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Brief Report

Asymptomatic SARS-CoV-2 infection following first dose mRNA-1273 COVID-19 vaccine in a veterans affairs long term care facility

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A B S T R A C T

An outbreak of SARS-CoV-2 involving four residents of a United States Veterans Affairs long term care facility occurred following administration of the first dose of the mRNA-1273 vaccine (Moderna) to thirty out of 33 residents. Three out of 4 positive cases were partially vaccinated and remained asymptomatic. One of 2 partially vaccinated patients who were tested for anti-spike protein antibodies had detectable levels at the time of diagnosis. The mortality rate was lower compared to a prior outbreak reported in this facility.

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In December 2020 the United States Centers for Disease Control recommended that healthcare workers and residents of long term care facilities (LTCFs) be prioritized to receive the first vaccines approved for coronavirus disease 2019 (COVID-19) during the initial phase of the COVID-19 vaccination program.¹

At the Northport Veterans Affairs Medical Center in New York, vaccination of residents of an affiliated LTCF began with 30 out of 33 residents receiving a first dose of the mRNA-1273 vaccine by January 8th. Subsequently on January 18 an employee of this LTCF developed symptoms of upper respiratory infection and tested positive for SARS-CoV-2 by nasopharyngeal polymerase chain reaction. This instigated a facility-wide surveillance program which identified 4 positive patients on January 22. Three of the 4 patients had already received the first vaccine dose more than 2 weeks before testing positive and all three reported no symptoms of COVID-19 at the time of diagnosis.

The first case was a 78 year old male with emphysema, hypertension, atrial fibrillation and history of stroke. The patient received the first dose of mRNA-1273 on January 6. His SARS-CoV-2 PCR resulted positive on January 22 with cycle threshold of 22 (Cepheid). The patient had tested negative for SARS-CoV-2 by PCR during routine surveillance throughout the pandemic including his most recent

screening on January 11. SARS-CoV-2 antibody testing performed on the date of his positive test revealed positive anti-spike protein receptor binding domain IgG antibody (6.74 S/Co [reference <0.8] [Beckman]) and anti-spike protein receptor IgM antibody (11.01 S/Co [reference] <1.0 [Beckman]) and negative anti-nucleocapsid IgG antibody (0.11 S/Co [reference 0–1.39] [Abbott]).

The second case was a 77 year old male with emphysema, hypertension, atrial fibrillation, and dementia. The patient received the first dose of mRNA-1273 on January 7. His SARS-CoV-2 PCR resulted positive on January 22 with cycle threshold of 22. He previously tested negative for SARS-CoV-2 by PCR repeatedly through January 11. Anti-spike protein IgG (0.11 S/Co) and IgM antibody (0.18 S/Co) and anti-nucleocapsid IgG antibody (0.02 S/Co) were all negative on the date of diagnosis.

The third case was a 99 year old male with coronary artery disease, atrial fibrillation and dementia. The patient received the first dose of mRNA-1273 on January 7. His SARS-CoV-2 PCR resulted positive on January 22 with cycle threshold of 36. He previously tested negative for SARS-CoV-2 by PCR during routine screening with most recent negative test on December 26. The patient declined venipuncture for antibody testing.

All three patients remained asymptomatic for 7 days of observation. There was no difference in clinical course or outcomes between the two patients with or without detectable anti-spike antibody at the time of diagnosis.

Whole genome sequencing of all three viral specimens revealed lineage B.1.2 with identical amino acid substitutions A570V and

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Table 1
Positive SARS-CoV-2 cases during January 2021 outbreak by prior COVID-19 infection and vaccination status

	Vaccinated		Unvaccinated	
	Positive SARS-CoV-2	Negative SARS-CoV-2	Positive SARS-CoV-2	Negative SARS-CoV-2
Prior COVID-19	0	6	0	2
No Prior COVID-19	3	21	1	0
Total	3	27	1	2
Attack Rate	3/30 = 10%		1/3 = 33%	

D614G in the spike protein (Illumina NextSeq). No mutations associated with so-called variants of concern known to confer greater transmissibility or immune escape such as N501Y or E484K were discovered.²

There were no other cases of COVID-19 identified among the remaining 27 patients who received the first dose of mRNA-1273, including 21 partially vaccinated residents with no prior history of COVID-19 infection (Table 1). The fact that 2 of the positive patients' nucleocapsid antibodies were negative confirms that they were among those not previously infected.

Of the three unvaccinated patients, two patients who previously recovered from symptomatic COVID-19 tested negative during this investigation, while the 1 patient in this facility who had neither previously been infected nor vaccinated for COVID-19 became the fourth positive case on January 22, and reported mild symptoms. There were no deaths as a result of this outbreak.

In this small sample size, vaccine effectiveness after a single dose of mRNA-1273 was 70 percent. While both phase 3 clinical trials of mRNA vaccines demonstrated over 90 percent efficacy in preventing symptomatic COVID-19 after completing a 2 dose series, further studies have suggested that beginning 2 weeks after the first dose vaccine efficacy may already exceed 80 percent.^{3,4,5} Opponents of delaying the second dose raise concerns about lower antibody titers particularly among older individuals following the first dose, and the potential for immune escape by variants of concern.⁶

Residents of LTC facilities have been particularly vulnerable to the devastation of COVID-19, accounting for more than a third of all COVID-19 related deaths in the United States.⁷ During a previous outbreak in associated LTCFs including this facility in March 2020,

there were 25 cases identified with a case fatality rate of 26%.⁸ It is encouraging that among these three patients at high risk for severe disease and mortality who received even a single vaccination, all remained asymptomatic, and the outbreak was limited to just four patients in total. We speculate that in addition to ongoing infection control measures, vaccination of residents of this facility with the first dose of mRNA-1273 may have mitigated both the extent of the outbreak and the severity of illness in those few who were ultimately infected.

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