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Brief Report

# Nondetection of SARS-CoV-2 on high-touch surfaces of public areas next to COVID-19 hospitalization units

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We studied the contamination with severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) and the bacterial load of high-touch surfaces located in public areas next to coronavirus disease (COVID-19) hospitalization units. Ninety-two samples were obtained from 46 different high-touch surfaces: 36 sites next to COVID-19 hospitalization units and 10 sites in the cabins of the public elevators. SARS-CoV-2 was not detected at any site, despite high bacterial loads suggested that the studied sites had been frequently touched prior to the sampling.


Most studies analyzing the contamination of surfaces with severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) have been conducted in the rooms of infected patients and the common areas of isolation wards and have identified high percentages of positive samples.[1-4] However, environmental contamination of other hospital areas during the coronavirus disease (COVID-19) pandemic has not received much attention.

## METHODS

On May 25 and 26, 2020, surface samples were obtained from public areas next to 4 COVID-19 hospitalization units at the Bellvitge University Hospital, Barcelona, Spain (2 intensive care units with 10 and 12 admitted patients and 2 conventional hospitalization units with 11 and 12 admitted patients). Due to the characteristics of the building, everyone entering or leaving these units had to pass through the public areas. The air supply of the entire building was 100% fresh (no recirculation). Since March 2020, visitors were not allowed, and universal masking with a surgical mask was mandatory for hospital workers in all areas.

Three different spaces in the public areas were considered for the environmental study: the halls next to the units, the public toilets (only in conventional hospitalization units) and the waste areas (only in intensive care units). The sites selected were repeatedly touched throughout the day. The sampled sites in the halls were the coffee vending machines, the staircases railings, the elevator's wall buttons, and the wall phones used by the health care professionals. Samples taken in the public toilets corresponded to sites that were touched before hand washing (door handles, flushes, soap dispensers, and sink faucets). As the common areas of intensive care units do not have public toilets, samples of the waste containers and the waste elevators were taken in the waste area. Apart from the public areas, 2 types of samples were taken in the cabins of the public elevators: the buttons and the wall area where hands lean when staying in the elevator.

The sites were sampled at mid-morning 4 hours after routine cleaning with 1,000 ppm sodium hypochlorite. Two samples were obtained at each site. For SARS-CoV-2 testing, a sterile polypropylene plastic swab wetted with viral transport medium (Biocomma) was used for sampling a 100-cm2 surface. Next to this surface, a RODAC plate with trypticase soy agar was pressed to provide a quantitative measure of the bacterial load. q-PCR technique was used to detect the presence of SARS-CoV-2. Swabs were transported to the laboratory in a refrigerated container within 2 hours after sampling. RNA

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**Table. 1**
Environmental sites sampled for SARS-CoV-2 and bacterial load detection in public areas next to the intensive care units and conventional hospitalization units attending COVID-19 patients

| | Intensive care unit 1 | | Intensive care unit 2 | |
|---|---|---|---|---|
| | SARS-CoV-2 q-PCR | ACC (CFU/cm$^2$) | SARS-CoV-2 q-PCR | ACC (CFU/cm$^2$) |
| Coffee vending machine, buttons | Negative | 16 | negative | 2 |
| Coffee vending machine, pickup window | Negative | 12 | negative | 16 |
| Public elevator, wall buttons | Negative | 7 | negative | 16 |
| Public staircase railing | Negative | 4 | negative | 5 |
| Waste container 1 | Negative | 6 | negative | 2 |
| Waste container 2 | Negative | 1 | negative | 25 |
| Waste container 3 | Negative | 2 | negative | 25 |
| Waste elevator, handle | Negative | 2 | negative | 7 |
| Wall phone | Negative | 16 | negative | 16 |
| | Hospitalization unit 1 | | Hospitalization unit 2 | |
| | SARS-CoV-2 q-PCR | ACC (CFU/cm$^2$) | SARS-CoV-2 q-PCR | ACC (CFU/cm$^2$) |
| Coffee vending machine, buttons | Negative | 2 | Negative | 1 |
| Coffee vending machine, pickup window | Negative | 7 | Negative | 16 |
| Public elevator, wall buttons | Negative | 1 | Negative | 1 |
| Public staircase railing | Negative | 25 | Negative | 25 |
| Public toilet, door handle | Negative | 2 | Negative | 13 |
| Public toilet, flush | Negative | 1 | Negative | 9 |
| Public toilet, soap dispenser | Negative | 16 | Negative | 1 |
| Public toilet, sink faucet | Negative | 1 | Negative | 2 |
| Wall phone | Negative | 2 | Negative | 16 |

*ACC*, aerobic colony counts

was extracted with the commercial PathoGene-spinTM DNA/RNA Extraction Kit. The commercial RT-qPCR VETfinder Real-Time PCR kit for the detection of nCoV-19 (Generon) and the LightCycler 480 Real-Time PCR System (Roche) instrument were used for the detection of viral RNA. To assess the extraction efficiency, RNA was added before the extraction process (Intype IC RNA, Generon). Finally, RNA levels were detected by qPCR with a probe against this RNA (HEX). The detection threshold of the technique was 35 copies/cm$^2$. RODAC plates were incubated at 37°C for 48 hours. The aerobic colony counting (ACC) was expressed as colony forming units per cm$^2$ (CFU/cm$^2$). According to the accepted standards for hospital cleanliness, when the ACC was ≥2.5 CFU/cm$^2$, the surfaces were considered dirty.[5]

## RESULTS

Ninety-two samples were obtained from 46 different high-touch surfaces of public areas: 36 sites next to COVID-19 hospitalization units and 10 sites in the cabins of the public elevators (Tables 1 and 2). SARS-CoV-2 was not detected at any site. Forty-three surfaces (93.5%) presented bacterial growth, 26 of which had levels greater than the cutoff point of 2.5 CFU/cm$^2$ (56.6%) (Tables 1 and 2). The highest bacterial loads in the public areas next to conventional hospitalization units were found in the staircase's railings (25 CFU/cm$^2$), whereas in the areas next to intensive care units the most contaminated surfaces corresponded to the waste containers. The remaining surfaces did not show a consistent pattern. Only 3 sites showed no bacterial growth, and all of the sites corresponded to the cabins of the elevators exclusively reserved for patients (Table 2).

**Table 2**
Environmental sites sampled in the cabins of the public elevators for SARS-CoV-2 and bacterial load detection.

| | SARS-CoV-2 q-PCR | ACC (CFU/cm$^2$) |
|---|---|---|
| Elevator for workers and visitors n° 1 | | |
| Buttons | Negative | 4 |
| Wall area where hands lean | Negative | 1 |
| Elevator for workers and visitors n° 2 | | |
| Buttons | Negative | 7 |
| Wall area where hands lean | Negative | 3 |
| Elevator for workers and visitors n° 3 | | |
| Buttons | Negative | 6 |
| Wall area where hands lean | Negative | 5 |
| Elevator exclusive for patients n° 1 | | |
| Buttons | Negative | 0 |
| Wall area where hands lean | Negative | 1 |
| Elevator exclusive for patients n° 2 | | |
| Buttons | Negative | 0 |
| Wall area where hands lean | Negative | 0 |

*ACC*, aerobic colony counts.

## DISCUSSION

Our data indicate that environmental contamination with SARS-CoV-2 in public areas in the vicinity of COVID-19 hospitalization units does not seem to be of great magnitude. However, our results are probably affected by the exceptional circumstances adopted by the hospital during the pandemic period. As no visitors were permitted, the contamination of surfaces was probably much lower than that during the normal functioning of the hospital. Furthermore, mandatory universal masking probably minimized environmental contamination with respiratory droplets.

It is known that the ACC of hospital surfaces correlates with the number of previous hand-touch counts.[6] In our case, the high bacterial loads suggested that the studied sites had been frequently touched prior to the sampling. Despite this, SARS-CoV-2 was not detected. Distance to the patient rooms did not seem to explain the differences found in the ACCs. These findings support the hypothesis that compliance with infection prevention practices of health care workers assisting COVID-19 patients was appropriate, especially universal masking and hand hygiene adherence.

Our study has several limitations. First, the environmental contamination in the hospitalization units was not studied, so we cannot state if it was significantly greater than that noted in public areas. Second, as this is a cross-sectional study, our hypothesis cannot be verified. Further research is required to confirm these findings and determine the role of inanimate surfaces on the risk of COVID-19 infection in the population.

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## SUPPLEMENTARY MATERIALS

Supplementary material associated with this article can be found in the online version at https://doi.org/10.1016/j.ajic.2021.01.007.

## References

1. Ong SWX, Tan YK, Chia PY, et al. Air, surface environmental, and personal protective equipment contamination by severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) from a symptomatic patient. *JAMA*. 2020;323:1610–1612.
2. Ye G, Lin H, Chen L, et al. Environmental contamination of SARS-CoV-2 in healthcare premises. *J Infect*. 2020;81:e1–e5.
3. Wu S, Wang Y, Jin W, et al. Environmental contamination by SARS-CoV-2 in a designated hospital for coronavirus disease 2019. *Am J Infect Control*. 2020;48:910–914.
4. Lei H, Ye F, Liu X, et al. SARS-CoV-2 environmental contamination associated with persistently infected COVID-19 patients. *Influenza Other Resp Viruses*. 2020;14:688–699.
5. Dancer SJ. Controlling hospital-acquired infection: focus on the role of the environment and new technologies for decontamination. *Clin Microbiol Rev*. 2014;27:665–690.
6. Adams CE, Smith J, Watson V, Robertson C, Dancer SJ. Examining the association between surface bioburden and frequently touched sites in intensive care. *J Hosp Infect*. 2017;95:76–80.