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Researchers demonstrate that stem cells can be engineered to kill HIV

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(PhysOrg.com) -- UCLA AIDS Institute researchers have for the first time demonstrated that human blood stem cells can be engineered to target and kill HIV-infected cells.

Researchers from the UCLA AIDS Institute and colleagues have for the first time demonstrated that human blood stem cells can be engineered into cells that can target and kill HIV-infected cells — a process that potentially could be used against a range of chronic viral diseases.

The study, published Dec. 7 in the-peer reviewed online journal PLoS ONE, provides proof-of-principle — that is, a demonstration of feasibility — that human stem cells can be engineered into the equivalent of a genetic vaccine.

"We have demonstrated in this proof-of-principle study that this type of approach can be used to engineer the human immune system, particularly the T-cell response, to specifically target HIV-infected cells," said lead investigator Scott G. Kitchen, assistant professor of medicine in the division of hematology and oncology at the David Geffen School of Medicine at UCLA and a member of the UCLA AIDS Institute. "These studies lay the foundation for further therapeutic development that involves restoring damaged or defective immune responses toward a variety of viruses that cause chronic disease, or even different types of tumors."

Taking CD8 cytotoxic T lymphocytes — the "killer" T cells that help

fight infection — from an HIV-infected individual, the researchers identified the molecule known as the T-cell receptor, which guides the T cell in recognizing and killing HIV-infected cells. These cells, while able to destroy HIV-infected cells, do not exist in enough quantities to clear the virus from the body. So the researchers cloned the receptor and genetically engineered human blood stem cells, then placed the stem cells into human thymus tissue that had been implanted in mice, allowing them to study the reaction in a living organism.

The engineered stem cells developed into a large population of mature, multifunctional HIV-specific CD8 cells that could specifically target cells containing HIV proteins. The researchers also found that HIV-specific T-cell receptors have to be matched to an individual in much the same way that an organ is matched to a transplant patient.

The next step is to test this strategy in a more advanced model to determine if it would work in the human body, said co-author Jerome A. Zack, UCLA professor of medicine in the division of hematology and oncology and associate director of the UCLA AIDS Institute. The researchers also hope to expand the range of viruses against which this approach could be used.

But the results of the study suggest that this strategy could be an effective weapon in the fight against AIDS and other viral diseases.

"This approach could be used to combat a variety of chronic viral diseases," said Zack, who is also a professor of microbiology, immunology and molecular genetics. "It's like a genetic vaccine."

Provided by University of California Los Angeles (news : web)