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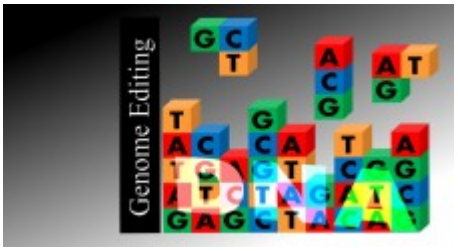
An Advance in Cutting HIV Genome from Infected T-Cells

By Lila Abassi — March 22, 2016



Gene editing via Shutterstock [1]

Editing genomes has reached new heights ever since the introduction of the CRISPR/Cas9 [2] gene editing technique. This method provides scientists the ability to very accurately cut and paste target areas of DNA.

Utilizing CRISPR/Cas9, scientists have been able to remove the entire genome of HIV-1, which is the most prominent type of HIV infection, from human CD4+ T-cells – the immune cells targeted by the virus.

In the Nature journal, *Scientific Reports* [3], researchers at Temple University have been able to successfully splice out the whole HIV-1 genome from CD4+ T lymphocytes. Further evaluations revealed there were no other deleterious or off-target consequences – the host genome was not compromised. Not only that, but the cells that had the HIV genome eradicated were conferred protection against new infection with HIV-1.

Analysis of cultured CD4+ T-cells obtained from individuals with HIV-1 infection revealed there was significant reduction in replication of HIV-1 with subsequent reduction of the viral load – a clinical measure of the patient's health status and level of infectivity.

"These findings are important on multiple levels," stated Kamel Khalili [4], Ph.D, Laura H. Carnell Professor and Chair of the Department of Neuroscience, Director of the Center for Neurovirology, and Director of the Comprehensive NeuroAIDS Center at the Lewis Katz School of Medicine at Temple University (LKSOM).

"They demonstrate the effectiveness of our gene editing system in eliminating HIV from the DNA of CD4 T-cells and by introducing mutations into the viral genome, permanently inactivating its replication," said Dr. Khalili. "Further, they show that the system can protect cells from reinfection and that the technology is safe for the cells, with no toxic effects.

"These experiments had not been performed previously to this extent," he continued. "But the questions they address are critical, and the results allow us to move ahead with this technology."

This research paves the way for future therapeutic interventions with the goal of curing AIDS.

Arguably, HIV treatment has come a long way since the virus was first identified in 1981. Antiretroviral therapy, the advent of pre-exposure prophylaxis (to prevent new infections), and other improved drug therapies, has enabled individuals to anticipate living long, healthy lives so long as they remain compliant with their medications. Once compliance dips, the virus can rear its ugly head and the disease can rapidly rebound because despite being able to achieve low viral loads, there is no cure for HIV. The infection is persistent and lifelong.

The research done by Dr. Khalili holds significant promise and integrates precision gene editing technology – and we will be watching closely to see how this line of research develops.

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