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Stability of SARS-CoV-2 in different environmental conditions

We previously reported the detection of severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) in different clinical samples.¹ This virus can be detected on different surfaces in a contaminated site.² Here, we report the stability of SARS-CoV-2 in different environmental conditions.

We first measured the stability of SARS-CoV-2 at different temperatures. SARS-CoV-2 in virus transport medium (final concentration ~6.8 log unit of 50% tissue culture infectious dose [TCID₅₀] per mL) was incubated for up to 14 days and then tested for its infectivity (appendix p 1). The virus is highly stable at 4°C, but sensitive to heat. At 4°C, there was only around a 0.7 log-unit reduction of infectious titre on day 14. With the incubation temperature increased to 70°C, the time for virus inactivation was reduced to 5 mins.

We further investigated the stability of this virus on different surfaces. Briefly, a 5 µL droplet of virus culture (~7.8 log unit of TCID₅₀ per mL) was pipetted on a surface (appendix p 1; ~cm² per piece) and left at room temperature (22°C) with a relative humidity of around 65%. The inoculated objects retrieved at

desired time-points were immediately soaked with 200 µL of virus transport medium for 30 mins to elute the virus. Therefore, this recovery of virus does not necessarily reflect the potential to pick up the virus from casual contact. No infectious virus could be recovered from printing and tissue papers after a 3-hour incubation, whereas no infectious virus could be detected from treated wood and cloth on day 2. By contrast, SARS-CoV-2 was more stable on smooth surfaces. No infectious virus could be detected from treated smooth surfaces on day 4 (glass and banknote) or day 7 (stainless steel and plastic). Strikingly, a detectable level of infectious virus could still be present on the outer layer of a surgical mask on day 7 (~0.1% of the original inoculum). Interestingly, a biphasic decay of infectious SARS-CoV-2 could be found in samples recovered from these smooth surfaces (appendix pp 2–7). 39 representative non-infectious samples tested positive by RT-PCR³ (data not shown), showing that non-infectious viruses could still be recovered by the eluents.

We also tested the virucidal effects of disinfectants by adding 15 µL of SARS-CoV-2 culture (~7.8 log unit of TCID₅₀ per mL) to 135 µL of various disinfectants at working concentration (appendix p 1). With the exception of a 5-min incubation with hand soap, no infectious virus could be detected after a 5-min incubation at room temperature

(22°C). Additionally, we also found that SARS-CoV-2 is extremely stable in a wide range of pH values at room temperature (pH 3–10; appendix p 1). Overall, SARS-CoV-2 can be highly stable in a favourable environment,⁴ but it is also susceptible to standard disinfection methods.

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See Online for appendix