Breakthrough technology holds potential for treating brain disorders

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A Florida International University professor and his team this month published news of a scientific breakthrough that could lead to the noninvasive treatment of Parkinson's and other neurodegenerative diseases.

Researchers remotely manipulated the electric waves that naturally exist in the brains of mice, a feat that has far-reaching implications for medicine.

The journal *Nanomedicine* is featuring the paper by Sakhrat Khizroev, a professor with dual appointments in the Herbert Wertheim College of Medicine and the College of Engineering & Computing.

Using a previously reported FIU-patented technology, researchers began by intravenously administering magneto-electric nanoparticles, or MENs, in mice. With a magnet placed over the head of each subject animal, the particles were pulled through the blood-brain barrier, where they "coupled" the externally created magnetic field with the brain's intrinsic electric field. This enabled researchers to wirelessly connect their computers and electronics to neurons deep within the brain.

The researchers then sent signals via computer to the MENs, which responded by modulating (or changing from low to high and back again) the frequency of the brain's naturally occurring electric waves. The resulting pulses created "deep-brain stimulation" that has implications for treating Parkinson's and other disorders. It stands in contrast to the

existing method of deep-brain stimulation, which involves invasive surgery to implant an electrode in the brain and a battery-operated medical device elsewhere in the body.

Worth noting, while the modulation was taking place, researchers had a view of the electrical activity within the brain. This feedback was sent from the MENs to a computer, allowing the researchers to confirm what was taking place.

In a nod to the increasingly personalized nature of medicine, Khizroev believes that MENs could one day be programmed to accomplish any number of medically related procedures to treat various disorders, among them Alzheimer's and autism. When properly targeted, the particles could, for example, be used to repair cells or destroy plaques. Khizroev also believes that MENs could potentially remain in place within the brain for extended periods to release drugs on a set schedule.

"This study is a critical stepping stone to opening a pathway to understanding the brain and treating many neurodenerative disorders," Khizroev says. "With this connection, we could see and repair, when necessary, all the electric circuitry deep in the brain."

More information: "Magnetoelectric 'spin' on stimulating the brain." *Nanomedicine* DOI: 10.2217/nnm.15.52

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