, air sampling was done with this flow rate for 50–60 min, which is practically impossible (the reported condition was examined in our air laboratory). We believe that the air sampling method in the Vosoughi et al. (2021) study is not flawless, and therefore, the conclusions they have drawn are not supported. To build on the results of this study, other researchers need details

Responsible Editor: Philippe Garrigues

✉ Sara Hemati
hemati.sara88@yahoo.com

Fazel Mohammadi-Moghadam
fm.moghadam@skums.ac.ir

[1] Department of Environmental Health Engineering, School of Health, Shahrekord University of Medical Sciences, Shahrekord, Iran

of the air sampling method. If used incorrectly, these methods can cause other researchers to be confused.

We need to improve air sampling techniques to tackle the important health issues of airborne viruses especially during the pandemic.

References

Faridi S, Niazi S, Sadeghi K, Naddafi K, Yavarian J, Shamsipour M, Jandaghi NZS, Sadeghniiat K, Nabizadeh R, Yunesian M (2020) A field indoor air measurement of SARS-CoV-2 in the patient rooms of the largest hospital in Iran. Sci Total Environ 725:138401

Hemati S, Mobini GR, Heidari M, Rahmani F, Soleymani Babadi A, Farhadkhani M, Nourmoradi H, Raeisi A, Ahmadi A, Khodabakhshi A, Sadeghi M, Bagheri M, Validi M, Taghipour S, Mohammadi-Moghadam F (2021) Simultaneous monitoring of SARS-CoV-2, bacteria, and fungi in indoor air of hospital: a study on Hajar Hospital in Shahrekord, Iran. Environ Sci Pollut Res. 28: 43792–43802. https://doi.org/10.1007/s11356-021-13628-9

Masoumbeigi H, Ghanizadeh G, Yousefi AR et al (2020) Investigation of hospital indoor air quality for the presence of SARS-Cov-2. J Environ Health Sci Engineer 18:1259–1263. https://doi.org/10.1007/s40201-020-00543-3

Rahmani AR, Leili M, Azarian G, Poormohammadi A (2020) Sampling and detection of corona viruses in air: A mini review. Sci Total Environ 740:140207

Ratnesar-Shumate S, Bohannon K, Williams G, Holland B, Krause M, Green B, Freeburger D, Dabisch P (2021) Comparison of the performance of aerosol sampling devices for measuring infectious SARS-CoV-2 aerosols. Aerosol Sci Technol 55:1–15

Razzini K, Castrica M, Menchetti L, Maggi L, Negroni L, Orfeo NV (2020) SARS-CoV-2 RNA detection in the air and on surfaces in the COVID-19 ward of a hospital in Milan, Italy. Sci Total Environ 742:140540

Schuit MA, Taylor J, Dunning R, Miller D, Freeburger D, Faisca L, Wahl V, Dabisch PA (2021) Comparison of the performance of aerosol sampling devices with aerosols containing Ebola virus. Aerosol Science and Technology 55:458–473

Tan L, Ma B, Lai X, Han L, Cao P, Zhang J (2020) Air and surface contamination by SARS-CoV-2 virus in a tertiary hospital in Wuhan, China. Int J Infect Dis 99:3–7

Van Doremalen N, Bushmaker T, Morris DH, Holbrook MG, Gamble A, Williamson BN (2020) Aerosol and surface stability of SARS-CoV-2 as compared with SARS-CoV-1. N Eng J Med 382:1564–1567