

**COVID-19 Information**[Public health information \(CDC\)](#) | [Research information \(NIH\)](#)[SARS-CoV-2 data \(NCBI\)](#) | [Prevention and treatment information \(HHS\)](#) | [Español](#)

FULL TEXT LINKS

**This article is a preprint**

Preprints have not been peer reviewed.

Learn more about preprints in the [NIH Preprint Pilot](#).[bioRxiv](#). 2020 Dec 13;2020.12.12.422516. doi: 10.1101/2020.12.12.422516. Preprint**SARS-CoV-2 RNA reverse-transcribed and integrated into the human genome**

Liguo Zhang, Alexsia Richards, Andrew Khalil, Emile Wogram, Haiting Ma, Richard A Young, Rudolf Jaenisch

PMID: 33330870 PMID: [PMC7743078](#) DOI: [10.1101/2020.12.12.422516](#)[Free PMC article](#)**Abstract**

Prolonged SARS-CoV-2 RNA shedding and recurrence of PCR-positive tests have been widely reported in patients after recovery, yet these patients most commonly are non-infectious. Here we investigated the possibility that SARS-CoV-2 RNAs can be reverse-transcribed and integrated into the human genome and that transcription of the integrated sequences might account for PCR-positive tests. In support of this hypothesis, we found chimeric transcripts consisting of viral fused to cellular sequences in published data sets of SARS-CoV-2 infected cultured cells and primary cells of patients, consistent with the transcription of viral sequences integrated into the genome. To experimentally corroborate the possibility of viral retro-integration, we describe evidence that SARS-CoV-2 RNAs can be reverse transcribed in human cells by reverse transcriptase (RT) from LINE-1 elements or by HIV-1 RT, and that these DNA sequences can be integrated into the cell genome and subsequently be transcribed. Human endogenous LINE-1 expression was induced upon SARS-CoV-2 infection or by cytokine exposure in cultured cells, suggesting a molecular mechanism for SARS-CoV-2 retro-integration in patients. This novel feature of SARS-CoV-2 infection may explain why patients can continue to produce viral RNA after recovery and suggests a new aspect of RNA virus replication.

**Related information**[MedGen](#)**LinkOut - more resources****Full Text Sources**[Cold Spring Harbor Laboratory](#)[PubMed Central](#)**Miscellaneous**[NCI CPTAC Assay Portal](#)**FOLLOW NCBI**

Follow NLM

National Library of Medicine  
8600 Rockville Pike  
Bethesda, MD 20894

Copyright

FOIA

Privacy

Help

Accessibility

Careers

NLM NIH HHS USA.gov