

# How long does immunity last after COVID vaccination, and do we need booster shots?

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An important factor in achieving [herd immunity](#) against SARS-CoV-2 (the virus that causes COVID-19) is how long the vaccines protect you.

If a [vaccine](#) continues to work well over a long period, it becomes easier to have a significant proportion of the population optimally protected, and in turn suppress or eliminate the disease entirely.

As the rollout of COVID-19 vaccines continues, public attention is increasingly turning to booster shots, which aim to top up immunity if it wanes. But is a third dose needed? And if so, when?

Let's take a look at what the data tell us so far about how long immunity from COVID-19 vaccines might last.

## **First, what about immunity following COVID-19 infection?**

The presence of antibodies against SARS-CoV-2 is used as an indicator of immunity, with higher levels indicating greater protection. Once antibody levels drop below a particular threshold, or vanish completely, the person is at risk of reinfection.

Initially, scientists observed people's [antibody levels rapidly decreased](#) shortly after recovery from COVID-19.

However, more recently, we've seen positive signs of long-lasting immunity, with [antibody-producing cells](#) in the bone marrow identified seven to eight months following infection with COVID-19. In addition, scientists have observed [evidence of memory T cells](#) (a type of immune cells) more than six months following infection.

A study of over 9,000 [recovered COVID-19 patients](#) in the United States up to November 2020 showed a reinfection rate of only 0.7%. These findings closely align with a slightly more [recent study](#) suggesting reinfection after COVID-19 is very uncommon, at least in the short

term.

While it seems likely there's some level of lasting protection following COVID-19 infection, if you've had COVID, getting vaccinated is still worthwhile.

There's some evidence vaccination after recovery leads to [a stronger level of immunity](#) compared to "natural" immunity from infection, or immunity from vaccination alone. People with so-called "hybrid immunity" appear to exhibit a more diverse range of antibodies.

## How long does immunity from vaccines last?

The vaccines deployed against COVID-19 in Australia and most of the western world come from two classes.

Those produced by [AstraZeneca](#) and [Johnson & Johnson](#) are viral vector vaccines. They use an adenovirus (which causes the common cold) to prime the immune system to respond to SARS-CoV-2.

The vaccines developed by Pfizer and Moderna use [mRNA-based technology](#). The messenger RNA gives your cells temporary instructions to make the coronavirus' spike protein, teaching your immune system to protect you if you encounter the virus.

For the viral vector vaccines, despite ongoing trials, there's little data available on the duration of the antibody response. The [original studies](#) showed efficacy for [one to two months](#), however the duration of protection, and whether a booster will be needed, require further evaluation.

Notably, a [vaccine similar](#) to AstraZeneca against a related coronavirus (Middle East respiratory syndrome, or MERS) showed stable antibody

levels over a 12-month follow-up period. This gives hope for lasting protection against similar coronaviruses.

The Pfizer and Moderna COVID-19 vaccines are the first vaccines based on mRNA technology to be approved for human use. So there's still significant research required to evaluate the nature and duration of immunity they induce.

Interestingly, "[germinal centers](#)" have been identified in the lymph nodes of people vaccinated with the Pfizer vaccine. These act as training sites for immune cells, teaching them to recognize SARS-CoV-2, indicating a potential for long-lasting protection.

Initial [studies](#) only evaluated short-term efficacy, however recent research has found strong antibody activity at [six months](#).

## What about Delta?

Variants such as Delta, which are more transmissible and potentially more dangerous, are likely to increase interest in booster programs.

All vaccines show modestly [reduced efficacy against Delta](#), so any decrease in protection over time could be more problematic than with the original SARS-CoV-2 virus, or other variants.

A [recent preprint](#) (a study yet to undergo peer review) found protection against the Delta variant waned within three months with both the Pfizer and AstraZeneca vaccines.

This research from the United Kingdom showed the Pfizer vaccine was [92% effective](#) at preventing people from developing a high viral load at 14 days after the second dose, but this dropped to 78% at 90 days. AstraZeneca was 69% effective against the same measure at 14 days,

dropping to 61% after 90 days.

This study shows vaccinated people who become infected with Delta still carry high amounts of virus (viral load). Third booster doses will be important to reduce these breakthrough infections and subsequent transmission.

Although the UK study looked at infections rather than hospitalisations or deaths, data from around the world continue to show the unvaccinated are making up the vast majority of patients who develop serious illness.

Nonetheless, scientists are continuing to investigate how waning immunity could affect protection against the more serious outcomes of COVID-19.

## **OK, so what now?**

Pfizer [has reported positive results](#) from trials of a [third dose](#) to boost immunity, and the company [is seeking](#) formal approval for a booster from the United States Food and Drugs Administration.

The [United States](#) has announced it will begin distributing third doses next month to people who received an mRNA vaccine eight months ago or more.

Other countries, such as Israel, have already begun rolling out boosters. The move to offer third doses in some high-income countries has raised ethical concerns, with many people around the world still unable to access a first or second dose.

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A number of countries [have authorized](#) booster doses for at-risk populations in response to the rise of the Delta variant.

This includes [older adults](#) and those with [compromised immune systems](#), to combat the increased risk of severe disease and diminished vaccine protection in these people.

In Australia, there is likely to be a booster program in the future. But given the current issues [surrounding supply](#), it's unlikely to be for some months.

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