How Well Do COVID Vaccines Work for People With HIV?

Overall, vaccines are highly effective, but some folks are at risk for poorer response.

January 3, 2022 By Liz Highleyman

Studies of COVID-19 outcomes among people living with HIV have yielded conflicting results, but some show that HIV-positive people are at greater risk for severe illness and death. Many people with HIV are older and have other chronic health conditions, and experts stress that they should get vaccinated—and boosted—as soon as possible.

“All of the authorized vaccines are safe and effective for people with HIV,” says Melanie Thompson, MD, of the AIDS Research Consortium of Atlanta. “Vaccination should be a very high priority.”

But how well do the vaccines work for people living with HIV? Once vaccinated, can they finally ease up on some precautions and start to resume their normal activities?

We know that people with compromised immunity are at risk for more severe COVID-19 and can have slower and weaker immune responses after infection or vaccination. Studies show, for example, that organ transplant recipients and cancer patients treated with immunosuppressive medications may not be fully protected.

Vaccine research involving people with HIV mostly looks good so far, but some individuals are at risk for poorer response, including those who are not benefiting from antiretroviral treatment.

“Vaccines remain the most important intervention for preventing morbidity and mortality from COVID-19, including among people living with HIV,” says Matthew Spinelli, MD, of the University of California at San Francisco. “The limited data available suggest that people with higher CD4 counts have robust immune responses to COVID-19 vaccines, but there is some concern that people with lower CD4 counts or with unsuppressed viral load could have diminished responses.”

Vaccine Response in People With HIV

A majority of people with HIV produce an adequate natural immune response against SARS-CoV-2, the coronavirus that causes COVID-19. A small study presented at this summer’s International AIDS Society Conference on HIV Science showed that 73% of HIV-positive people on antiretroviral

therapy who had recovered from COVID-19 had detectable SARS-CoV-2 antibodies, compared with 94% of people who are HIV negative.

But current antibody levels don't tell the whole story. Antibodies normally decline after infection or vaccination, but memory B cells are left behind to produce more if the virus is encountered again; T cells also play a role. In this study, all HIV-positive people had memory B cells and both groups had similar levels of virus-fighting T cells.

The ability to mount a natural immune response bodes well for a good vaccine response, and this is indeed what studies have generally seen.

Advocates fought to get people with HIV included in clinical trials of the vaccines, but the numbers were small and limited to those with good immune function. The pivotal trials of the Pfizer-BioNTech (BNT162b2, or Comirnaty) and Moderna (mRNA-1273, or Spikevax) vaccines included 196 and 179 HIV-positive people, respectively, among their tens of thousands of participants. No safety concerns were reported for people with HIV, but there were too few of them to draw conclusions about effectiveness.

More recent studies have shed more light on vaccine safety and efficacy in this population.

First, subsequent studies have shown that COVID-19 vaccines are safe for people with HIV. Side effects are similar to those of HIV-negative people, mostly temporary soreness at the injection site and mild to moderate flu-like symptoms. The Pfizer-BioNTech, Moderna and Johnson & Johnson vaccines do not contain live virus, so they do not pose a risk to immunocompromised people.

Turning to vaccine effectiveness, John Mellors, MD, of the University of Pittsburgh School of Medicine, and colleagues analyzed vaccine response in 107 healthy health care workers and 489 immunocompromised individuals, all fully vaccinated with one of the three authorized vaccines. While only 37% of organ transplant recipients and 55% of blood cancer patients produced antibodies against SARS-CoV-2, 95% of people with well-controlled HIV did so—similar to the 98% response rate for healthy participants.

Two small studies by researchers at Johns Hopkins University School of Medicine looked at responses in people with HIV who received the Pfizer-BioNTech or Moderna messenger RNA (mRNA) vaccines. Almost all of the 26 combined participants had an undetectable or very low viral load and a CD4 count well above 200. After the second dose, antibody levels and T-cell responses were comparable to those of an HIV-negative control group.

In a larger study, Galia Rahav, MD, of Sheba Medical Center in Tel Aviv, and colleagues compared vaccine response in 143 HIV-positive people on antiretroviral treatment and 400 HIV-negative health care staff. Most had an undetectable viral load, and the average CD4 count was around 700. Here, 98% of people with HIV produced antibodies after two doses of the Pfizer-BioNTech vaccine, and antibody levels were similar in HIV-positive and HIV-negative people. The four people with HIV who did not respond were older and had other underlying health conditions.

There has been less research on the Johnson & Johnson vaccine, but the pivotal clinical trials included more than 1,200 people with HIV. Among them, there were five cases of COVID-19 in the vaccine group and five in the placebo group, but these numbers were too small to draw conclusions about effectiveness.

Risk Factors for Poor Response

Experience with vaccines for other diseases shows that some people with HIV, including older people and those with a low CD4 count, do not have as strong or as durable a response as HIV-negative people, and this is true for COVID-19 vaccines as well.

"As is the case with some other common vaccines, people with CD4 counts below 200 and those whose virus is not controlled may not respond as robustly to vaccination against COVID," Thompson explains.

Spinelli and colleagues analyzed stored samples from 100 HIV-positive adults at the Ward 86 HIV clinic at Zuckerberg San Francisco General Hospital and 100 HIV-negative patients receiving care for other chronic conditions who got two doses of the Pfizer-BioNTech or Moderna vaccine. In the HIV-positive group, the median CD4 count was 511 and five people had a detectable viral load.

As reported at IDWeek 2021, people with HIV were more than twice as likely to have a poor vaccine response: 12% did not produce antibodies, compared with 5% of HIV-negative people. What's more, antibody levels were 43% lower in the HIV-positive group, and their antibodies were less able to neutralize SARS-CoV-2. People with detectable HIV had fewer antibodies, and each 100-cell increase in CD4 count was associated with a 28% rise in antibody levels. All seven people with a CD4 count below 200 were nonresponders.

In another study, presented at the 2021 European AIDS Conference, Andrea Antinori, MD, of the National Institute for Infectious Diseases in Rome, and colleagues compared immune responses to the mRNA vaccines in 32 HIV-positive people with severe immune deficiency (CD4 count below 200), 56 with moderate immune deficiency (CD4 count between 200 and 500) and 78 with a normal CD4 count (above 500). All were on antiretroviral therapy. A month after the second dose, five people—four of whom had fewer than 250 CD4 cells—had no detectable SARS-CoV-2 antibodies. Antibody levels, neutralization responses and T-cell responses were substantially lower in people with a CD4 count below 200.

Finally, Zabrina Brumme, PhD, of Simon Fraser University, and colleagues looked at vaccine response in 100 HIV-positive people in Vancouver, all of whom were on antiretroviral treatment with an undetectable viral load; the median CD4 count was 710. People with HIV had somewhat lower antibody levels and neutralization responses than an HIV-negative control group after their first dose, but they mostly caught up after the second shot. In fact, after controlling for other factors, HIV itself was not associated with weaker vaccine response, nor was current or lowest-ever CD4 count (though only a couple of people had a count below 250). However, older people and those with more underlying health conditions had less robust responses.

Advice for People Living With HIV

U.S. health officials now recommend that all adults and many children should get COVID-19 vaccines, but this is even more important for people with HIV. And it's essential to get both doses.

Studies showing poor vaccine response among people with a detectable viral load or a low CD4 count are a concern, given that around a third of people living with HIV in the United States are not in care, and about 40% have not achieved viral suppression. What's more, many are older and have other chronic health conditions.

For HIV-positive people who are not on treatment, starting antiretroviral therapy is a key step toward protection against COVID-19 and better overall health. Those who still have a detectable viral load or a low CD4 count while on treatment should talk with their doctor about optimizing their regimen.

"Starting HIV treatment is the most important way to boost vaccine responses, suppress HIV and prevent HIV transmission," Thompson emphasizes.

For those who don't have adequate CD4 recovery despite treatment, COVID-19 pre-exposure prophylaxis (PrEP) may help. Monoclonal antibodies and antiviral pills, such as molnupiravir and Paxlovid, when taken during the early stage of COVID-19, can prevent severe illness. Researchers are now testing whether monoclonal antibodies—and potentially oral antivirals—can be used even earlier as periodic PrEP for immunocompromised people.

"There are likely millions of immunocompromised people, including some with HIV, who cannot mount an immune response to the vaccines," says Dorry Segev, MD, PhD, of Johns Hopkins University. "Pre-exposure prophylaxis with monoclonal antibodies could be the miracle they have been waiting for."

Even people who respond well to the vaccines can still get breakthrough infections, and some of them will develop severe illness or long COVID—though the risk is much lower compared with unvaccinated people.

Now that a majority of Americans have received their initial vaccines, attention has turned to boosters in an effort to reduce that risk even further as well as to curb transmission.

In August 2021, the Food and Drug Administration (FDA) and the Centers for Disease Control and Prevention (CDC) recommended an additional dose of the Pfizer-BioNTech or Moderna vaccine for moderately to severely immunocompromised people, including those with advanced or untreated HIV. (For such individuals, the extra shot is considered part of the initial series needed to achieve full protection, not a booster.)

Patients at Spinelli's HIV clinic are now receiving third doses, and his team will evaluate responses after the additional shot. "Given higher risk of severe disease, I think people living with HIV should be prioritized for vaccination and, when available locally, for boosters," he says. "There are data

showing that boosters for other immunocompromised populations can boost responses and reverse antibody nonresponse."

The FDA and CDC later went further, recommending boosters for all Pfizer-BioNTech and Moderna recipients six months after their last dose and for Johnson & Johnson recipients two months after their initial dose. Immunocompromised people who received an additional dose can also receive a booster six months later, for a total of four shots.

While this is good news for residents of the United States, many people in low- and middle-income countries still do not have access to first vaccines (see "Vaccine Equity" sidebar). For countries where vaccines are in short supply, medical experts and advocates urge that people living with HIV should be among those prioritized for vaccination.

"Advocates should be insisting on equitable and convenient access to vaccines for all HIV-positive people, and people with HIV should feel confident about rolling up their sleeves to get the jabs," says Thompson. "We have two pandemics to fight now, but at least we have effective vaccines for one of them."
