Man Who Got HIV Days Before Starting PrEP Spent 7 Months With No Viral Rebound

He started HIV treatment immediately, and after sensitive tests showed near-complete loss of virus, he stopped after 34 months.

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A man who was diagnosed with HIV only days after starting Truvada (tenofovir disoproxil fumarate/emtricitabine) as pre-exposure prophylaxis (PrEP) and was immediately put on a full HIV treatment regimen ultimately spent seven months off antiretrovirals (ARVs) before his viral load rebounded. While he was on ARVs, ultrasensitive tests showed a near-complete or complete loss of detectable virus.

This case study was presented at the 9th International AIDS Society Conference on HIV Science in Paris (IAS 2017). The first report of this man's case was presented at the 2014 Conference on Retroviruses and Opportunistic Infections (CROI) in Boston.

While the trajectory of this man's experience with HIV proved disappointing in the end, scientists have much to learn from these rare cases of posttreatment control of HIV (otherwise known as viral remission). In particular, researchers are looking at how the apparent size of a very small viral reservoir—the infected cells that remain under the radar of standard ARV treatment—may help predict the length of such a viral remission.

The viral reservoir is composed at least in part by long-lived immune cells that rarely begin replicating again, sometimes with intervals that span years. So even if the viral reservoir is all but eliminated—or prevented by early HIV treatment—such cells may wake up at any time and possibly successfully repopulate the body with virus should an individual stop taking ARVs.

The man in question was enrolled in the PrEP Demo Project, which included men who have sex with men (MSM) at high risk for HIV. He tested negative for the virus through pooled RNA tests, a fourth-generation enzyme immunosorbent assay (EIA) and rapid antibody tests conducted on blood samples drawn 13 and 21 days before he started taking daily Truvada for prevention.

The blood sample drawn the day he started PrEP ultimately revealed that he had an HIV viral load of 220 at that point. The antibody tests conducted on that sample were negative, indicating he

had a very recent infection. The researchers estimated he contracted HIV five days before starting PrEP.

Ultimately, the man took Truvada as PrEP for seven days. Then, on the eighth day, after the investigators had finally diagnosed him with the virus (it took some time for all the tests to come back), he was put on a conventional HIV treatment regimen of Prezista (darunavir), Norvir (ritonavir) and Truvada. (Truvada alone, which contains two ARVs, is insufficient to treat HIV; three or more medications are required to fully suppress the virus.)

Seven days after he started PrEP, the man's viral load was 120; it fell below 40 (undetectable by standard viral load tests) by 22 days after starting PrEP, when he was on the full HIV treatment regimen. Thirty-two days after his estimated day of infection, a test showed he had low-level cellular HIV RNA, at 3.2 copies per million CD4 cells.

The researchers followed the man for the next two years. They could detect no HIV in his body, even after massive sampling from his ileum (a portion of the small intestine), rectum, lymph nodes, bone marrow, cerebral spinal fluid, plasma and subsets of his CD4 cells.

The investigators went so far as to study 530 million of the man's CD4 cells in a humanized mouse model—mice genetically engineered to have human immune systems. One of the 10 mice given the man's CD4 cells experienced a very low viral load of 201 after 5.5 weeks.

After 34 months on treatment, the researchers took the man off his ARVs to see whether he would enter an official state of viral remission. Indeed, he maintained an undetectable viral load for 7.4 months without treatment for the virus. His infection then rebounded with a viral load of 36 that spiked to 59,805 six days later. He was promptly put back on HIV treatment.

Genetic sequencing showed that the virus seen in his viral rebound was identical to that found when he was in the very early stage of infection, helping to rule out the possibility that he had been reinfected.

The investigators conducted mathematical modeling that predicted that the man had a reservoir of 200 cells before they took him off ARVs and that only 1 percent of individuals with a similarly sized reservoir may go on to achieve lifelong remission of the virus without HIV treatment.
