



How long are people with COVID-19 infectious?

Source: Emerging Sciences Group of the Public Health Agency of Canada. Emerging Evidence on COVID-19: Rapid Review of Infectious Period. September update. Full report available from: phac.emergingsciencesecretariat-secretariatdessciencesemergentes.aspc@canada.ca

Background: COVID-19 cases need to be isolated long enough to prevent further transmission but no longer than needed. Determining the infectious period of COVID-19 is complicated by four factors: 1) people can be diagnosed when they are symptomatic, pre-symptomatic or asymptomatic, 2) the common diagnostic test, RT-PCR, is accurate for diagnosis as it is able to detect viral genetic material, but it cannot document when someone is no longer infectious because it cannot distinguish whether viral particles are still infectious or not, 3) cell culture is the best way to confirm whether infectious virus is present, but it takes time and requires specialized laboratory facilities, and 4) although transmission is primarily respiratory, virus has been found in feces and eye secretions.

Methods: Twenty databases and key websites were searched for relevant reviews, peer-reviewed publications and preprints up to August 31, 2020. Keywords included: “Shedding”, “Viral dynamics”, “Viral clearance”, “Viable”, “Culture”, “Infectivity”, “SARS-CoV-2 detection”, “Infectious Period”, “Communicability period”, “Recurrence”, and “Re-positive”. Data from studies were extracted into evidence tables on risk of infection, severity of disease and mortality and organized by asymptomatic, pre-symptomatic, symptomatic, recurrent or reinfection, as well as culture versus RT-PCR and sample source (e.g. respiratory, fecal, etc.).

Results: Over 1,000 citations were screened and relevant full texts were reviewed. There were some good quality prospective cohort studies, but the majority of publications were case reports and observational studies of contact tracing; many of these were preprints and are at high risk of bias. Due to their number and preliminary nature, not all case reports were summarized.

Symptomatic infectious period, N=107 studies

CULTURE (that measures viable virus): N=18 studies and two systematic reviews:

- Respiratory
 - Mild illness: Cultures from respiratory samples—taken from the time of self-reported symptom onset—have documented viral shedding for 8–10 days with a peak in viral load ranging from just before to during the first week after onset of illness.
 - Severe illness: Culture from respiratory samples have documented cases of prolonged viable viral shedding (18–32 days). These cases are typically individuals who are either immunocompromised or have multiple chronic underlying health conditions. These studies usually include single cases or small sample sizes and many are still in preprints.

- Feces: SARS-CoV-2 has been cultured from the fecal/rectal samples of confirmed cases, however the length of viable virus shedding and whether it is a potential transmission route remains unclear.

RT-PCR (that measures viral RNA): N=88 studies and six systematic reviews:

- Nasopharyngeal swabs: Most studies show RT-PCR tests become negative within 14–20 days of self-reported symptom onset.
 - Prolonged viral RNA shedding (up to 83 days) have been reported. Multiple studies have found this is positively associated with severity of COVID-19 and older age. Once these cases have clinically recovered, cultures have not detected viable virus and there has been no evidence of transmission.
- Stool samples: Stool samples can remain positive a few days to four weeks longer than respiratory samples.
- Eye swabs: SARS-CoV-2 RNA has been identified in the eye up to 22 days post onset of self-reported symptoms.

Pre-symptomatic infectious period, N=25 studies

- CULTURE: Viable virus has been cultured from respiratory samples 1–6 days prior to symptom onset and from the rectum as early as three days before symptom onset.
- RT-PCR has detected COVID-19 virus RNA from respiratory samples 1–7 days (2.5 days on average) before symptom onset.

Asymptomatic infectious period, N=25 studies

- CULTURE and RT-PCR: Viable virus and viral RNA was highest during the first week of infection and declined in subsequent weeks. Based on the current evidence, the total infectious period of asymptomatic cases appears to be similar to, or shorter than, mildly symptomatic cases; viral loads have been similar.

Recurrent viral shedding in convalescent period, N=55 studies

- CULTURE and RT-PCR: Only one culture study found viable virus in a recurrent case. Multiple case reports and observational RT-PCR studies have detected recurrent viral RNA shedding in people who were asymptomatic in the convalescent period, typically within seven days of two consecutive negative RT-PCR results. Following recurrence, patients remained viral RNA positive for approximately 1–8 days, but no evidence of transmission was reported.

Reinfection, N=2 studies

- Two studies have been published with compelling evidence that reinfection can occur. In both cases genetic analysis confirmed the virus from the first and second infection were different. This appears to be rare.

Conclusion: Across studies, similar viral loads have been reported for asymptomatic, pre-symptomatic, and symptomatic cases. Mild cases are typically no longer infectious 10 days after diagnosis. More severe cases are generally infectious for at least 20 days; when these cases are no longer infectious can only be confirmed by viral culture.