Fat kills cancer

3 July 2007

Researchers in Slovakia have been able to derive mesenchymal stem cells from human adipose, or fat, tissue and engineer them into “suicide genes” that seek out and destroy tumors like tiny homing missiles. This gene therapy approach is a novel way to attack small tumor metastases that evade current detection techniques and treatments, the researchers conclude in the July 1 issue of *Cancer Research*, a journal of the American Association for Cancer Research.

“These fat-derived stem cells could be exploited for personalized cell-based therapeutics,” said the study’s lead investigator, Cestmir Altaner, Ph.D., D.Sc., an associate professor in the Cancer Research Institute of the Slovak Academy of Sciences in Bratislava. “Nearly everyone has some fat tissue they can spare, and this tissue could be a source of cells for cancer treatment that can be adapted into specific vehicles for drug transport.”

Mesenchymal stem cells help repair damaged tissue and organs by renewing injured cells. They are also found in the mass of normal cells that mix with cancer cells to make up a solid tumor. Researchers believe mesenchymal stem cells “see” a tumor as a damaged organ and migrate to it, and so might be utilized as a “vehicle” for treatment that can find both primary tumors and small metastases. These stem cells also have some plasticity, which means they can be converted by the micro environment of a given tissue into specialized cells, Altaner says.

After extracting the stem cells from human fat tissue the researchers worked to find a less toxic way to treat colon cancer than the standard-of-care chemotherapy agent, 5-fluorouracil (5-FU), which can produce toxic side effects in normal cells. They expanded the number of mesenchymal stem cells in the laboratory and then used a retrovirus vector to insert the gene cytosine deaminase into the cell. This gene can convert a less toxic drug, 5-fluorocytosine (5-FC), to 5-FU inside the stem cells, and the chemotherapy can then seep out into the tumor, producing a lethal by-stander effect.

In nude mice – animals with an inhibited immune system – engrafted with human colon cancer, the researchers first injected the engineered mesenchymal stem cells, then 5-FC. They found tumor growth was inhibited by up to 68.5 percent in the animals, and none of the mice exhibited any signs of toxic side effects.

However, none of the animals remained tumor-free. “The procedure was quite effective even though we applied the stem cells just once. Obviously, repeated treatment will increase the efficacy, as would using this strategy in combination with other treatments,” Altaner said.

Normal mesenchymal cells can be isolated from various sources, including bone marrow, but the yield is not nearly as great as what the researchers derived from fat tissue. Removal of fat tissue during surgery to remove a tumor would be simple, says Altaner. Liposuction could also be used to isolate mesenchymal stem cells can also be gathered and isolated through liposuction, and the cells frozen in liquid nitrogen for future therapeutic use. Both processes would be easier than taking bone marrow from a patient, Altaner said.

Source: American Association for Cancer Research