$14.6M Grant to Explore a Therapy to Control HIV Without Meds

Researchers hope to combine gene editing with a less toxic stem cell transplant. Here's how findings may apply to cancer and other illnesses.

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In nearly 40 years of the HIV epidemic, only two people have likely been cured of the virus. Both scenarios resulted from stem cell transplants needed to fight blood cancers such as leukemia. Inspired by these two cases, a team of scientists is studying a multipronged way to potentially control HIV without medication. It involves two different genetic alterations of immune cells and with a safer method of stem cell transplants, also referred to as bone marrow transplants, a procedure that is generally toxic and dangerous.

The research is being funded by a five-year $14.6 million grant from the National Institutes of Health. The scientists coleading the preclinical studies are Paula Cannon, PhD, a distinguished professor of molecular microbiology and immunology at the Keck School of Medicine of the University of Southern California, and Hans-Peter Kiem, MD, PhD, who directs the stem cell and gene therapy program at the Fred Hutchinson Cancer Research Center, also known as Fred Hutch. According to a Keck School of Medicine press release, the two other main partners are David Scadden, MD, a bone marrow transplant specialist and professor at Harvard University and the Harvard Stem Cell Institute, and the biotechnology company Magenta Therapeutics.

In the HIV cure scenarios—involving the so-called Berlin and London patients—both men received stem cell transplants from donors with a natural genetic mutation that made them resistant to HIV. Specifically, their genes resulted in immune cells that lack CCR5 receptors on their surface (HIV latches onto these receptors to infect cells). Unfortunately, this method isn't viable for the nearly 38 million people worldwide living with HIV. Not only is it expensive, toxic and risky—it involves wiping out the patient's immune system and replacing it with the new immune cells—but it also requires matched donors who are CCR5 negative. According to the press release, about 1% of the population have this mutation.

With funding from this new grant, researchers hope to overcome these challenges in several ways. First, Cannon has already developed a gene-editing method to remove the CCR5 receptors from a patient's own stem cells. She now hopes to further genetically engineer stem cells so they release antibodies that block HIV.

“Our engineered cells will be good neighbors,” Cannon said in the press release. “They secrete these protective molecules so that other cells, even if they aren’t engineered to be CCR5 negative, have some chance of being protected.”

Fred Hutch’s Kiem will use CAR-T therapy—a new method of genetically modifying immune cells that is emerging out of cancer research—with the goal of creating T cells that attack HIV-infected cells.

In addition, other scientists involved in the federal grant aim to develop less toxic methods of bone marrow transplantation—for example, by reducing the amount of chemotherapy required and speeding up the process of creating the new immune system.

The research finding could translate to other illnesses, such as cancer, sickle cell anemia and autoimmune disorders.

“A home run would be that we completely cure people of HIV,” Cannon said. “What I’d be fine with is the idea that somebody no longer needs to take anti-HIV drugs every day because their immune system is keeping the virus under control so that it no longer causes health problems and, importantly, they can’t transmit it to anybody else.”

For the latest on the cure cases, see “Famed London Man ‘Probably’ Cured of HIV” from earlier this year. And in related news, see “$14M Federal Grant to Research CAR-T Gene Therapy to Cure HIV.”
