Respiratory Viral Shedding in Healthcare Workers Reinected with SARS-CoV-2, Brazil, 2020


Address for correspondence: Martin Zacharias, Diagnostic and Research Institute of Pathology, Medical University of Graz, Neue Stiftungtalstraße 6, 8010 Graz, Austria; email: martin.zacharias@medunigraz.at

We documented 4 cases of severe acute respiratory syndrome coronavirus 2 reinfection by non-variant of concern strains among healthcare workers in Campinas, Brazil. We isolated infectious particles from nasopharyngeal secretions during both infection episodes. Improved and continued protection measures are necessary to mitigate the risk for reinfection among healthcare workers.

Coronavirus disease (COVID-19) is caused by severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2), which emerged in Wuhan, China, 2019, and has been spreading globally since then.

1These authors contributed equally to this article.
in late 2019. As of April 8, 2021, COVID-19 has affected >132 million persons and caused >2.87 million deaths around the world (https://covid19.who.int). Whether the immune response elicited by an initial infection protects against reinfection is uncertain. The Pan American Health Organization provisionally defines reinfection as a positive SARS-CoV-2 test result ≥45 days after initial infection, given that other infections and prolonged shedding of SARS-CoV-2 or viral RNA have been ruled out (1). Healthcare workers (HCWs) are consistently exposed to SARS-CoV-2 and are therefore susceptible to reinfection.

We investigated 4 cases of SARS-CoV-2 reinfection among HCWs at the Hospital das Clínicas da Unicamp, a tertiary public hospital at the University of Campinas (Campinas, Brazil). This study was approved by the Research Ethical Committee of the University of Campinas (approval no. CAAE-31170720.3.0000.5404). The 4 HCWs, consisting of 3 nurses and 1 staff member, were women with an average age of 44 years (range 40–61 years) (Figure 1, panel A). For the initial infections, symptom onset ranged from April 5–May 10, 2020, and lasted 10–23 days. We identified SARS-CoV-2 RNA in nasopharyngeal swab samples using real-time quantitative reverse transcription PCR (qRT-PCR) 2–4 days after symptom onset (2). All 4 HCWs had mild COVID-19 signs and symptoms and recovered (Table). After signs and symptoms resolved, the HCWs tested negative by qRT-PCR, Elecsys Anti-SARS-CoV-2 (Roche Diagnostics, https://diagnostics.roche.com), or both. Reinfection, confirmed by a nucleic acid amplification test using the GeneFinder COVID-19 Plus RealAmp Kit (3), developed 55–170 days after symptom onset of the first infection. Signs and symptoms of reinfection lasted 9–23 days. Only 1 HCW had a concurrent condition (chronic bronchitis), and none were immunosuppressed. None required hospitalization during the initial or reinfection episodes (Table). After recovering from their initial infections, all HWCs continued to use the same types of personal protective equipment (i.e., disposable surgical masks, gloves, gowns, and goggles) in accordance with recommendations from the Ministry of Health of Brazil (https://coronavirus.saude.gov.br/saude-e-seguranca-do-trabalhador-epi).

To assess whether infectious SARS-CoV-2 particles were shed in nasopharyngeal secretions during both COVID-19 episodes, we conducted viral isolation in Vero cells (ATCC no. CCL-81) (W.M. de Souza, unpub. data, http://dx.doi.org/10.2139/ssrn.3793486) (Appendix). We inoculated Vero cells with isolated SARS-CoV-2 virions from nasopharyngeal swab samples collected during the first and second infections; we observed a cytopathic effect 3–4 days after inoculation. On day 4, we obtained cell culture supernatant by centrifugation and conducted qRT-PCR selective for the envelope gene to confirm the presence of SARS-CoV-2 RNA; we found the supernatants had $2.8 \times 10^2$–$1.4 \times 10^{10}$ RNA copies/mL (2).

Figure. Timeline of severe acute respiratory syndrome coronavirus 2 reinfections (SARS-CoV-2) among healthcare workers, Brazil, 2020. (+), positive; (−), negative.
The second episode of HCW 2. The D614G mutation in the spike protein in samples from both episodes of HCW 1 and the second episode of HCW 4; however, the spike protein in samples from both episodes of HCW 1 and the second episode of HCW 2. The D614G mutation associated with reinfection or long-term infection. In addition, we found the D614G mutation in the genomes had the mutations in spike proteins described in 3 recent VOCs (https://cov-lineages.org). Other cases of SARS-CoV-2 reinfection by strains without mutations in the spike protein were documented in India; those infections were associated with lineages B.1.1.8 and B.1.1.29 (9). Our results provide additional evidence of SARS-CoV-2 reinfection by non-VOC strains.

In conclusion, we report cases of SARS-CoV-2 reinfection among HCWs. We observed the shedding of infectious viral particles during both infection episodes of each HCW. Hence, the continuation of protective measures, as well as efforts to monitor, track exposures, and identify areas at high risk for infection, are critical to reducing SARS-CoV-2 reinfection, especially among HCWs.

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Table. Characteristics of healthcare workers with severe acute respiratory syndrome coronavirus 2 reinfections, Brazil, 2020*

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>Healthcare worker</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Underlying conditions</strong></td>
<td>1</td>
</tr>
<tr>
<td>None</td>
<td>Chronic bronchitis</td>
</tr>
<tr>
<td>Hospitalized</td>
<td>No</td>
</tr>
<tr>
<td><strong>Symptoms</strong></td>
<td></td>
</tr>
<tr>
<td>First infection</td>
<td>Fever, headache, chills, sneezing, coryza, and myalgia</td>
</tr>
<tr>
<td>Second infection</td>
<td>Headache, nasal congestion, odynophagia, ageusia, and anosmia</td>
</tr>
<tr>
<td><strong>Cycle threshold values</strong></td>
<td></td>
</tr>
<tr>
<td>First infection†</td>
<td>E gene: 35.24; N gene: 40.12</td>
</tr>
<tr>
<td><strong>Time between symptom onsets, d</strong></td>
<td>55</td>
</tr>
</tbody>
</table>

†Real-time quantitative reverse transcription PCR selective for the envelope gene (2).
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About the Author
Ms. Amorim is a doctoral candidate at the Department of Genetics, Evolution, Microbiology and Immunology at the University of Campinas, Brazil. Her research interests include genomic sequencing and epidemiologic surveillance of emerging viruses in Brazil.

References

Address for correspondence: Jose Luiz Proença-Modena, Universidade Estadual de Campinas – Genetics, Microbiology and Immunology Rua Monteiro Lobato, 255 – Cidade Universitária Campinas São Paulo 13083-862, Brazil; email: jlmodena@unicamp.br; Fabiana Granja, Universidade Federal de Roraima, Boa Vista, Roraima, Brazil; email: fabiana.granja@ufrr.br

Multisystem Inflammatory Syndrome in Adults after Mild SARS-CoV-2 Infection, Japan

Yasuhiro Yamada,1 Kaoru Fujinami,1 Tadashi Eguchi, Hiroshi Takefuji, Nobuaki Mori

Author affiliations: National Hospital Organization Tokyo Medical Center, Tokyo, Japan (Y. Yamada, K. Fujinami, T. Eguchi, H. Takefuji, N. Mori); University College London, London, UK (K. Fujinami)

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In Japan, a 51-year-old man had minimally symptomatic severe acute respiratory syndrome coronavirus 2 infection. Multisystem inflammatory syndrome was diagnosed ≈5 weeks later; characteristics included severe inflammation, cardiac dysfunction, and IgG positivity. Clinicians should obtain detailed history and examine IgG levels for cases of inflammatory disease with unexplained cardiac decompensation.

1These authors contributed equally to this article.