

and loss of taste and smell). Of the 5 residents with COVID-19, 4 were fully vaccinated and asymptomatic, and 1 was unvaccinated and asymptomatic. All 4 of the fully vaccinated residents and 8 of the 9 fully vaccinated staff members had a presumed re-infection, which we define as having a positive COVID-19 test >90 days prior to their current infection. In the 48 hours prior to symptom onset, the unvaccinated staff member with infection provided direct clinical care to 3 residents who developed infection and worked in proximity to the other 2 infected residents. The staff member was restricted from work upon experiencing symptoms. The nature of the residents' exposure to the other staff members with COVID-19 is unknown because their lack of symptoms precluded our ability to determine a precise infectious period. None of the infected residents left the facility or had visitors in the 21 days prior to their positive SARS-CoV-2 test. An infection control assessment by the DPH did not identify any deficiencies. The SARS-CoV-2 polymerase chain reaction (PCR) cycle threshold (Ct) values ranged from 31.5 to 34 (the cutoff for a positive test at the laboratory used by the SNF), indicating low levels of virus that were insufficient for conducting whole-genome sequencing.

Our study had several limitations. First, the lack of sequencing data from outbreak-associated SARS-CoV-2 isolates meant that we could not exclude the possibility of cases resulting from multiple introductions into the facility, as opposed to transmission arising from a single common source. Second, the lack of symptoms for most outbreak-associated cases made it difficult to determine the exact onset of infection, which is necessary for determining precise incubation periods and for interpreting SARS-CoV-2 PCR Ct values. Despite these limitations, our investigation provides strong circumstantial evidence that SARS-CoV-2 was introduced into the SNF by an asymptomatic vaccinated SNF staff member who likely acquired infection in the community. The possibility that asymptomatic vaccinated persons can transmit infection carries important policy implications. Precautionary measures, such as a need for continued use of face masks by

healthcare workers (regardless of vaccination status), must be implemented when there is substantial community transmission of SARS-CoV-2. Our investigation also supports continuing weekly surveillance testing, which allowed for the detection of infection in asymptomatic persons; early detection of an outbreak allows the DPH to assess and address potential gaps in infection control. All vaccinated persons were asymptomatic, and all except for one vaccinated case had evidence of prior COVID-19, indicating that immunity by past infection or vaccination can protect against symptomatic illness and severe disease. The occurrence of asymptomatic infections among fully immunized persons, however, could support the need for COVID-19 booster doses to reduce transmission among SNF staff members and residents.

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Transmission of severe acute respiratory coronavirus virus 2 (SARS-CoV-2), delta variant, between two fully vaccinated healthcare personnel

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To the Editor—Breakthrough severe acute respiratory coronavirus virus 2 (SARS-CoV-2) infection causing coronavirus disease 2019 (COVID-19) in fully vaccinated individuals occurs, and the frequency is increasing since the SARS-CoV-2 delta variant virus

began circulating widely.¹ COVID-19 vaccines are highly effective at reducing SARS-CoV-2 shedding and transmission.² The question of whether fully vaccinated people with breakthrough COVID-19 can transmit the SARS-CoV-2 virus to others is central to the debate around the need for mitigation efforts including masking and physical distancing for fully vaccinated individuals. We report apparent SARS-CoV-2 viral transmission between 2 fully vaccinated healthcare workers (HCW) in the setting of occupational unmasked close contact.

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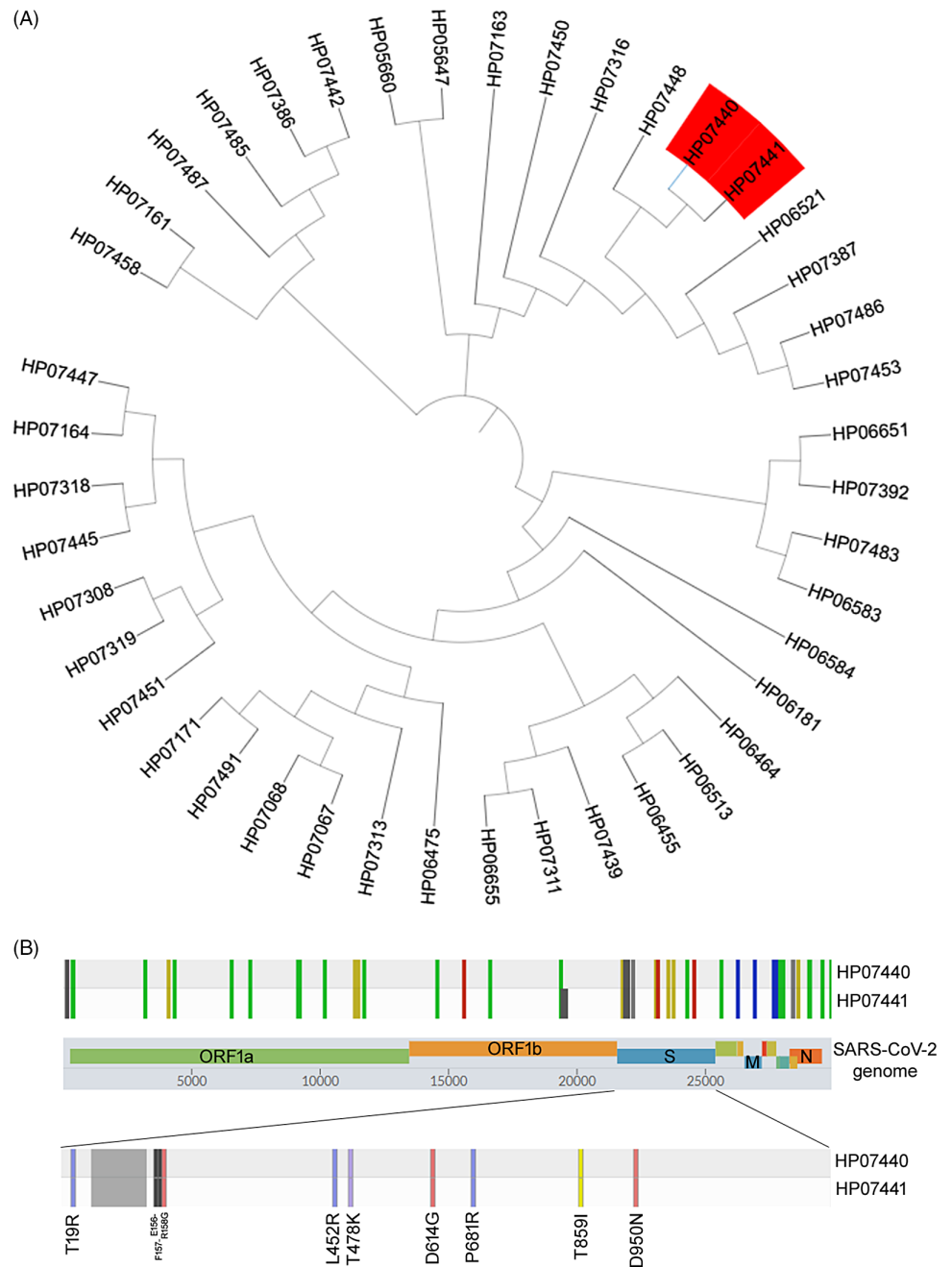


Fig. 1. Analysis of SARS-CoV-2 delta variant genomes from 2 fully vaccinated healthcare workers (HCWs) compared with other viral isolates from April through July 2021. (A) Relationship between the 2 HCW SARS-CoV-2 genomes to 41 other SARS-CoV-2 delta variants identified at Johns Hopkins Molecular Virology diagnostic laboratory and characterized by whole-genome sequencing. Genomes from the 2 HCWs are highlighted in red. (B) Genomic alignment of the 2 HCW genomes that shows the amino acid changes compared to the reference genome using Nextclade version 1.5.2 software. Amino acid changes are shown as colored vertical lines and dark gray bars indicate genomic gaps or deletions. The inset of the spike region shows the amino acid changes carried by the 2 HCW genomes including the S: T859I which was exclusively detected in these 2 genomes compared to the whole cohort.

Methods

Healthcare personnel are screened daily and report COVID-19 symptoms to occupational health. Symptomatic HCW are tested for SARS-CoV-2 using a nasopharyngeal swab sample and the cobas SARS-CoV-2 assay (Roche, Basel, Switzerland). Contact tracing is conducted by interviewing personnel who test positive and their close contacts. Whole-genome sequencing is conducted for all SARS-CoV-2 viral isolates as previously described.³ Consensus sequences are analyzed with Clustal omega (ebi.ac.uk) and visualized with interactive tree of life (itol.embl.de).

Results

In late July, a fully vaccinated HCW (2 doses COVID-19 mRNA vaccine > 6 months earlier) developed new onset headache, cough, fatigue, muscle aches, and sore throat, progressing to fever and loss

of taste and smell. At 4 days after symptom onset, a nasopharyngeal swab was positive for SARS-CoV-2 with cycle threshold (Ct) values of 25 and 26 for the E and ORF1ab genes, respectively. Risk factors for COVID-19 included international travel and interacting unmasked with others in the 2 weeks prior to symptom onset. Contact tracing identified 8 exposed HCW contacts; 7 were fully vaccinated and 1 was unvaccinated. No patient exposures occurred. One exposed, fully vaccinated HCW (2 doses COVID-19 mRNA vaccine > 6 months earlier) developed headache, fever, muscle aches, cough, fatigue, and chills 4 days after unmasked, close contact (<2 m or 6 feet) for ~120 minutes while the index case was asymptomatic and ~30 minutes while the index case was symptomatic during the infectious period. Both exposures involved eating together, unmasked, in a shared space. The exposed HCW tested positive for SARS-CoV-2 (Ct values of 17 and 18) 1 day after symptom onset and 4 days after the first exposure to the index HCW. The second

HCW had no other known COVID-19 exposures but did interact unmasked with coworkers in the 2 weeks before testing positive. Whole-genome sequencing detected the SARS-CoV-2 delta variant (B.1.617.2). Genome alignment to 41 other delta variants isolated at our institution from April through July 2021 confirmed the relatedness of the 2 HCW viruses and their distinctiveness from other SARS-CoV-2 isolates (Fig. 1).

Discussion

Recent CDC guidance says that fully vaccinated individuals may not need to wear masks indoors or practice physical distancing due to vaccine effectiveness and the low likelihood of a fully vaccinated person transmitting the virus to others.⁴ The genetic and epidemiological data from our investigation of 2 HCW with breakthrough SARS-CoV-2 infection strongly suggest transmission of the SARS-CoV-2 virus delta variant from one fully vaccinated individual to another in the setting of unmasked close contact. Limitations include the fact that source of the infection for the first HCW is unknown; it remains possible that both HCWs were infected with SARS-CoV-2 from a common source or through separate exposures.

SARS-CoV-2 variants, such as the delta variant, can have higher viral loads, potentially increasing transmissibility and requiring enhanced public health measures.⁵ This apparent transmission of SARS-CoV-2 from one fully vaccinated person to another demonstrates that masking and physical distancing remain vital infection prevention measures for fully vaccinated people while the SARS-CoV-2 virus is still evolving and circulating.

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Healthcare personnel frequently have positive severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) antigen tests 5 days or more after diagnosis of coronavirus disease 2019 (COVID-19)

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To the Editor—During the coronavirus disease 2019 (COVID-19) pandemic, healthcare facilities have had to balance the goals of

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preventing healthcare-associated transmission of severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) and maintaining adequate staffing.¹ The emergence of the highly transmissible omicron variant has greatly exacerbated staffing shortages due to frequent infections in unvaccinated and vaccinated personnel.² In response, the Centers for Disease Control and Prevention (CDC) recently provided modified guidance to mitigate healthcare

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