

Antibody production following immunization by mRNA vaccines in Ontario long-term care residents and staff

Long-term care residents and staff immunized with the Moderna vaccine elicit stronger total and neutralizing antibody responses compared to those vaccinated with Pfizer-BioNTech, according to new research. The preprint findings, yet to be peer-reviewed, also illustrate differences between the ability of the two mRNA vaccines to neutralize variants of concern (VOC). Notably, about 38% residents immunized with Pfizer were unable to neutralize the VOC Beta. This CITF-funded research is led by Drs. Anne-Claude Gingras, Allison McGeer, Sharon Straus, Jennifer Gommerman, and Mario Ostrowski, among others.

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Key points:

- In residents and staff, the Moderna vaccine elicited a stronger total and neutralizing antibody response than the Pfizer-BioNTech vaccine.
- In residents and staff, both mRNA vaccines were less adept at neutralizing VOCs Alpha, Beta, and Gamma than they were at neutralizing the original SARS-CoV-2 strain.
- Of the residents who received the Pfizer-BioNTech vaccine, 37.9% were unable to neutralize the VOC Beta and 29.3% were unable to neutralize the VOC Gamma. In comparison, 11.5% of residents who received Moderna were unable to neutralize Beta and 4.9% were unable to neutralize Gamma.

In Ontario, long-term care (LTC) residents and staff received one of two Health Canada-approved mRNA vaccines following the manufacturer-recommended dose intervals: notably, 28 days for Moderna and 21 days for Pfizer. In this study, 198 residents and 78 staff across four LTC facilities in south-central Ontario were invited to provide blood samples, either through dried blood spot (DBS) or traditional blood draw (venipuncture), at three different timepoints: (1) pre-vaccination, (2) 3-4 weeks post-dose 1, and (3) 2-4 weeks post-dose 2.

Encouragingly, the study showed that immunization with either mRNA vaccine mounted a detectable total antibody response in the older individuals, which peaked 2-4 weeks after the second dose. However, residents and staff who received the Moderna vaccine had a stronger total antibody response compared to residents and staff who received Pfizer.

When probed for their ability to neutralize the VOCs Alpha, Beta, and Gamma, samples from residents and staff alike showed a reduction in their ability to neutralize VOCs compared to the original SARS-CoV-2 strain from Wuhan, China (against which the vaccines were originally designed). Moreover, for a number of residents who got the Pfizer vaccine, neutralization activity was completely absent for some VOCs, particularly, Beta and Gamma. Indeed, in this cohort, 37.9% of residents who received Pfizer were unable to neutralize variant Beta, compared to 11.5% of residents in the Moderna cohort. Moreover, 29.3% of residents who received Pfizer could not neutralize the VOC Gamma, a much higher percentage compared to the 4.9% of residents who received Moderna who could not neutralize that variant.

While other studies have seen similar differences in antibody responses between mRNA vaccine products, the authors note that the functional mechanism behind these observations is not yet understood. They do, however, comment on the difference in concentration of mRNA in each product: Moderna has 100 micrograms of mRNA whereas Pfizer-BioNTech has 30 micrograms of mRNA. Additionally, the study focused on the antibody response, which is only one part of the immune response. The second arm - cell-mediated immunity – has also been shown to be activated by COVID-19 vaccines and helps by fighting against the infection.

The preprint findings illustrate that continued close surveillance of antibody responses and other immune correlates following vaccination in older individuals is crucial, particularly in light of emerging VOCs and the potential need for third vaccine shots (boosters) in this priority population.

The CITF funds several vaccine surveillance research studies in long-term care homes across Canada. Additional information on these studies can be accessed [here](#).

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