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Letter

Longitudinal Monitoring of SARS-CoV-2 RNA on High-Touch Surfaces in a Community Setting

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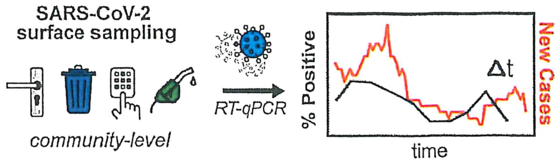
ABSTRACT: Environmental surveillance of surface contamination is an unexplored tool for understanding transmission of SARS-CoV-2 in community settings. We conducted longitudinal swab sampling of high-touch non-porous surfaces in a Massachusetts town during a COVID-19 outbreak from April to June 2020. Twenty-nine of 348 (8.3%) surface samples were positive for SARS-CoV-2 RNA, including crosswalk buttons, trash can handles, and door handles of essential business entrances (grocery store, liquor store, bank, and gas station). The estimated risk of infection from touching a contaminated surface was low (less than 5 in 10,000) by quantitative microbial risk assessment, suggesting fomites play a minimal role in SARS-CoV-2 community transmission. The weekly percentage of positive samples (out of $n = 33$ unique surfaces per week) best predicted variation in city-level COVID-19 cases with a 7-day lead time. Environmental surveillance of SARS-CoV-2 RNA on high-touch surfaces may be a useful tool to provide early warning of COVID-19 case trends.



INTRODUCTION

SARS-CoV-2, the virus causing the current global COVID-19 pandemic, is believed to be transmitted primarily through droplets and aerosols.[1,2] However, the role of fomites in transmission is unclear.[3] Recent commentaries argue that the risk of transmission via fomites may be low in clinical settings,[4−6] despite common detection of SARS-CoV-2 RNA on surfaces.[7−11] In laboratory experiments, SARS-CoV-2 has been found to remain viable on surfaces for up to 28 days, using large initial viral concentrations and under optimized environmental conditions, with half-lives on plastic and stainless steel ranging from hours to days.[12−17] However, data on the prevalence on high-touch surfaces in community settings are limited,[18−20] and temporal trends during a COVID-19 outbreak have not been measured.

Environmental surveillance is an emerging field for monitoring infectious disease prevalence and trends at the population level. Surveillance of environmental reservoirs has the potential to be less invasive, lower cost, and less biased than sampling individuals, particularly for pathogens with a high proportion of asymptomatic infections. Wastewater sampling (or wastewater-based epidemiology) has successfully been used to track outbreaks that are otherwise difficult to capture through clinical surveillance such as poliovirus and SARS-CoV-2.[21,22] Recent studies have documented that SARS-CoV-2 RNA levels in wastewater track with trends in case numbers in communities.[23−31] However, wastewater epidemiology has not yet been demonstrated to be an early warning system for COVID-19 cases.[29,32]

Environmental surveillance methods that do not rely on shedding in stool, such as fomite or air sampling, may be better situated to provide early warning of spikes in COVID-19 cases. Viral load in the upper respiratory tract peaks within 1 week after symptom onset, whereas viral load in stool has been found to peak 1 to 6 weeks after symptom onset.[33−41] Pre- and asymptomatic patients also shed SARS-CoV-2 in the respiratory tract;[42,43] thus, environmental surveillance may capture trends among total cases.[44] Targeted sampling of high-touch surfaces has the potential to complement other pandemic surveillance strategies by identifying recent locations (e.g., buildings or rooms) of currently infectious individuals, providing insight on fomite transmission pathways and serving as an early warning system of case trends.

We collected longitudinal high-touch surface samples in public locations and essential businesses throughout a COVID-19 outbreak from March 13–June 23, 2020 in Somerville, Massachusetts. Our objectives were to (1) document the types of high-touch non-porous surfaces likely to be contaminated with SARS-CoV-2 RNA during an outbreak, (2) measure the concentration of SARS-CoV-2 RNA on surfaces to estimate risk of infection from contact with fomites in the community setting, and (3) assess the temporal relationship between

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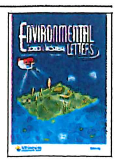

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