



Toronto Western Hospital
University Health Network

NEWS RELEASE

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Lack of “Sonic Hedgehog” brain chemical linked to development of Parkinson’s disease

(Toronto – October 2, 2003) – Decreased amounts of a newly-identified brain chemical called Sonic Hedgehog contribute to symptoms of Parkinson’s disease, report scientists at Toronto Western Hospital. The findings suggest that increasing the amount of Sonic Hedgehog in the brain may be a potential treatment for Parkinson’s disease.

Researchers have known that Sonic Hedgehog – named after the video game – was a protein involved in forming the mammalian brain and body while in the womb. However, as Sonic Hedgehog is also found in the adult brain, its function after birth was never understood.

In a study published in the October 2 issue of *FASEB Journal*, an international scientific journal published by the Federation of American Societies for Experimental Biology, principal investigator Dr. Jonathan Brotchie and his collaborators in France, U.S.A., and U.K. show that Sonic Hedgehog is a neurotransmitter, a chemical crucial for the communication of brain and nerve cells.

The study also shows that Sonic Hedgehog is found in the area of the brain that controls movement, and that it influences activity of the specific part of the brain, called the “subthalamic nucleus”, which is known to be hyperactive in people with Parkinson’s disease. The scientists discovered that the subthalamic nucleus is hyperactive because there are insufficient amounts of Sonic Hedgehog to adequately control its activity.

“The research demonstrates that Sonic Hedgehog plays a surprising role in the brain’s control of body movement,” says Dr. Jonathan Brotchie, senior scientist with Toronto Western Research Institute, the research arm of Toronto Western Hospital. He is the first researcher at Toronto Western Hospital to be supported by the Krembil Scientist Fund, which supports exceptional neuroscience laboratory research.

“More importantly, we have shown that this function of Sonic Hedgehog is reduced in Parkinson’s disease, and that this reduction may be one of the causes of Parkinson’s disease. In fact, we are hopeful this discovery may lead us to a potential treatment for Parkinson’s disease.”

Further research is needed to develop Sonic Hedgehog into a medication, which will likely take years.

To understand the role of Sonic Hedgehog, Dr. Brotchie and his collaborators measured the electrical activity of brain slices from the subthalamic nucleus of adult rats, before and after adding a solution of Sonic Hedgehog. Within minutes of adding Sonic Hedgehog, the amount of electrical activity in the subthalamic nucleus decreased. In looking at an animal model of Parkinson’s disease, they saw that the gene responsible for Sonic Hedgehog was switched off. The scientists expect that these findings will be applicable to humans.

“Our discovery will allow a more focused approach for treating Parkinson’s disease – one that just targets the malfunctioning areas of the brain,” says Dr. Brotchie. “Medications currently used to treat Parkinson’s disease affect neurotransmitters located throughout the brain.”



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Parkinson's disease is a progressive, degenerative disorder of the central nervous system. In Canada, approximately one percent of people over the age of 55 have Parkinson's disease. Symptoms include tremor, slow movement, shuffling, impaired balance and coordination, and fixed facial expression. While the average age of onset is 60, Parkinson's disease can affect people as young as 30 or 40.

As there is no known cure, current treatments focus on symptoms and improving the patient's quality of life. Many medications cause side effects such as dyskinesia – abnormal, involuntary movements. Other treatments include surgery such as deep brain stimulation (DBS) – a surgical treatment pioneered at Toronto Western Hospital, one of few North American centres to offer the treatment – which involves implanting electrodes into the brain to address the electrical activity of the subthalamic nucleus. A recent long-term study indicates that DBS does improve the motor skills of patients with advanced Parkinson's disease.

The study was supported in part by the Medical Research Council, Curis Inc., Biotechnology and Biological Sciences Research Council, the U.K. Parkinson's Disease Society, Centre National de la Recherche Scientifique, and University Victor Segalen-Bordeaux.

Toronto Western Hospital has been serving the health care needs of its culturally diverse community for more than 100 years. Today, the hospital provides highly specialized tertiary care to people from surrounding areas and across Canada. Home to the Krembil Neuroscience Centre, one of the largest combined clinical and research neurological facilities in North America, the hospital also offers a community and population health program and expertise in musculoskeletal health and arthritis. Toronto Western Hospital is one of three hospitals – including Toronto General Hospital and Princess Margaret Hospital – that comprise University Health Network, a teaching hospital of the University of Toronto.

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