

New regulator of circadian clock identified

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Daily sleeping and eating patterns are critical to human well-being and health. Now, a new study from Concordia University has demonstrated how the brain chemical dopamine regulates these cycles by altering the activity of the "clock-protein" PER2. Published in the *Journal of Neuroscience*, these findings may have implications for individuals with Parkinson's Disease with disrupted 24-hour rhythms of activity and sleep.

"PER2 is a protein well-known for its role in the regulation of daily or [circadian rhythms](#), this is why it is referred to as a clock protein," says senior author, Shimon Amir, a psychology professor at the Concordia Center for Studies in Behavioral Neurobiology. "Many molecules, such as [stress hormones](#) are known to have an impact on the activity of PER2. Until now, the role of dopamine in regulating circadian rhythms has been unclear. Our findings show that not only is PER2 influenced by dopamine but also that dopamine is necessary for its rhythmic expression in specific [brain regions](#)."

Dopamine and Parkinson's

Parkinson's disease is caused by the degeneration of specific [nerve cells](#), which results in a decrease in dopamine levels in the [brain](#). Dopamine is critical for normal movements and balance and its decreased level results in instability and involuntary movements, the telltale symptoms of Parkinson's.

The findings from this Concordia study may explain the disruptions of

daily behavioral and physiological rhythms that are also frequently reported in Parkinson's.

Rise in dopamine followed by rise in PER2

Amir and his colleagues studied the role of dopamine in rats. Their first steps were to show that PER2 is present in a specific brain area that normally receive dopamine, namely the dorsal striatum, and that it fluctuates daily in this area.

In this same region of the brain the research group demonstrated that a rise of dopamine preceded the rise in PER2 and that removing dopamine from the brain or blocking one of its [receptors](#) resulted in decreased PER2, which, in turn, could be reversed by the administration of a drug that mimics the action of dopamine on this receptor.

"Our findings are consistent with the idea that the rhythm of expression of PER2 depends on the daily activation by dopamine," says first author Suzanne Hood, a doctoral student at Concordia.

More information: "Endogenous Dopamine Regulates the Rhythm of Expression of the Clock Protein PER2 in the Rat Dorsal Striatum via Daily Activation of D2 Dopamine Receptors," www.jneurosci.org/

Provided by Concordia University

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