Third COVID-19 vaccine dose effectively boosts immunity for the majority of patients with cancer

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Samra Turajlic's lab working on the CAPTURE project. Credit: The Francis Crick Institute

Nearly 100 percent of cancer patients with solid tumors have antibodies

effective against the delta variant after a third dose of COVID-19 vaccine, according to new results published as a correspondence in *Cancer Cell* this week.

The new findings also highlight a proportion of patients with blood cancers who still have undetectable antibody levels against delta after three doses, and should take up invitations for their fourth, especially as we enter a wave of new omicron infections.

As we face a new, more infectious variant in omicron, it's increasingly important to prioritize protection for vulnerable patients.

As part of the ongoing CAPTURE study led by the Francis Crick Institute and The Royal Marsden NHS Foundation Trust, and funded by The Royal Marsden Cancer Charity, researchers have been monitoring the immune responses of hundreds of patients with different types of cancer, after one, two and three doses of COVID-19 vaccine.

Using a highly accurate test, a viral neutralization assay developed at the Crick, the team measured levels of antibodies which specifically block the delta variant from infecting cells. In 199 people with cancer who had received a third vaccine dose (115 with solid cancers and 84 with blood cancers), they assessed whether levels of these neutralizing antibodies in the blood were sufficient to block at least 50 percent of virus infection under laboratory conditions.

To examine the added benefit of a booster, the team specifically analyzed responses in patients who had not shown a neutralizing antibody response against delta after their second vaccine dose, or in patients whose response had waned since. They found that after a third dose, 94 percent (47/50) of patients with solid cancers had newly detectable levels of neutralizing antibodies against delta. While a third vaccine dose also effectively boosted antibody levels for many patients

with blood cancers (54 percent or 28/52), a substantial proportion still had undetectable levels in their blood.

Overall, across all patients studied after three doses, 97 percent of patients with solid cancer and 71 percent of patients with blood cancers had detectable antibody levels against delta.

The research team suggest that patients with solid cancers should be as protected against delta as healthy individuals after three vaccine doses. But patients with blood cancers should remain cautious and come forward for a fourth dose when invited. UK guidance already says that adults and children aged 12 and over who are severely immunosuppressed should have three primary doses of the COVID-19 vaccine, followed by a fourth booster dose.

In their previous analysis of patient responses after two vaccine doses, the researchers had found that 31 percent of patients with blood cancer and 62 percent of patients with solid cancers had detectable antibody levels against delta. The team suggest that low vaccine protection and a reduction in protective measures likely contributed to people with blood cancer now accounting for a higher proportion of COVID-19 deaths.

Dr. Samra Turajlic, lead author and group leader at the Crick and Consultant Medical Oncologist at The Royal Marsden NHS Foundation Trust, said: "Overall we're seeing the positive effects of vaccination in patients with cancer, who we know are more vulnerable to COVID-19 infection.

"Even for people with blood cancers, we're seeing some who initially weren't responding to the vaccine, start to develop antibodies after three doses. And because of this, we hope that a fourth dose will provide effective protection to a larger proportion of this group."

The team also examined differences in the types of vaccines patients had received. In patients with blood cancers, they found that a third dose of Pfizer-BioNTech was more likely to boost antibodies to detectable levels if the patient had the Oxford-AstraZeneca vaccine for their first and second dose. This is reassuring as the previous study showed that the Oxford-AstraZeneca vaccine initially induced lower antibody levels in this group.

Importantly, the researchers were also able to study T-cell responses in a subset of the patients, helping to fill a significant gap in our understanding of the wider immune response to COVID-19. Overall, they found that a third dose also effectively boosts T-cell levels in patients with both solid and blood cancers.

"As we face a new, more infectious variant in omicron, it's increasingly important to prioritize protection for vulnerable patients," added Samra. "Our team will continue to examine changes in immune response as the pandemic evolves."

More information: Annika Fendler et al, Immune responses following third COVID-19 vaccination are reduced in patients with hematologic malignancies compared to patients with solid cancer (2021). DOI: 10.21203/rs.3.rs-1191603/v1

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