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Assessing the potential for fomite transmission of SARS-CoV-2



Over the course of the COVID-19 pandemic the routes of SARS-CoV-2 transmission have remained highly contentious.¹ Respiratory viruses such as SARS-CoV-2 are thought to spread directly from one person to another through the air, typically during prolonged close contact, but there is a possibility that fomites might also play a role.² Fomites are objects in the environment on which infectious virions can survive, acting as a vector for person-to-person transmission. For fomite transmission to occur there must be sufficient infectious virus shed into the environment and it must persist *ex vivo* at sufficiently high titres such that it is able to establish an infection upon exposure to the mucosal surfaces of a susceptible individual. In a Syrian hamster model, exposure to bedding from SARS-CoV-2 infected animals resulted in seroconversion of sentinel hamsters; however, this transmission route was thought to be less efficient than airborne transmission.³ Many studies have detected the *ex-vivo* persistence of SARS-CoV-2 RNA,⁴ in some cases for at least 57 days after exposure.⁵ Although there is support from such studies for fomite transmission of SARS-CoV-2, the relative importance of fomite transmission compared with other modes has remained uncertain.

In an Article published in *The Lancet Microbe*, Nieves Derqui and colleagues⁶ investigated possible vectors of household SARS-CoV-2 transmission in a prospective, longitudinal study of SARS-CoV-2 cases in the UK during the pre-alpha and alpha (B.1.1.7) variant waves. In their study, the hands and upper respiratory tract of index cases and their household contacts, as well as frequently touched surface samples, were longitudinally sampled and tested for SARS-CoV-2 RNA. Importantly, viral RNA levels in the upper respiratory tracts of index cases were not associated with SARS-CoV-2 transmission to household contacts. Instead, transmission was associated with the detection of SARS-CoV-2 RNA on the hands of index cases, the hands of contact cases, and household surfaces. Moreover, the PCR-negative contacts who had viral RNA detected on their hands (or the hands of index cases) predominantly had pre-existing immunity to SARS-CoV-2, possibly explaining why infection was not observed in these potentially exposed individuals.

Although intriguing, these results must be interpreted with caution. Firstly, association does not indicate causation. As the authors themselves note, the contamination of fomites and surfaces might occur through deposition of droplets or via the hands of infected cases without being part of the transmission pathway. Furthermore, a more subtle route of transmission could involve resuspended virus from fomites.⁴ Air samples were not collected in this study, and detection of virus in the air would in any case not be sufficient to prove transmission occurred through the air. It must also be emphasised that the presence of viral RNA does not indicate the presence of infectious virus. In the study of Derqui and colleagues,⁶ although viral culture was attempted on 10 hand swabs, only one hand swab was positive for infectious virus and no household surface swabs were positive via viral culture. Although this finding might reflect delays between sample acquisition and viral culture it is important to note that SARS-CoV-2 infectious virions can be detected on surfaces for 7 days while RNA can be detected for at least 3 weeks after inoculation.⁷ It is also possible that actions such as wearing masks and the restriction of SARS-CoV-2 positive individuals in specific rooms of the house led to an increased role of fomite transmission in this study. More generally, it is important to recognise that interventions that block one mode of transmission might lead to an increase in transmission via other modes.⁸ To control transmission most effectively it could be important to block multiple modes of transmission. Finally, fomite transmission was only implicated in a subset of transmission events in this study; therefore, the question remains as to the route of transmission in cases where RNA could not be detected on fomites or hands. Nevertheless, these data suggest that fomite transmission can occur in at least some cases, and we shouldn't be too quick to rule out the possibility that hand hygiene could reduce SARS-CoV-2 transmission, particularly if other interventions are being implemented that target other modes of transmission.

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Roche, and Sanofi Pasteur. The opinions and data presented in this manuscript are of the authors and are independent of these relationships.

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