
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.

safety profile of lenzilumab that we noted in our study in the ongoing randomized phase 3 clinical trial (NCT04351152). This phase 3 trial is now 80% enrolled and a recent interim analysis was favorable with lenzilumab showing clinical benefit over and above concomitant dexamethasone and remdesivir.[4]

We also look forward to results from the ACTIV-5/Big Effect Trial sponsored by the National Institutes of Health which will determine if the combination of lenzilumab and remdesivir is superior to remdesivir alone (NCT04583969). This trial is now actively enrolling patients.

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## Neutralization of Fecal Aerosol-Laden SARS CoV-2: Public Health Implications

***To the Editor:*** The emergence of severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) presents an unprecedented challenge to global health.[1] The looming threat of socioeconomic collapse, livelihood, and human security needs to be intervened.[2] Action taken to disrupt the pathways of viral transmission can have positive outcomes on the coronavirus disease 2019 disease burden.

The primary transmission route of the virion through respiratory aerosols is well documented.[3] There is an emerging recognition of potential transmission of SARS-CoV-2 through aerosolization of virus-laden stools.[4] Air sampling for SARS-CoV-2 in hospital toilets used by patients has yielded positive results.[5,6] Recent studies reported the presence of SARS-CoV-2 viral RNA in fecal samples that were detected even after 22.3±29.8 (mean ± SD) days from diagnosis.[7,8] Another review suggested that SARS-CoV-2 can be excreted in urine in addition to stool.[9]

The phylogenetically related severe acute respiratory syndrome coronavirus 1 transmission through fecal bioaerosols was well highlighted in the Amoy Garden residential complex incident in Hong Kong in 2003.[10] This outbreak led to more than 300 confirmed cases and 50 fatalities.[10,11] Clusters of fecal transmissions of SARS-CoV-2 are being reported in hospitals and high-rise apartments in China. Epidemiological investigations using tracer studies point toward passage of virus-laden fecal bioaerosols through exhaust fans and faulty sewage systems.[12]

With the exponential rise in world infection rates, such a transmission modality poses a potential risk for countries with high population densities. The lesser spatial separation of living spaces in concentrated areas presents a major risk for fecal aerosol infiltration. As evidence of transmission through lesser known pathways accumulates, innovative approaches may be needed.

In the November issue of *Mayo Clinic Proceedings*, McDermott et al[13] suggested shutting the toilet lid while flushing, closing lavatory doors, staff education, adequate ventilation, better plumbing, and UV irradiation of circulating air for hospital infection control.[14] These recommendations are salutary and can add to the efficacy of hospital infection control. We suggest an additional universally affordable option that could disinfect aerosols at its source, in the clinical as well as community settings.

Adding a household disinfectant (5% sodium hypochlorite [NaOCl]) in the water cistern of the flush tank could be useful. This step can be achieved by treating with sustained-release NaOCl tablets in addition to liquid bleach. Such treated water (reaching 1% NaOCl concentration) could lower the quantum of viable viral particles in the fecal aerosol generated during flushing. Sodium hypochlorite releasing free chlorine is suggested for inactivation of SARS-CoV-2 in residential and hospital wastewater treatment plants.[15] Further studies are needed to test

the resultant reduction in viral density and thereby contagion dissemination. However, it appears plausible at this stage that the addition of NaOCl disinfectant in the toilet flush could contain fecal virus-laden bioaerosols.

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## In Reply — Neutralization of Fecal Aerosol-Laden SARS CoV-2: Public Health Implications

***To The Editor:*** The authors of "Neutralization of Fecal Aerosol-Laden SARS CoV-2: Public Health Implications" make an interesting and important suggestion for containing the spread of coronavirus disease 2019 (COVID-19).[1] In response to our article about infectious fecal bioaerosols contributing to COVID-19 outbreaks,[2] Immanuel et al[1] rightly point out that chlorination of toilet water could reduce the spread of infectious fecal bioaerosols in the hospital setting. This is an important consideration for community spreading, especially in countries with high population density. Furthermore, the effects of inadequate disinfection of the plumbing systems and wastewater facilities on fomite transmission have received little attention so far.

Immanuel et al[1] propose that chlorination may be accomplished by addition of tablets or household bleach to toilet tanks. This is a reasonable suggestion for private homes and shared living facilities. We propose several additional considerations for implementation of such a toilet water treatment program to prevent the spread of COVID-19. Using a disinfecting apparatus or extended-release tablet is probably more practical than adding household bleach repeatedly to the tank. An extended-release disinfectant may also be preferable because it is unclear how much contact time would be required to inactivate the virus in a toilet bowl.

Additionally, we propose that a 1% concentration of disinfectant may be higher than necessary, as water chlorination at 0.17 to 1.0 mg/L inactivates a variety of viruses including noroviruses and poliovirus.[4] A 0.1% solution of household bleach has been recommended to achieve surface disinfection without causing irritation.[3] Because not all toilet tanks and bowls are the same size, it could be difficult for private residences to achieve the correct concentration by diluting a household bleach solution. However, using the correct concentration is important for both households and commercial facilities and should be done in concert with facility engineering experts, as oxidizing disinfectants may erode important plumbing components, and inhalation of chlorinated bio-aerosols may irritate the respiratory tract of sensitive residents or patients.

Some barriers exist to disinfecting the water source for commercial buildings. Facilities such as hospitals may have tankless toilets; thus, chlorinating the water supplying the toilet may require a facility