

SARS-CoV-2

Viral Dynamics During Early Infection



How do SARS-CoV-2 RNA concentrations change during an infection?



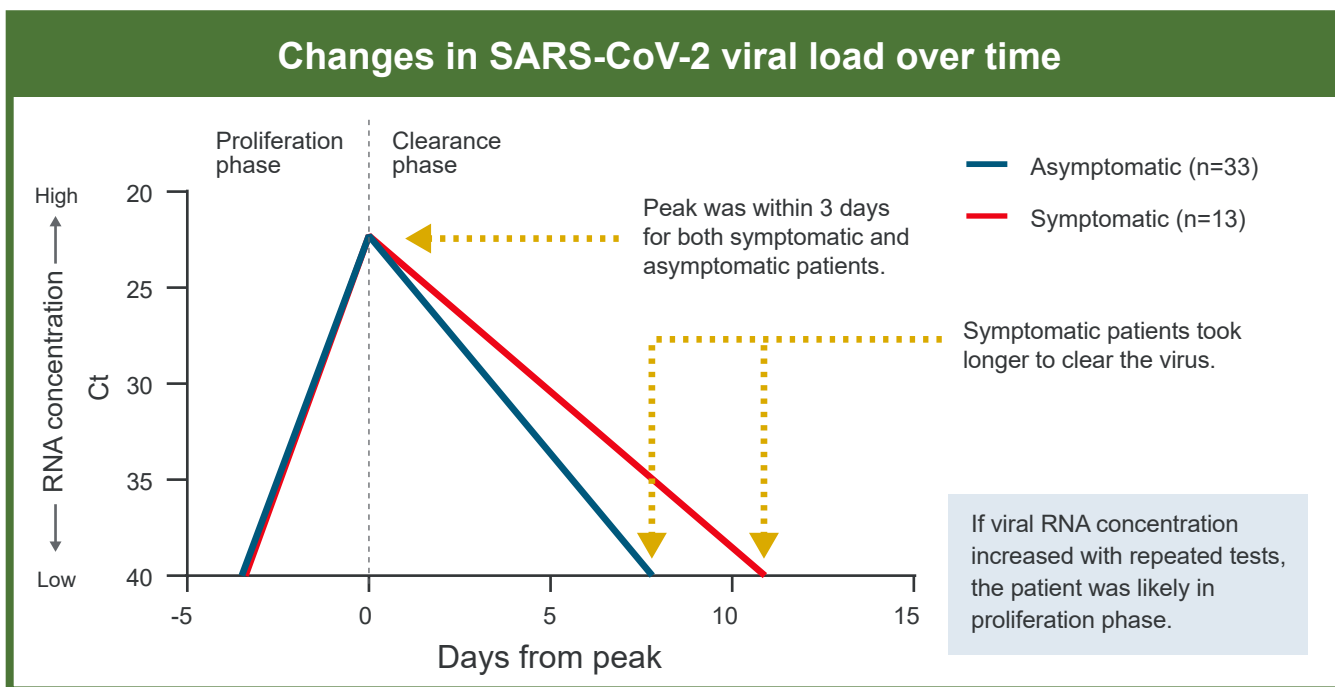
Background

Serial quantitative testing for SARS-CoV-2 RNA during the post-pandemic phase of the 2019-2020 NBA season offered an opportunity to investigate how viral concentrations change early during symptomatic and asymptomatic infection.



Methods and Results

Prospective serial quantitative PCR testing of ambulatory, non-hospitalized people participating in the 2019-2020 National Basketball Association season. Forty-six people had acute (new during the study period) SARS-CoV-2 infection as defined by ≥ 1 positive result.



Viral dynamics in early infection are similar for symptomatic and asymptomatic people. Repeat testing can help determine whether viral levels are increasing or decreasing and may thus inform management.

¹ Kissler SM, Fauver JR, Mack C, et al. Viral dynamics of acute SARS-CoV-2 infection and applications to diagnostic and public health strategies. *PLoS Biol.* 2021;19(7):e3001333. doi:10.1371/journal.pbio.3001333

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Article Title: Viral Dynamics of Acute SARS-CoV-2 Infection and Applications to Diagnostic and Public Health Strategies

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Background

- Nucleic acid amplification testing for SARS-CoV-2 is key in determining whether a person has COVID-19 and is contagious.
- Real-time, reverse-transcription-based quantitative polymerase chain reaction (RT-qPCR) can detect SARS-CoV-2 and also allows evaluation of viral concentrations.
- The dynamics of SARS-CoV-2 RNA concentrations in the earliest stages of infection, when contagiousness is rapidly increasing, remain unclear.
- **Objective:** This study examined SARS-CoV-2 quantitative RNA testing data obtained during the post-pandemic phase of the 2019-2020 NBA season to investigate viral dynamics, especially during early symptomatic and asymptomatic infection.

Methods

- SARS-CoV-2 infection and RNA concentrations were determined using RT-qPCR testing from June 23 through September 7, 2020.
 - Included in the analysis were results from 68 individuals who were tested at least 5 times, mostly on consecutive days, with at least 1 positive test (cycle threshold [Ct]<40; Ct is the number of thermal cycles needed to amplify viral RNA to a detectable level).
- For individuals with new infection during the study period (acute infection), the duration of infection phases (proliferation and clearance) and peak viral concentrations were inferred using mathematical modeling.

Results

- Acute infection was identified in 46 individuals.
- The average duration of the proliferation phase and the peak concentrations (based on Ct) were similar for symptomatic and asymptomatic individuals:
 - Symptomatic: 3.4 days (95% credible interval [CI], 2.0, 4.8), peaking at 22.3 Ct (95% CI, 19.3, 25.3)
 - Asymptomatic: 3.5 days (95% CI, 2.5, 4.5), peaking at 22.3 Ct (95% CI, 20.0, 24.4)
- The average duration of the clearance phase was longer for symptomatic individuals than for asymptomatic individuals: 10.9 days (95% CI, 7.9, 14.4) vs 7.8 days (95% CI, 6.1, 9.7).
- A second test that indicated higher viral concentrations than the initial test (within 2 days) was more likely to be associated with the proliferation phase than the clearance phase.

Conclusions

- The findings of this study indicate that SARS-CoV-2 viral dynamics in early infection are similar for symptomatic and asymptomatic people, though symptomatic people take longer to clear viral RNA.
- Repeat testing has the potential to help determine whether viral levels are increasing or decreasing and may thus inform management.

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