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Airborne transmission of COVID-19 and other coronaviruses in indoor and outdoor environments: a systematic literature review



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Abstract

Most coronavirus infections are transmitted via respiratory droplets through the mucosa or direct inhalation route and are manifested as respiratory diseases. However, human coronaviruses such as SARS-CoV-2 (the COVID-19 virus) show environmental resistance that makes airborne transmission plausible. According to published evidence related to COVID-19, airborne transmission through droplet nuclei that propagate in air is limited to aerosol generating procedures during clinical care of COVID-19 patients. However, recent experimental studies have indicated that SARS-CoV-2 can remain viable in airborne aerosols potentially for hours. Studies in hospitals in Iran and China have reported undetectable levels of airborne SARS-CoV-2 RNA at distances over 2 m from patients' beds or in well sanitised spaces. Although fine particles, pollen and dust in ambient air have all been linked to other infectious diseases in the past, their role in the transmission of COVID-19 and other coronaviruses has not been systematically reviewed so far. Theoretically, inhalation of virus-laden airborne particles could transport the virus deeper into alveolar regions, which could increase the risk of infective transmission. In this rapid systematic review, we analyse the evidence on airborne transmission of COVID-19 and other coronaviruses in outdoor and indoor settings. We investigate how aerosols, including droplets, droplet nuclei, smoke particles, dust, pollen and other aeroallergens may act as carriers of coronaviruses in the air and into the human respiratory system causing infection. We analyse peer-reviewed studies (published or

accepted) reporting on airborne transmission of any human coronavirus, including SARS-CoV-2. We include experimental, epidemiological, and mathematical modelling studies in any human population. No restrictions are imposed on the health status or age of these populations or setting (outdoor, indoor, residential, occupational). The primary outcomes of the review are confirmed coronavirus infections as well as positive environmental samples. We searched PubMed, MEDLINE, Scopus, Cochrane Library, and relevant government agency databases.

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