Nicotine found to protect against Parkinson's-like brain damage

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New research suggests that nicotine treatment protects against the same type of brain damage that occurs in Parkinson's disease. The research was conducted in laboratory animals treated with MPTP, an agent that produces a gradual loss of brain function characteristic of Parkinson's. Experimental animals receiving chronic administration of nicotine over a period of six months had 25 percent less damage from the MPTP treatment than those not receiving nicotine.

This protective effect may explain the lower incidence of Parkinson's disease among smokers. The results also suggest that nicotine may be useful as a potential therapy in the treatment of early-stage Parkinson's patients.

The five-year study was conducted by researchers at The Parkinson's Institute, an independent, non-profit research institute located in Sunnyvale, California. The study results are published in an on-line early release in the *Journal of Neurochemistry* (doi:10.1111/j.1471-4159.2006.04078.x)

Parkinson's disease is a progressive, neurodegenerative disease caused by the death of small clusters of cells in the midbrain. The gradual loss of these cells results in reduction of a critical transmitter called dopamine, the chemical messenger responsible for normal movement.

"While we would never recommend that people smoke, these results suggest that nicotine promotes the survival of dopamine-producing cells

in animals with no overt Parkinson's symptoms," said David A. Schwartz, M.D., director of the National Institute of Environmental Health Sciences, the federal agency that provided funding for the study. "These findings also have implications for its use in slowing the progression of Parkinson's." Based on these findings, the researchers wondered what compound in cigarette smoke could be causing this effect. "We decided to focus our attention on nicotine because studies have shown that nicotine stimulates the release of dopamine in the brain region that is associated with Parkinson's," said Quik.

To test their theory, the researchers treated experimental animals with MPTP, an agent that selectively destroys the dopamine-producing brain cells. Half of the animals also received a low-dose administration of nicotine over a six-month period. During this time, the nicotine dose was gradually increased to a level typically found in cigarette smoke.

The test results showed that animals receiving only the MPTP suffered a 75 percent loss of function in their dopamine-containing brain cells. When the researchers tested the animals that had received both MPTP and nicotine, the damage in the dopamine cells was only 50 percent. "The results suggested that the nicotine treatment had reduced the cell damage by 25 percent," said Quik.

While there is no immediate explanation for this effect, the researchers believe the nicotine may stimulate the release of naturally occurring proteins called growth factors that play a key role in nerve cell growth and repair. "It is also possible that the nicotine may activate the immune system to protect the cells from MPTP-induced damage," said Quik.

According to Quik, Parkinson's disease symptoms only start to develop when 80 to 90 percent of dopamine in striatal nerve terminals is depleted. "This means that a reduction in terminal damage from 80 to 60 percent can mean the difference between having disease symptoms and

being symptom-free," said Quik.

While treatments currently available for Parkinson's disease are limited to the day to day relief of symptoms, nicotine may someday be used to reduce or even prevent the progression of the disease. "With current symptomatic therapies, the progress of the disease is not halted and, symptoms become worse and more difficult to control," said Quik. "With neuroprotection, a patient could receive treatment that would halt the disease progress and prevent symptoms from getting worse."

Source: The Parkinson's Institute