# Dual dose of the Pfizer COVID-19 vaccine elicits strong antibody immune responses in older people

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A University of Birmingham-led study supported by the UK Coronavirus Immunology Consortium has found that 98% of people aged 80 or over who had two doses of the Pfizer COVID-19 vaccine had a strong antibody immune response.

The research involved 100 people aged 80 to 96, who were living independently, and had received the Pfizer vaccine twice at three weeks apart. Immune measurements were taken two weeks after the second vaccination.

The largest and most complete independent study of older people's immune response to Pfizer vaccination published to date, the study showed that, in 63% of participants, cellular T cell responses developed and correlated with antibody response.

The research also found that participants who had previously had natural COVID-19 infection had a peak antibody response after just one Pfizer vaccination. In these participants, their antibody response remained 28-fold higher even after the second vaccine dose.

Working with Public Health England at the Porton Down laboratory, the team showed live Wuhan virus was strongly neutralized in serum from blood samples taken from participants after they had two doses of the Pfizer vaccine.

The levels of neutralization reduced 14-fold when tested against the P.1 COVID-19 variant that was first discovered in Brazil. However, the team are still hopeful that the levels of neutralization shown is still sufficient to provide broad protection against this viral variant of concern.

First Author Dr. Helen Parry, a National Institute for Health Research (NIHR) Academic Clinical Lecturer at the University of Birmingham, said: "With hopes pinned on COVID-19 vaccination playing a key role in bringing the current pandemic under control, it is essential that vaccine-induced immune responses are elicited effectively in people of older age, who we know are the most vulnerable group to COVID-19.

"However we also know that the quality of immune responses, including responses to vaccination, deteriorates with age.

"Although the Pfizer vaccine has shown good efficacy in those aged over 75, data on the immunological responses in those aged 80 years and over is lacking, including immune responses induced by the vaccine to the new COVID-19 variants of concern.

"Our research provides further evidence that the mRNA vaccine platform delivers a strong immune antibody response in people up to 96 years of age

and retains broad efficacy against the P.1 variant, which is a variant of concern."

UK Coronavirus Immunology Consortium Lead and Corresponding Author Professor Paul Moss, of the University of Birmingham, adds: "Our data also shows that for older people who have already had a natural COVID-19 infection, a single dose of the Pfizer vaccine strongly boosts the immune response. Indeed, in these people the levels of antibody remain quite a lot higher even after two doses of vaccine.

"While we need further research to understand this finding better, it's important that everyone still follows NHS guidelines to get two doses of the vaccine, even if a person thinks they may have previously had COVID-19.

"Meanwhile, we found cellular immune responses were less complete and were detectable only in 63% of participants. It is not yet entirely clear how important these cellular responses are for protection or for supporting antibody responses in the longer term. However, this profile must be monitored and we will continue to study this cohort."

The research, carried out in collaboration with Public Health England and the UK Government's Vaccine Taskforce, has been published today on The Lancet's pre-print server therefore is yet to be peer reviewed.

The study was partially supported by the UK Coronavirus Immunology Consortium, which is funded by UK Research and Innovation and NIHR.

Professor Moss continued: "Taking a collaborative approach to research through the UK Coronavirus Immunology Consortium and National Core Studies has allowed us to drive forward our knowledge at an incredible pace and build our understanding of how different components of the immune system respond to COVID vaccines. This knowledge will allow us to optimize vaccination protocols and maximize protection against SARS-CoV-2 within our population."

Dr. Joanna Jenkinson, Head of Infections and Immunity at the Medical Research Council, part of UKRI, said: "As the UK continues its rollout of vaccines against COVID-19, it's critical we study the real-world impact of these vaccines at pace, especially amongst the groups most affected by the virus. This study from a group of world-leading immunologists who have come together under the UKRI and NIHR-funded UK Coronavirus Immunology Consortium, brings much welcome reassurance that the mRNA vaccine elicits a strong immune response in people over 80 years of age."

The research specifically analyzed the immune response to SARS-CoV-2 'spike protein." For viruses like COVID-19 to survive, they have to get inside cells in order to replicate and build new virus particles and spread to other cells.

Coronaviruses are surrounded by a fatty membrane, and in order to gain entry to the inside of a cell they use something known as a 'spike protein' to fuse the membrane to a cell and take over the cell.

The spike protein of SARS-CoV-2 is stuck on a roughly spherical viral particle, projecting out into space, and ready to cling on to unsuspecting cells.

Given how crucial the SARS-CoV-2 spike protein is, some COVID-19 vaccines—known as mRNA vaccines and includes the Pfizer vaccine—have been designed to give instructions to our immune system to make our own version of the spike protein. Production of the spike inside our cells then starts the process of protective antibody and T cell production.

**More information:** Parry, Helen Marie et al. BNT162b2 Vaccination in People Over 80 Years of Age Induces Strong Humoral Immune Responses with Cross Neutralisation of P.1 Brazilian Variant. Available at SSRN: ssrn.com/abstract=3816840

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