Scientists Develop Micro Device, Nano-Engineered Materials to Treat Cancer and HIV

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Using nanotechnology, engineering researchers at the University of Missouri-Columbia have developed a small but powerful device capable of enhancing the delivery of drugs to treat life-threatening illnesses.

Classified as an advanced drug delivery system, the state-of-the art device has numerous capabilities for destroying tumors, kidney stones and ulcers, and treating cancer and HIV. Nanotechnology works with microscopic particles that are about one millionth the size of a strand of hair. At one cubic inch in size - comparable to four kernels of popcorn - Mizzou's device, which is now in the testing phase, is far smaller than similar delivery systems that have been designed by other researchers.

The development effort was led by Shubhra Gangopadhyay, an electrical and computer engineering professor in the College of Engineering and head of the University's International Center for Nano/Micro Systems and Nanotechnology.

Similar to other nano/micro-scale devices by Gangopadhyay, this one also operates on a "dual-use" platform, which powers alternative energy and munitions systems for the U.S. military. By incorporating microchip-based technology with nanotechnology, Gangopadhyay fuses both technologies to trigger a reaction resulting in supersonic shockwaves. For medical purposes, those shockwaves, along with nanoparticles, propagate into the body to make infected cells permeable for drug interaction. The

device allows for a non-invasive procedure that utilizes the body's pores as entry points.

Other usages include:

- The dispersing of drug-carrying nanoparticles, referred to as nanosponge, into the body. Such sponges can target specific cells and areas that have been affected by disease.

- The delivery of gold nanoparticles, a florescent material, into the body. By attaching to infected cells, the unique particles can allow doctors to track drug movement and the spread of disease throughout the body.

Gangopadhyay's collaborators are Steve Apperson, a doctoral student; Andrey Bezmelnitsyn and Raj Thiruvengadathan, both post-doctoral research associates in electrical and computer engineering; Dan Tappmeyer, an undergraduate chemical engineering major; and Keshab Gangopadhyay, research professor of electrical and computer engineering. The team of engineers is working with Luis Polo-Parada, assistant professor of pharmacology and physiology, at the Dalton Cardiovascular Research Center for testing.

Apperson said MU's nanoparticles contain no harmful components and aren't hazardous to the body. He said the device will require as many as three more years of testing before it's made available to pharmaceutical companies. Nems/Mems Works, LLC will market the device and various nanoparticles associated with the research. The company is owned by the Gangopadhyays, Apperson and Martin Walker, who is director of administrative services in the college.

Source: University of Missouri