At dusk and dawn: Scientists pinpoint biological clock's synchronicity

September 30 2014

Scientists have uncovered how pacemaker neurons are synchronized at dusk and dawn in order to maintain the proper functioning of their biological clocks. Their findings, which appear in the journal *PLOS Biology*, enhance our understanding of how sleep-wake cycles are regulated and offer promise for addressing related afflictions.

"We've known for some time that the time-keeping of our biological clocks is a complex enterprise," says New York University's Justin Blau, a professor of biology and neural science and one of the study's co-authors. "But our results offer new details on how clock neurons work together to keep each other in check."

The study also included researchers from the University of Michigan and the University of Houston.

They examined the biological, or circadian, clocks of *Drosophila* fruit flies, which are commonly used for research in this area—earlier studies of "clock genes" in fruit flies allowed the identification of similarly functioning genes in humans.

While scientists have a firm understanding of how biological clocks work within individual cells, it is less clear how individual cells tick in time together. Such an understanding is vital so that an organism has one coherent sense of time.

This dynamic was the focus of the *PLOS Biology* study.

The researchers focused on eight master pacemaker neurons (LNvs) located in the central brain —these neurons set the timing of the daily transitions between sleep and wake in the fly.

Specifically, they examined the signals coming in to these eight LNvs. The researchers found that LNvs need two synchronizing signals: they signal to each other at dawn and receive a signal from a second group of clock neurons at dusk. The LNvs start to desynchronize very quickly in flies lacking either of these synchronizing signals, showing how active and important this process is. And in flies lacking both of these signals, the LNvs show weak clock gene rhythms and disrupted sleep/wake cycles.

The researchers point out their findings shed new light on what occurs at dusk—and the significance of the timing of this signaling.

"Scientists already knew about the signaling at dawn, but we hadn't previously known about the signaling that occurs in the evening," explains Blau. "We can see how delicate this process is–and treatments to desynchronize clocks might even allow us to reset our clocks more quickly to a new time zone, which would be invaluable in jetlag."

Provided by New York University

Citation: At dusk and dawn: Scientists pinpoint biological clock's synchronicity (2014, September 30) retrieved 24 April 2024 from https://phys.org/news/2014-09-dusk-dawn-scientists-biological-clock.html