75% of People With HIV Show Good Immune Response to COVID-19 Virus

Response to natural SARS-CoV-2 infection suggests HIV-positive people can also respond well to COVID-19 vaccines.

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HIV-positive people on antiretroviral treatment showed evidence of broad immune responses against SARS-CoV-2, the virus that causes COVID-19, offering hope that they can also respond well to vaccines, according to studies presented at the recent 11th International AIDS Society Conference on HIV Science (IAS 2021).

Immune suppression is linked to poor COVID-19 outcomes, but studies have yielded conflicting answers about whether people living with HIV are at greater risk for severe COVID-19 and death. It is also unclear how well HIV-positive people respond to natural infection with SARS-CoV-2, and data about the effectiveness of COVID-19 in this population are scarce.

Antibody and Cellular Responses

Aiming to address the second question, Juan Tiraboschi, PhD, of Bellvitge University Hospital in Spain, and colleagues assessed immune responses in people with and without HIV who recovered from COVID-19. The researchers measured antibody responses (humoral immunity) and B-cell and T-cell responses (cellular immunity). Both components of the immune system play an important role in fighting the coronavirus.

The analysis included 11 HIV-positive people with a median age was 52; all were on antiretroviral treatment. Prior to COVID-19 diagnosis, their latest CD4 T-cell counts ranged from nearly 300 to 1000, with seven having more than 600 cells. However, five had a low nadir (lowest-ever) level, indicating substantial immune system damage in the past. Five had mild COVID-19 and six had moderate to severe illness. The researchers also included 39 HIV-negative people, 20 with mild and 19 with moderate to severe COVID-19.

Looking at immune responses three months after SARS-CoV-2 infection, the researchers found that nearly three-quarters (73%) of the HIV-positive people had detectable SARS-CoV-2 IgG antibodies, compared with 94% of the HIV-negative people. Everyone who had severe COVID-19 in both groups had antibodies, but 60% of the HIV-positive people with mild illness did not. Six months after infection, the result was the same in the HIV-positive group, but a few of the HIV-negative people no longer had detectable antibodies.

While antibody levels naturally wane over time, memory B cells are left behind that can make new ones if the same invader appears again. At three months post-infection, all the HIV-positive people had memory B cells capable of producing antibodies against the SARS-CoV-2 spike protein—including those without detectable IgG antibodies. However, one person in this group lost memory B cells by six months.

HIV-positive people and HIV-negative people had similar levels of T cells that produce interferon-gamma, interleukin-2 or both (chemical messengers that activate immune cells) at three months. HIV-negative people with severe COVID-19 had the highest T-cell immune responses at six months.

These findings suggest that HIV-positive and HIV-negative people develop "comparable natural immunization" after recovery from COVID-19, the researchers concluded. They added that there appears to be a correlation between more severe COVID-19 and the strength of both humoral immunity and cellular immunity at six months.

SARS-CoV-2 Immunity

In a second study, Maria Laura Polo, PhD, of Instituto INBIRS in Buenos Aires, and colleagues also evaluated SARS-CoV-2 immunity in people who had recovered from COVID-19.

They analyzed blood samples donated to the Argentinean Biobank of Infectious Diseases from 21 HIV-positive people on antiretroviral treatment with an undetectable viral load and 21 HIV-negative people who were diagnosed with mild to moderate COVID-19. The median ages of the two groups were 47 and 41, respectively. The HIV-positive group had a median CD4 count of 554 and a median CD8 count of 605.

Polo's team measured SARS-CoV-2 IgG antibody levels and how well they worked against the original (wild-type) coronavirus strain. They also measured the number of T cells, B cells and natural killer cells and assessed SARS-CoV-2-pecific T-cell responses.

Consistent with the previous study, the researchers found that 75% of HIV-positive and 85% of HIV-negative people had detectable SARS-CoV-2 antibodies; levels did not differ significantly between the two groups. In the HIV-positive group, antibody neutralization capacity was correlated with IgG levels and CD4 and CD8 counts. There was no significant difference in the number of B cells, although HIV-positive people had fewer antibody-producing cells.

All the donors had evidence of cellular immunity against SARS-CoV-2, though responses in the HIV-positive group were weaker and less broad. Both groups generally had a similar numbers and types of CD4 and CD8 T-cells, although HIV-positive people had a higher proportion of T-follicular helper cells (which help B cells produce antibodies). The two groups showed some differences in functional markers on immune cells, with HIV-positive people having higher expression of PD-1 (a marker of T-cell exhaustion) on CD4 cells, HLA-DR (a marker of T-cell activation) on CD8 cells and several different markers on natural killer cells.

“Although people living with HIV showed an immune profile with enhanced activation and exhaustion, severity of COVID-19 was not exacerbated,” the researchers concluded. HIV-positive people “could elicit SARS-CoV-2-specific cellular responses,” but these were lower than those of HIV-negative individuals.

In the HIV-positive group, a higher CD4 count emerged as a key factor associated with better antibody responses and higher neutralization capacity, leading the researchers to suggest that antiretroviral treatment not only controls HIV but also improves the ability to control other infections.

Implications for Vaccine Response

Session moderator Marcus Buggert, PhD, of the Karolinska Institute in Stockholm asked Polo whether her findings have implications for COVID vaccine response among people with HIV.

“From what we saw, we think that people living with HIV will be able to elicit robust responses to vaccination,” she said. Her team is now studying vaccine response in HIV-positive and HIV-negative people using the Russian Sputnik vaccine, which is most widely available in Argentina.

Buggert noted that he is seeing the same thing, suggesting that most people with HIV seem to respond fine compared with immunocompromised people such as organ transplant recipients, and that those with higher CD4 counts appear to respond a bit better.

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