Serotonin levels can be detected and measured through an innovative device called WINCS

7 February 2011

Mayo Clinic researchers have concluded that, through deep brain stimulation, a Wireless Instantaneous Neurotransmitter Concentration System (WINCS) can detect and measure serotonin levels in the brain. The findings suggest that in the future such measurements of serotonin may help establish a therapeutic mechanism of deep brain stimulation for psychiatric disease. This study was published in the September 2010 issue of the *Journal of Neurosurgery.*

Serotonin is a neurotransmitter in the brain that is thought to play a key role in controlling depression, the second most disabling condition in the developed world, with lifetime prevalence in the United States of 17%. Using deep brain stimulation, neurosurgeons can help patients with essential tremor, Parkinson's disease, movement disorders, and now, based on this study, psychiatric disorders.

"In a previous study, in order to better understand the mechanism of deep brain stimulation, we created WINCS, a new device that successfully measured such neurotransmitter levels as dopamine and norepinephrine on a second-by-second basis," said Kendall Lee, neurosurgeon at Mayo Clinic. "In this experiment, we wanted to try to measure serotonin, which is very important in the mechanism of depression and its treatment. This study shows that WINCS can measure serotonin with a technology called fast-scan cyclic voltammetry, which is an electrochemical method of being able to measure serotonin in real time in the living brain," Kendall added.

Researchers collaborated with Mayo Clinic's division of Engineering and Paul Garris, at Illinois State University, who helped design and test the WINCS device. "We were able to take the laboratory method of neurotransmitter detection and create a miniaturised, wireless, computer-controlled device that allowed the detection to occur in real time," says Kevin Bennet, chair, Mayo Clinic's division of Engineering "We took the technique of fast-scan cyclic voltammetry, created real-time control and reporting, and converted it into something that can be used in animals and humans."

"Using this device, we can now do real-time serotonin measurement, so we are hopeful that in the near future we are able to use WINCS to measure serotonin in the human brain," said Lee "What is significant is that if we can measure serotonin, perhaps we can modulate it. This opens the door for even more exciting areas of medicine. By having technology such as WINCS, rather than just diagnosing or measuring neurotransmitters, you can use this as a therapeutic tool to more precisely regulate brain neurotransmitter levels."