SYNOPSIS

KEY POINT SUMMARY

OBJECTIVES

The purpose of the research was to explore the stability of SARS-CoV-2 virus on environmental surface materials common to healthcare and household indoor spaces.

SARS-CoV-2 viability on 16 common indoor surface finish materials

Ronca, S. E., Sturdivant, R. X., Barr, K. L., Harris, D., 2021 | HERD: Health Environments Research & Design; Volume 14, Issue 3, Page(s) 49-64

Key Concepts/Context

During the coronavirus pandemic, studies identified the contaminated environmental surface materials as potential pathways for viral transmission of the disease through contact. To understand the role of surfaces, 16 materials were contaminated with the virus and the stability of the virus on each material was examined. The results suggested that while long-term survival of the virus declines over time, a risk of transmission remains, and frequent disinfection of surfaces is recommended for preventing transmission.

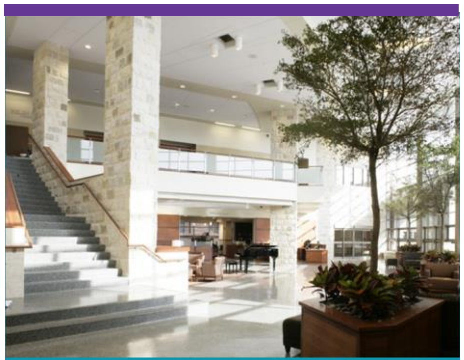
Methods

In order to identify the stability of SARS-CoV-2 virus on common indoor environmental surface materials (including both high-touch such as stainless steel, and low-touch such as rubber flooring), the researchers inoculated the following 16 materials with the virus:

1) Acrylic solid surface; 2) Solid surface with CuO; 3) Stainless steel, brushed; 4) High-pressure laminate; 5) Copper sheet; 6) Quartz; 7) Rubber flooring; 8) Vinyl, sheet, homogenous; 9) Wood laminate flooring, commercial; 10) Luxury vinyl tile #15; 11) Luxury vinyl tile #21; 12) Luxury vinyl tile #26; 13) Carpet, commercial; 14) Carpet, residential; 15) Upholstery, nonwoven; 16) Vinyl wall covering, type II

A 2” by 2” sample of each material was cleaned and inoculated with the virus while ensuring the same environmental conditions (i.e., temperature and humidity) across all the samples. At periods of 4, 8, 12, 24, 30, 48, and 168 hours post infection, samples were tested for stability of the virus.

Standard plaque assay (a method in microbiology that is based on quantitative measurement of the plaques formed in cell culture while infected with the virus) was determined for investigating presence and amount of virus on each sample at the data collection time points. Regarding data analysis, statistical techniques such as nonparametric modeling, maximum likelihood estimates for survival curves, and



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parametric proportional hazards regression models were utilized to investigate survival of virus across different materials.

Findings

Nonparametric modeling in this study demonstrates that after 4 hours no amount of detectable infectious virus was present on the two materials of copper sheet and solid surface with CuO (cupric oxide). Other significant pattern of the overall data is the fast degradation of the viral contamination. After 24 hours, only three materials still carried detectable virus (Acrylic solid surface, Quartz, Vinyl wall covering, type II), and after 48 hours only one material (Vinyl wall covering, type II) still carried contamination. After seven days, no amount of infectious virus was detected on any surfaces.

At hour 4, brushed stainless steel was found to carry the most notable amount of viral contamination. However, the virus degraded quickly and no amount of contamination is visible at hour 12.

Regression modeling in the study shows that all contaminated materials degrade to 10% of the original viral contamination in less than two and a half hours.

It should be emphasized that the true infectious dose of SARS-CoV-2 from contaminated surfaces is unknown. Increasing disinfection of all surface materials (specifically within the 12- to 24-hour timeframe) is recommended as an approach to mitigating the risk of contact transmission. The findings of the research are aligned with the disinfection recommendations by the CDC.

Limitations

The study tested the viral contamination of interior materials under laboratory conditions. Authors encourage additional research to be conducted in uncontrolled environments including healthcare, residential, and educational settings. Although their statistical modeling is identified to be on the conservative side in terms of survival time estimates, it is encouraged that more data in more frequent time points be collected in future studies.

Testing hypotheses in real-life settings, supplemented with observational methods and other behavioral studies, can be invaluable additions to future studies of contact transmission of viral diseases.

Design Implications

While long-term survival of the SARS-Cov-2 virus declines over time on surfaces, a risk of transmission remains, and in line with CDC recommendations, frequent disinfection of surfaces is recommended for preventing transmission. Copper sheet and solid surface with cupric oxide do not retain infectious virus beyond four hours, indicating the effectiveness of the materials in decreasing the viral load. The study demonstrates that no amount of viral load is detectable in carpet beyond hour 12, showing no extra hazard of viral transmission for this material.

And Also...

The authors have categorized the 16 materials into four categories based on time to no infectious particles in Table 4.

Table 6 that groups materials with statistically similar survival curves is also valuable.