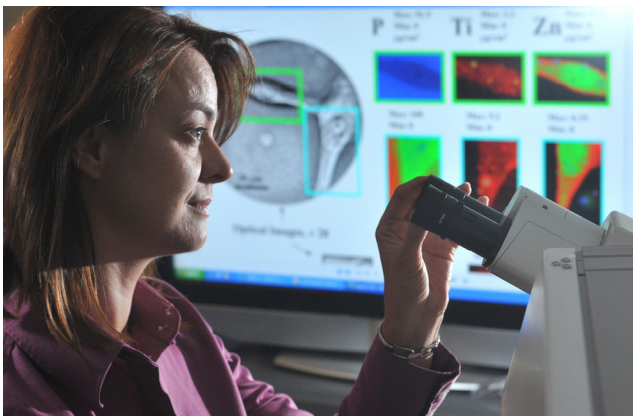
Argonne Scientists Discover Novel Materials Approach to Fighting Cancer

Traditional cancer treatment methods, such as chemotherapy and radiation, negatively affect both cancer cells and normal healthy cells.

The Challenge

Brain cancer is notoriously difficult to treat with standard cancer-fighting methods, so scientists have been looking into nanomaterials as a treatment alternative to traditional medical approaches.

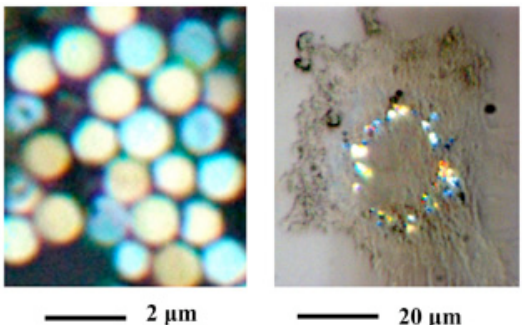


Argonne nanoscientist Elena Rozhkova examines brain cancer cells under a microscope.

The Solution

A team of scientists from Argonne and the University of Chicago Brain Tumor Center have discovered promising new nanomaterials that can destroy cancer cells via magnetomechanical actuation. The technique is based on using gold-plated iron-nickel microdiscs chemically grafted with brain cancer-seeking antibodies.

The discs possess a spin-vortex ground state and sit dormant on the cancer cell until a low frequency, alternating magnetic field is applied and the vortices shift, creating an oscillation. The energy from the oscillation is transferred to the cell and triggers apoptosis, or "cell suicide."



A representative optical microscope image of the gold-plated iron-nickel microdiscs (left). These microdiscs are capable of selectively binding to the surface of glioblastoma cells (shown at right).

The Results

Since the antibodies are attracted only to brain cancer cells, the process leaves surrounding healthy cells unharmed. The microdiscs are an example of a nanomagnetic material and can be used to probe cell mechanics and activate mechanosensitive ion channels, as well as to advance cancer therapies.

But this method is still in the very early research stages. The process requires continued testing and research, including an examination of the method using *in vivo* models.

"The use of nanomaterials for cancer treatment is not a new concept, but the ability to kill the cells without harming surrounding healthy cells has incredible potential," **said Elena Rozhkova, nanoscientist, Argonne National Laboratory.**

For further information: Elena Rozhkova, rozhkova@anl.gov
Valentyn Novosad, novosad@anl.gov

July 2010