

What's Hot in Parkinson's Disease?

November 2009

Brain Cells Keep Time Stamps: Implications for Parkinson's Disease Therapies

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Albert Einstein once said, "the only reason for time is so that everything doesn't happen at once." Einstein's comment was both clever and also insightful, however, Dr. Jin, Dr. Fujii, and Dr. Graybiel have uncovered important and relevant evidence about how brain cells actually keep track of that time. It may be surprising for many of you to know that we really didn't have solid evidence on how, or even if, human brain cells possessed "time-stamps." The most recent issue of the *Proceedings of the National Academy of Sciences*, has some important insights on the topic.

The involved research team which had members from Japan, Pennsylvania, and Massachusetts performed a simple but elegant experiment (Anne Graybiel, one member of the team, is from Massachusetts/MIT and is currently a NPF supported scientist who has dedicated her career to uncovering the brain circuitry underlying medical issues such as Parkinson's disease). The team taught monkeys how to perform simple eye movements by taking direction from a computer screen. During eye movements the team recorded thousands of single brain cells (neurons). What they found was astonishing. "The results raise the possibility that the representation of time may reflect an inherent tendency for the brain to represent time as part of ongoing task-specific information processing. If so, neural circuits might build time representations as an infrastructure to use when needed. Such encoding would have major advantages for

neural processing related to learning how to control actions, because all of the elements needed to form on demand new associations between events and precisely timed actions would be available” (1). Thus, they discovered that brain cells indeed create time stamps.

The relevance to Parkinson’s disease is potentially tremendous, as the last several decades of clinical and research experience have revealed that much of the Parkinson disability results from issues in timing (slow and in some cases fast abnormal movements, despite a relatively intact and functioning brain motor system). Therefore, some of the next generation of treatment paradigms (targeting these brain cells) and technological advances (e.g. decoding algorithms) could be directed toward brain cell “time stamps.” The challenge now should go out to our Parkinson’s research community to integrate and leverage this important discovery in their own research.

Reference:

(1) Jin DZ, Fujii N, Graybiel AM. Neural representation of time in cortico-basal ganglia circuits. Proc Natl Acad Sci U S A. 2009 Oct 22.