How to rescue the immune system: Study could lead to novel therapy for cancer

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In a study published in *Nature Medicine,* Loyola researchers report on a promising new technique that potentially could turn immune system killer T cells into more effective weapons against infections and possibly cancer.

The technique involves delivering DNA into the immune system's instructor cells. The DNA directs these cells to overproduce a specific protein that jumpstarts important killer T cells. These killer cells are typically repressed in patients who have HIV or cancer, said José A. Guevara-Patino, MD, PhD, senior author of the study. Guevara is an Associate Professor in the Oncology Institute of Loyola University Chicago Stritch School of Medicine.

Guevara and colleagues reported their technique proved effective in jumpstarting defective immune systems in immuno-compromised mice and in human killer T cells taken from people with HIV.

Guevara said a clinical trial in cancer patients could begin in about three years.

The study involved killer cells, known as CD8 T cells, and their instructor cells, known as antigen-presenting cells. The instructor cells instruct CD8 T cells to become killer T cells to kill infected cells or cancer cells -- and to remain vigilant if they reencounter pathogens or if the cancer comes back.

In addition to getting instructions from the antigen-presenting cells, CD8 T cells need assistance from helper T cells to become effective killers. Without this assistance, the killer T cells can't do their job.

In patients who have HIV, the virus destroys helper T cells. In cancer patients, helper T cells also are affected. Among a tumor's insidious properties is its ability to prevent killer T cells from attacking tumors. It does this by putting helper T cells into a suppressed stage, limiting their ability to assist CD8 T cells, said Andrew Zloza, MD, PhD, one of the leading authors of the study.

In the study, snippets of DNA were delivered into skin instructor cells by a device known as a gene gun. The DNA directed the instructor cells to produce specific proteins, which act like molecular keys. When CD8 T cells interact with the instructor cells, the keys unlock the CD8 T cells' killer properties -- jumpstarting them to go out and kill pathogens and cancer cells.

With the use of this technique, the killer T cells would not need the assistance of helper T cells. So even if a tumor were to put the helper T cells in a suppressive cage, the killer T cells would still be able to go out and kill cancer cells. Researchers expect that future studies using the technique will make it applicable to many diseases, including cancer.

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