Nanoparticles Yield Safer Light-Activated Cancer Therapy

September 27 2007

Photodynamic therapy, in which light activates a chemical known as a photosensitizer, triggering the production of cell-killing reactive oxygen, has proven itself as an effective therapy for a limited number of cancers.

Oncologists have long suspected that photodynamic therapy could find broader use if only there was some way to limit the accumulation of photosensitizer molecules to tumors, sparing healthy tissue from unintended damage. Now, using modified silica nanoparticles, a team of investigators at the State University of New York, Buffalo, has developed a photosensitizer delivery method that has the potential to target tumor cells specifically.

Paras Prasad, Ph.D., principal investigator of one of the National Cancer Institute's Cancer Nanotechnology Platform Partnerships, heads the research effort that is aiming to use nanotechnology to make photodynamic therapy safer and more effective. His group has approached this problem by using porous silica nanoparticles modified in such a way as to form a strong chemical bond between the nanoparticles and the photosensitizer molecules. When exposed to light, the permanently entrapped photosensitizer still produces reactive oxygen molecules that can diffuse out of the nanoparticles through their porous silica shells.

The investigators found, too, that human colon cancer cells readily take up the photosensitizer-loaded nanoparticles. More importantly, shining light on these cells resulted in their death. In contrast, cells that were not

exposed first to these nanoparticles suffered no ill effects from exposure to light. The investigators, who published their results in the journal Nano Letters, note that they are now developing a second-generation nanoparticle-photosensitizer construct that also includes tumor-targeting and imaging molecules.

This work, which was supported by the National Cancer Institute's Alliance for Nanotechnology in Cancer, is detailed in the paper, "Organically modified silica nanoparticles with covalently incorporated photosensitizer for photodynamic therapy of cancer." Investigators from the Roswell Park Cancer Institute also participated in this study.

This paper was published online in advance of print publication. An abstract is available through PubMed.

Source: National Cancer Institute