Since January 2020 Elsevier has created a COVID-19 resource centre with free information in English and Mandarin on the novel coronavirus COVID-19. The COVID-19 resource centre is hosted on Elsevier Connect, the company's public news and information website.

Journal of Hospital Infection 113 (2021) 192—194

Available online at www.sciencedirect.com

Journal of Hospital Infection

journal homepage: www.elsevier.com/locate/jhin

Letter to the Editor

BNT 13b2 Pfizer vaccine protects against SARS-CoV-2 respiratory mucosal colonization even after prolonged exposure to positive family members

Sir,

Coronavirus disease 2019 (COVID-19), is a new disease caused by the novel severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2). In the State of Israel, with a population of roughly 9 million, approximately 700,000 people have recovered from COVID-19, and to date 56% of the total population have been vaccinated (BNT 13b2 Pfizer). Ziv Medical Center (ZMC) is a periphery hospital in Northern Israel, with about 1800 employees. In the past year, 12% of hospital employees became ill with COVID-19, and by the end of January 2021, 91% of the non-infected employees had been vaccinated. Despite the herd immunity of the medical staff, most of them returned home to locations where the epidemic was raging, in communities in which more than 7% of members were verified COVID-19-positive. Vaccinated workers did not have to quarantine even if a verified patient resided in their home, and they were allowed to continue working regularly at the hospital, unless they developed suspicious clinical symptoms for COVID-19. However, prolonged exposure to a positive family member living in the same house may be a challenge to the immune system, unlike exposure to a positive patient for a short period.

The main glycoproteins in the gel layer of the respiratory mucosa are mucins, components of glycosylated proteins designed to block the penetration of pathogens, as well as defensin and other components, together with an adaptive component of the immune system: immunoglobulin A (IgA) [1,2]. IgA serum level is 2—3 mg/mL, a quarter of the level of immunoglobulin G (IgG). The role of IgA stems from its various locations in the body and from its role in binding pathogens planning invasion [3]. Unlike other antibodies, IgA does not activate the complement system. Its primary action in the mucosa is to bind to the virus and prevent its binding to high-affinity receptors [4]. The Pfizer BNT 13b2 vaccine produces IgG antibodies against the spike protein [5]. These IgG antibodies are not found in mucous membranes and cannot prevent the virus from binding to mucous membranes of the airways. Binding of the virus to the mucous membranes of the airways can create an initial response of local infection and a superficial non-invasive, non-symptomatic disease that does not progress because of the presence of IgG antibodies, but can enable viral secretion and cultivation in unvaccinated persons.

We wanted to investigate whether it was possible for vaccinated hospital workers to be carriers of SARS-CoV-2 as a result of prolonged, high-level exposure. We defined prolonged exposure as a situation in which the hospital worker was living with a family member who was COVID-19-positive, but as-yet undiagnosed. The patient was immediately isolated from the rest of the family. In addition, the Infection Control Unit of the hospital mandates a series of two to three polymerase chain reaction (PCR) tests for vaccinated staff members exposed to a sick family member. PCR tests were performed using nasopharyngeal swabs from Xpert® Xpress SARS-CoV-2 (Cepheid). Quantitative serology tests were performed to measure immunogenicity in the group of interest, before getting the vaccination and after the first and second doses. We performed serologic tests using the Diasorin LIAISON SARS-CoV-2 S1/S2 IgG assay.

Fourteen vaccinated workers had reported the presence of a verified COVID-19-positive family member in their home. Based on serology, one of the employees was defined as a recovering patient. Thirteen workers had been vaccinated with two doses of the vaccine, and on the day of exposure they were at least eight days after the second dose (average time was 25 days). The employee characteristics and serology test results are presented in Table I.

The mean antibody titre for all ZMC workers that were tested, three weeks after the first dose was 67 (range 35—400), and two weeks after the second dose it was 423 (range 150—1630). All PCR SARS-CoV-2 tests performed for the 14 workers after exposure (33 tests) were found to be negative: no carriers were found.

These findings are encouraging, especially in light of the way mRNA triggers the immune system. BNT 13b2 Pfizer is a new vaccine whose properties are still being studied. Because its mechanism of action induces the production IgG antibodies only, in contrast to IgA antibodies, which are formed naturally in infected persons, the concern is that the virus may bind to the mucous membranes and cultivate in its superficial epithelial cells, making the vaccinated person a carrier. Our findings indicate that the BNT 13b2 Pfizer vaccine is effective against mucosal colonization of SARS-CoV-2 even during prolonged exposure (a total of 120 days of exposure for 14 employees). None of the employees developed COVID-19 symptoms or signs. This is the first report describing the

https://doi.org/10.1016/j.jhin.2021.03.023

Table I
Employee characteristics after exposure to a verified COVID-19-positive family member

No.	Age	Sector	Disconnect (yes/no)**	Second vaccination day***	Exposure date***	First PCR***	Second PCR***	Third PCR***	Time between second vaccination and exposure (days)	IgG before	IgG 21 days after first vaccine	IgG 14 days after second vaccine
1	28	Nursing	No	−16	0	1	7	15	16	Neg	97*	293
2	37	Manager and economy	Yes	−19	0	1	7		19	ND	ND	ND
3	41	Nursing	Yes	−17	0	1	9		17	Neg	82.9	266
4	61	Paramedical	No	−19	0	1	9	17	19	Neg	72	192
5	26	Nursing	No	−15	0	1	8	14	18	Neg	77	221
6	60	Nursing	Yes	−23	0	1	7		23	ND	ND	ND
7	51	Nursing	Yes	−17	0	1	8		19	Neg	ND	209
8	35	Medicine	Yes	−23	0	1	5		23	ND	ND	ND
9	36	Nursing	No	−41	0	1	10	18	41	Neg	35	150
10	30	Medicine	Yes		0	1	10			Pos	ND	ND
11	39	Medicine	Yes	−34	0	1	7		34	ND	ND	ND
12	55	Medicine	Yes	−42	0	1	10		42	Neg	ND	ND
13	47	Manager and economy	No	−41	0	1	10	17	41	ND	ND	ND
14	26	Nursing	Yes	−22	0	1	10		50	Neg	>400	1630

IgG, immunoglobulin G; ND, not done; Neg, negative; Pos, positive; PCR, polymerase chain reaction test.
* Positive >15 AU/mL.
** Disconnect from verified COVID-19-positive family member immediately after informed.
*** Day zero (X) for each employee is that employee's exposure day.

effectiveness of the vaccine in preventing the virus from adhering to the mucosa of vaccinated persons, precluding the possibility of carrying the virus.

Conflict of interest statement
None declared.

Funding sources
None.

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Available online 31 March 2021