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Scientists use virus to kill cancer cells while leaving normal cells intact

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(PhysOrg.com) -- A virus that in nature infects only rabbits could become a cancer-fighting tool for humans. Myxoma virus kills cancerous blood-precursor cells in human bone marrow while sparing normal blood stem cells, a multidisciplinary team at the University of Florida College of Medicine has found. The findings are now online and will appear in an upcoming issue of the journal *Leukemia*.

The discovery could help make more cancer patients eligible for bone marrow self-transplant therapy and reduce disease relapse rates after transplantation.

“This is a new strategy to remove cancer cells before the transplant,” said virologist Grant McFadden, senior author of the paper and a member of the UF Genetics Institute. “This is the first time anyone has shown in a living animal that a virus can distinguish normal bone marrow stem cells from cancerous stem cells.”

The major therapeutic applications will likely be for blood cancers such as leukemia, lymphoma and bone marrow cancers, the researchers say.

In mouse studies, myxoma virus was used to purge cancerous cells from leukemia patient bone marrow samples before they were infused into the test animals. The technique was effective against an aggressive form of leukemia that is resistant to conventional chemotherapy.

Microorganisms have been used to fight cancer before. More than 100

years ago, physicians treating patients who had bone and head and neck cancers used mixtures of bacteria to jumpstart the immune system, which also happened to attack the cancer. While the approach helped some people it sometimes also caused harm.

Today, patients who have certain types of cancer such as acute myelogenous leukemia are usually treated with using high doses of chemotherapy. But that can destroy the patient's own immune system unless he or she receives a transplant of blood stem cells, which can be from the patient's own marrow samples or from a donor.

Although reinfusion of a patient's own bone marrow stem cells is generally safer in the short run, those patients are at high risk of dying from return of disease because of leukemia contaminating the infused bone marrow.

"That's one of the major frustrations, so we're looking for ways to clean these stem cells before putting them back into patients," said Dr. Christopher R. Cogle, an assistant professor in the division of hematology and oncology and a leader of the research team.

Previous methods to remove contaminating cancer cells from bone marrow have resulted in loss or damage of normal blood-forming stem cells.

The UF team's work demonstrates that a live virus can be used to target diseased cells and separate them from normal cells in a gentler way than currently used.

"They have shown that you can take tumor-bearing marrow and purge the leukemia cells while leaving the normal cells unscathed," said John C. Bell, a professor of medicine, biochemistry, microbiology and immunology at the University of Ottawa, who is not affiliated with the

study. “This could be hugely important because transplanting is one of the few ways we can cure cancer patients.”

When the researchers mixed healthy human stem cells with myxoma virus they did not become infected, and their development potential was not stunted. On the other hand, most of the leukemia cells that were subjected to the same treatment became infected and their growth and spread was dramatically restricted.

The virus was able to eliminate the cancer from 90 percent of the test mice, and was shown to be safe when it did not infect even animals whose immune systems were severely compromised.

“This is a fascinating discovery because it melds together two disciplines to show a new vulnerability of cancer,” Cogle said. “Our ultimate goal with this is to use nature to fight nature.”

It is possible that re-infusing patients with marrow in which leukemia cells were killed by viruses might vaccinate those patients against the tumor, which becomes detectable by the immune system, researchers said.

The researchers are working to identify the exact manner in which the virus differentiates between cancerous and normal cells. They hypothesize that myxoma might zero in on cells that have high expression of a cancer-related protein called AKT. Also, it could be that while cancer cells are trying to fight off virus infection they produce conditions that stymie their own ability to grow and spread.

Provided by University of Florida (news : web)