

Ct values and infectivity of SARS-CoV-2 on surfaces

Akiko Iwasaki¹ raises the important question of whether a person with a positive PCR test result for severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) is automatically infectious or infectious only if the cycle threshold (Ct) is below a certain value (eg, <35). The same question should be asked for other potential sources of viral spread, such as inanimate surfaces.

Through a search of MEDLINE up to Oct 6, 2020, we identified six studies with original data on surface contamination with SARS-CoV-2 (RNA and infectious virus; appendix). Viral RNA was found in the surroundings of confirmed COVID-19 cases in 1.0–52.7% of samples. In five studies, infectious SARS-CoV-2 was not detected on any surface. In one study, infectious virus was detected in 9.2% of samples, which was mainly explained by a single patient with persistent cough and frequent sputum spitting during sampling (appendix). The findings are consistent with laboratory data showing for SARS-CoV-2 that Ct values of 29.3 (steel surface) or 29.5 (plastic surface) correlate with the detection of culturable virus, whereas Ct values of 32.5 (steel surface) or 32.7 (plastic surface) correlate with the detection of non-culturable virus.²

SARS-CoV-2 RNA can be found on inanimate surfaces up to 28 days after discharge of patients with COVID-19,

which further limits the relevance of RNA detection on surfaces.³ A Ct value higher than 33 obtained from a surface sample probably has no epidemiological relevance. In public settings, contamination with infectious virus is even less likely than in hospitals. Viral contamination can occur only in the unlikely event a SARS-CoV-2 carrier comes near to a surface. The potential viral source is not permanently present next to the surface, probably has no symptoms, and may wear a face mask, resulting in a low probability of viral spread. In workplaces it was found that only five (0.6%) of 841 tests among employees were positive for SARS-CoV-2 RNA over a period of 2 weeks, with Ct values between 33 and 36.⁴ Among 5500 surface samples, only 44 (0.8%) were positive, with Ct values between 34 and 38, indicating that viral loads were indeed very low on surfaces in close and permanent proximity to viral shedders.⁴

A simple binary approach to the interpretation of PCR results will result in the possible segregation of large numbers of people who are not infectious and, hence, not a threat to public health. It will probably also result in regular disinfection of surfaces, leading to a reduction in the diversity of the microbiome and an increase in the diversity of resistance genes.⁵ Permanent exposure of bacteria to subinhibitory concentrations of some biocidal agents used for surface disinfection can cause a strong adaptive cellular response, resulting in stable tolerance to the biocidal

agents and, in some cases, in new antibiotic resistance.⁶ We propose to routinely clean public surfaces, and to consider surface disinfection only when there is evidence that a surface is contaminated with a sufficient amount of infectious virus and is likely to contribute to viral transmission that cannot be controlled by other measures, such as surface cleaning or handwashing.

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*Günter Kampf, Sebastian Lemmen, Miranda Suchomel
guenter.kampf@uni-greifswald.de

University Medicine Greifswald, Institute for Hygiene and Environmental Medicine, 17475 Greifswald, Germany (GK); University Hospital Aachen, Department of Infection Control and Infectious Diseases, Aachen, Germany (SL); and Institute of Hygiene and Applied Immunology, Medical University, Vienna, Austria (MS)

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See Online for appendix