Fat droplet nanoparticle delivers tumor suppressor gene to tumor and metastatic cells

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Dr. Esther Chang describes the most recent developments in human trials of the first systemic, non-viral, tumor-targeted, nanoparticle method designed to restore normal gene function to tumor cells while completely bypassing normal tissue April 21 at an American Association of Anatomists (AAA) scientific session at Experimental Biology 2009 in New Orleans.

Dr. Chang, a molecular oncologist, and her colleagues at Georgetown University Medical Center's Lombardi Cancer Center, have developed a nanoparticle - about one thousandth smaller than a printed period -- that can travel through the blood stream. "Decorated" with a tumor-targeting antibody, the nanoparticle is able to locate primary and hidden metastatic tumor cells and deliver its payload: a fully functioning copy of the P53 tumor suppressor gene.

Normal cells have two copies of the functioning P53 gene. The protein produced by the P53 gene is activated to either coordinate the repair process in cells or induce cell suicide. Loss of normal p53 function results in malignant cell growth and has been linked to resistance to radiotherapy and chemotherapy in a number of cancers.

In earlier work using animal models, Dr. Chang's group delivered functional p53 genes to tumor cells and tumor metastases in 16 different types of cancer, including prostate, pancreatic, melanoma, breast cancer and head and neck cancer. The presence of the replacement genes dramatically improved the efficacy of conventional cancer therapy. That

suggests that use of the P53 delivery system eventually would allow physicians to use a lower dose of therapies, achieving the same or enhanced therapeutic results but sharply diminishing the side effects so troublesome in many treatments.

Dr. Chang's nanoparticle delivery system is designed to reduce side effects in another way as well. When the job of reinstating a normal P53 suppressor gene is done, the nanoparticle - essentially a little fat droplet wrapped around the gene - simply melts away, unlike non-biodegradable delivery systems.

Clinical trials are now underway at the Mary Crowley Medical Research Center, affiliated with Baylor University at Dallas, under the direction of clinical trial principal investigator Dr. John Nemunaitis. The trial already has enrolled six patients with various cancers and anticipates a total of 14. Early results are promising, says Dr. Chang. In addition to evaluating the safety issues for which phase 1 trials are designed, investigators are seeing anti-tumor efficacy. Dr. Chang says she is hopeful that the gene therapy will become a first line treatment that will significantly reduce the probability of recurrent tumors.

Source: Federation of American Societies for Experimental Biology (news : web)