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Covid-19 Transmission *via* Water: Should we be Worried about the Faecal Droplet-Respiratory Transmission Route?

Smriti Sharma^{1*} and Vinayak Bhatia²

¹Department of Chemistry, Miranda House, University of Delhi, New Delhi, India

²ICARE Eye Hospital and Postgraduate Institute, U.P, Noida, India

*Corresponding author: Smriti Sharma, Department of Chemistry, Miranda House, University of Delhi, New Delhi, India, Tel: + 919999913821; E-mail: nishupapersub@gmail.com

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Abstract

Coronavirus disease 19 (COVID-19) outbreak is the third recognised case of infection of an animal coronavirus to humans in the 21st century with the first two being SARS and MERS. One of the major environmental transmission route for coronavirus is the person-to-person faecal droplet-respiratory transmission route. In order to better evaluate the hazards posed by this exposure pathway, there is the need for more information on the survival and persistence of coronavirus in water and sewage. This review collates information from research on transmission and stability of coronavirus in natural, wastewater and sewage. Factors that can influence virus survival in water include temperature, organic matter, and aerobic microorganisms. Our review reflects that the potential for long-term survival of coronavirus coupled with airborne faecal droplet transmission could be a major health risk in this pandemic. Water or sewage contaminated with coronavirus can become aerosolized exposing a major chunk of populace to infection in spite of quarantine measures being followed.

Keywords: Covid-19; Coronavirus; Faecal droplet-respiratory transmission route; Waste water; Sewage water

Description

Coronavirus disease 19 (COVID-19) outbreak is the third recognised case of infection of an animal coronavirus to humans in the 21st century with the first two being SARS [1] and MERS [2]. Its rate of transmission is unprecedented. Investigations regarding the transmission routes of Covid-19 are underway to better contain the spread of these viruses. If the spread of SARS is considered, faecal droplet-respiratory transmission route must be investigated in detail. During an

outbreak of SARS in a high-density Hong Kong housing complex Amoy gardens, it was found out after detailed study that SARS-CoV shed in the faeces of an infected building guest may have transmitted the disease to other inhabitants of the building *via* droplets and aerosols of virus-contaminated commode water. The infected water entered multiple apartments through faulty toilet plumbing and floor drains. This had led to a large cluster of 268 SARS cases [3]. There is every chance that COVID-19 pandemic can also spread from this route.

Previous coronavirus infections in humans were mild and self-limiting but Covid-19 virus has been different in its transmission, morbidity, and mortality. There have been very less studies on the transmission route of coronaviruses. Many cases of transmission of coronaviruses through droplets and aerosols formed from water contaminated with microorganisms have occurred in the past. For example, ingestion or inhalation of dried particles formed because of the desiccation and aerosolization of body fluids and fecal matter has resulted in the transmission of hantavirus [4] and norovirus [5].

One can get infected with Legionella, a respiratory pathogen by inhaling contaminated water droplets [6] or with cryptosporidium, an enteric pathogen by ingesting contaminated droplets [7]. As explained in the first section, SARS was spread through person to person faecal droplet-respiratory transmission route and the focal point was Amoy Gardens apartment building in Hong Kong [8]. Amoy Gardens is a large, high rise apartment complex in Hong Kong where the SARS virus was spread mostly through the viral aerosols generated because of faulty building plumbing. This virus laden air was transported by winds to adjacent buildings thus exposing many people [9,10].

Conclusion

There needs to be more studies on the transmission of coronaviruses. Since Covid-19 is a novel coronavirus, there have been hardly any studies on its transmission *via* infected

water. There is need for more information about survival of coronavirus in water and wastewater. According to in depth analysis of the studies on different coronaviruses in literature, the prospects for long term survival of corona virus along with the airborne fecal droplet transmission model leads one to believe that fecally contaminated aqueous media could be a big risk for the spread of this disease. Authorities need to take into consideration that if water or sewage contaminated with SARS-CoV becomes aerosolized, it could potentially expose large chunk of populace to infection. Even if quarantine is imposed, this transmission route will continue to be a looming risk because contaminated commercial, residential, and hospital water or sewer systems will continue the transmission of the virus. The outbreak at Amoy gardens in Hong Kong is an example that safety and security of building plumbing systems should also be considered while making a comprehensive policy on the containment of the infection of the coronavirus. There is need for further detailed investigations on the kinetics of coronavirus survival and inactivation in water, sewage, and other aqueous media. In sewage water, the organic matter and suspended solids provide protection because viruses adsorb to these particles. This adsorption of viruses on the surface of organic matter and solids can be used to remove the viruses by settling the solids. This is one strategy that can be explored. There is need for more testing of water samples to determine whether water treatment methods are effective in killing SARS-CoV-19 and coronaviruses in general. Careful appraisal of this transmission route is important to effectively manage the pandemic arising because of covid-19. To better evaluate the hazards posed by this new exposure pathway, studies are needed on the survival and persistence of 2019-nCoV in water and sewage. The quick spread of coronaviruses during epidemics leads one to believe that the primary mode of transmission of human coronaviruses is respiratory droplets but there is no direct confirmation of this fact.

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