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Usher Network for COVID-19 Evidence Reviews

Summary: How long can SARS-CoV-2 persist outdoors on gates, fences and stiles in the Scottish context?

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Title: How long can SARS-CoV-2 persist outdoors on gates, fences and stiles in the Scottish context?

Summary answer:

We found no studies of direct relevance to the question, so we cannot quantify the risk of transmission of SARS-CoV-2 via surface contamination on outdoor surfaces, nor assume that this risk is low. We found some studies that looked at surface contamination and persistence of SARS-CoV2 on different materials and at different temperatures. The strengths of these studies is that they were conducted under strictly controlled experimental conditions. The limitation is that they cannot be directly extrapolated to outdoor conditions and did not evaluate other relevant factors such as rainfall or UV exposure. The most relevant study was by Chin et al. They evaluated a range of materials including wood. They found that the virus persists on smooth surfaces such as glass and metal longer than on rough surfaces such as wood. They also evaluated presence of the virus at different temperatures. They found that the virus persists for longer at colder temperatures, which is an important finding for our climate here in Scotland. We found no studies evaluating virus persistence outdoors under natural conditions. Policy implications: as surface cleaning is not feasible, appropriate measures would be education on avoiding self inoculation of mucosae after contact.

Extended abstract and relevant references:

We summarised and evaluated evidence from the following papers:

- Van Doremelan et al (2020) Aerosol and Surface Stability of SARS-CoV-2 as Compared with SARS-CoV-1
- Rapid Expert Consultation Update on SARS-CoV-2 Surface Stability and Incubation for the COVID-19 Pandemic (March 27, 2020)
- Chin et al (2020) Stability of SARS-CoV-2 in different environmental conditions

Detailed information on each source is presented below.

Reference: Aerosol and Surface Stability of SARS-CoV-2 as Compared with SARS-CoV-1

What they were asking: How stable is SARS-CoV-2 compared with SARS-CoV-1, on different surfaces?

What they did: They generated aerosolised particles of SARS-CoV-2 (<5 µm) to simulate samples obtained from the upper and lower respiratory tract in humans. They then tested the following surfaces for traces of the virus at various time points: plastic, stainless steel, copper, and cardboard. They compared this with results for SARS-CoV-1.

What they found: Viable SARS-CoV-2 was detected up to 72 hours after application to plastic and stainless steel. It was more stable on plastic and stainless steel than on copper and cardboard. The virus titer was greatly reduced over time:

- from 103.7 to 100.6 TCID50 per milliliter of medium **after 72 hours on plastic**
- from 103.7 to 100.6 TCID50 per milliliter **after 48 hours on stainless steel.**

On **copper, no viable SARS-CoV-2 was measured after 4 hours**.
On cardboard, **no viable SARS-CoV-2 was measured after 24 hours**

Quality and relevance to this question: This experiment was conducted under carefully controlled experimental conditions. It looked at persistence and viability of SARS-CoV-2 on various surfaces

over various time periods. It was conducted under environmental conditions and not outdoors. Stainless steel and plastic may be relevant to the question but it did not evaluate other relevant materials (wood, stone).

Reference: Rapid Expert Consultation Update on SARS-CoV-2 Surface Stability and Incubation for the COVID-19 Pandemic (March 27, 2020)

What they were asking: How long does SARS-CoV-2 survive on surfaces?

What they did: This is an evidence review. The most relevant study for the current question is summarised below (Chin et al). The review also looked at the evidence from natural experiments.

What they found: Studies on the Diamond Princess and in various hospital and other settings found that the virus can persist for many days on surfaces (e.g. up to 17 days after cabins were vacated on Diamond Princess).

Quality and relevance to this question: Most studies of environmental contamination relied on RT-PCR to assess the presence of SARS-CoV-2. The presence of environmental viral RNA tells us nothing about infectivity or risk of transmission to humans.

Reference: Chin et al, 2020 Stability of SARS-CoV-2 in different environmental conditions

What they were asking: How long does SARS-CoV-2 persist at different temperatures?

What they did: They measured the stability of the virus at different temperatures.

What they found: 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. At 22°C it was detectable at 7 days but not at 14 days. With the incubation temperature increased to 70°C, the time for virus inactivation was reduced to 5 mins.

Quality and relevance to this question: Laboratory study under highly controlled experimental conditions – difficult to extrapolate to real life context.

Reference: Chin et al, 2020 Stability of SARS-CoV-2 in different environmental conditions

What they were asking: How long does SARS-CoV-2 persist on different materials?

What they did: They pipetted a 5 µL droplet of virus culture (~7·8 log unit of TCID50 per mL) onto a surface and left it at room temperature (22°C) with a relative humidity of around 65%.

What they found: 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).

Quality and relevance to this question: Laboratory study under highly controlled experimental conditions. Note that this study does not necessarily reflect the potential to pick up the virus from casual contact because in order to retrieve samples of virus at various time points, they used techniques to elute (ie remove) the virus from the sample.

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The UNCOVER network is committed to responding quickly and impartially to requests from policymakers for evidence reviews. This document has therefore been produced in a short timescale and has not been externally peer-reviewed.