Nanotechnology in the Fight Against Cancer

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A world-renowned medical researcher discusses the key role that nanotechnology has begun to play in the detection and treatment of cancer in an article that will appear in the March 2010 edition of *Mechanical Engineering* magazine.

Mauro Ferrari, Ph.D., explains how advanced nanotech-based therapeutic agents possess characteristics that can effectively exploit the unique mechanical properties of cancer lesions and treat the various forms of the disease locally.

According to Ferrari, professor and chairman of the Department of Nanomedicine and Biomedical Engineering at The University of Texas Health Science Center, some engineered nano-particles have demonstrated the capability to deliver drugs only to areas affected by disease, in the process protecting healthy cells and reducing debilitating side effects.

An important insight in understanding how to treat cancer, Ferrari says, is that aspects of the disease such as malignancy, metastasis, and angiogenesis (which is the growth of new arteries to feed tumors) are mechanical phenomena pertaining to the motion and transport of blood and cells. Nanotechnology-based therapies currently under experimentation for cancer treatment take advantage of some of these mechanical properties to find new ways to attack tumors.

This constitutes a new field that Ferrari and his medical colleagues refer to as “transport oncophysics.”

Formulations of drugs made from nano-particles have shown the ability to overcome biological barriers -- for example, by leaking through the blood vessels inside a tumor -- to concentrate on localized cancers. Because of this, nanotechnology-based drugs may be used in smaller doses and are less likely to disperse to healthy parts of the body. Ferrari and his team at The University of Texas also have designed nano-particles called Multi-Stage Vectors, which offer great promise in targeting individual cancer cells.

“We are on the brink of a new era in cancer treatment,” asserts Ferrari in the forthcoming article, titled “Infernal Mechanism.”

“The level of specificity that can be achieved through the use of the conceptual model of cancer as a mechanical disease - and through the power of the mechanical engineering design process - will result in greater therapeutic efficacy with reduced side effects,” he concludes.

Mauro Ferrari will speak on Feb. 8 at the First Global Congress on Nano-engineering for Medicine and Biology. The conference, sponsored by ASME, will open on Feb. 7 at the JW Marriott Houston, in Houston, Texas.

Provided by ASME