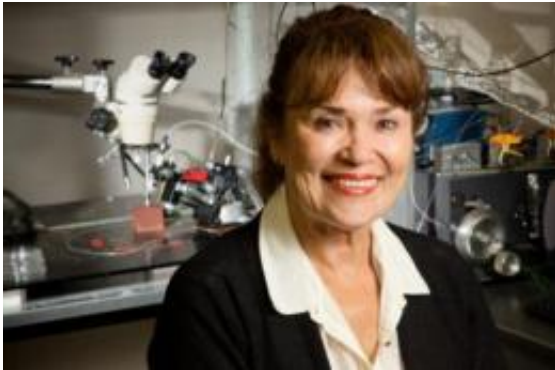


Metabolism in the brain fluctuates with circadian rhythm

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Cell and developmental biology professor Martha Gillette and her colleagues at Illinois discovered that metabolism influences time-keeping in the brain. Credit: L. Brian Stauffer

(Medical Xpress)—The rhythm of life is driven by the cycles of day and night, and most organisms carry in their cells a common, (roughly) 24-hour beat. In animals, this rhythm emerges from a tiny brain structure called the suprachiasmatic nucleus (SCN) in the hypothalamus. Take it out of the brain and keep it alive in a lab dish and this "brain clock" will keep on ticking, ramping up or gearing down production of certain proteins at specific times of the day, day after day.

A new study reveals that the brain clock itself is driven, in part, by metabolism, the production and flow of chemical energy in cells. The researchers focused primarily on a phenomenon known as "redox" in

tissues of the SCN from the brains of rats and mice.

Redox represents the energy changes of [cellular metabolism](#) (usually through the transfer of electrons). When a molecule gains one or more electrons, scientists call it a reduction; when it loses electrons, they say it is oxidized. These [redox reactions](#), the researchers found, oscillate on a 24-hour cycle in the brain clock, and literally open and close channels of communication in [brain cells](#).

The researchers report their findings in the journal [Science](#), which also wrote a [Perspective](#) on the research.

"The language of the brain is electrical; it determines what kind of signals one part of the brain sends to the other cells in its tissue, as well as the other [parts of the brain](#) nearby," said University of Illinois [cell and developmental biology](#) professor [Martha Gillette](#), who led the study. "The fundamental discovery here is that there is an intrinsic oscillation in metabolism in the clock region of the brain that takes place without external intervention. And this change in metabolism determines the excitable state of that part of the brain."

The new findings alter basic assumptions about how the brain works, Gillette said.

"Basically, the idea has always been that metabolism is serving brain function. What we're showing is metabolism is part of [brain function](#)," she said. "Our [study](#) implies that changes in cellular metabolic state could be a cause, rather than a result, of neuronal activity."

More information: The paper, "Circadian Rhythm of Redox State Regulates Excitability in Suprachiasmatic Nucleus Neurons," is available [online](#).

Provided by University of Illinois at Urbana-Champaign

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