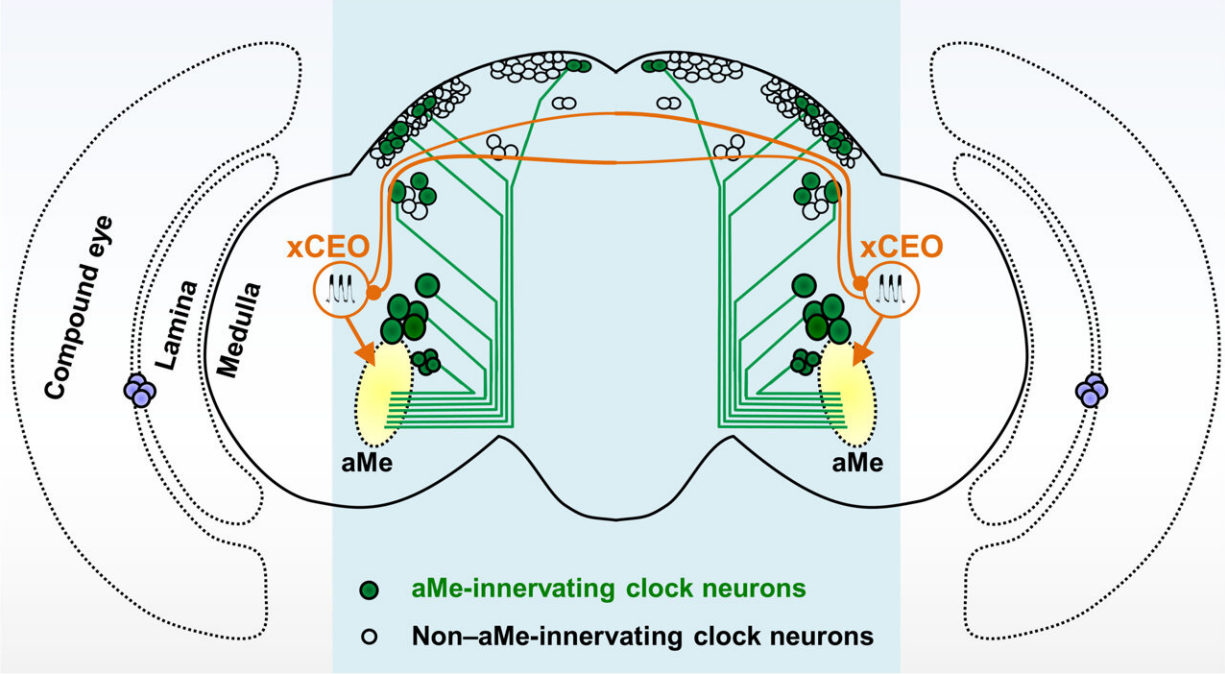
How an extra-clock ultradian brain oscillator sustains circadian timekeeping

September 14 2022



Widespread ultradian oscillation in clock neurons driven by xCEOs. Among the 150 central clock neurons, many subtypes arborize their processes in the aMe and others do not. In each brain hemisphere, there is one set of xCEO neurons. The two sets of xCEO neurons mutually connect with each other via their dorsal commissure, producing synchronized ultradian bursting across the brain. By making monosynaptic connections with circadian clock neurons in the aMe, xCEOs pace synchronized ultradian bursting in most clock neuron subtypes to support free-running circadian locomotor rhythms. Credit: *Science Advances* (2022). DOI: 10.1126/sciadv.abo5506

On September 2, Luo Dong-Gen and his research team from Peking University's School of Life Sciences, McGovern Institute for Brain Research, Center for Quantitative Biology, and Center for Life Sciences jointly published a research paper titled "An extra-clock ultradian brain oscillator sustains circadian timekeeping" in *Science Advances*.

The master circadian clock has long been regarded as self-sufficient in maintaining free-running timekeeping. Yet the breakthrough discovery by Luo Dong-Gen and his team has now challenged this traditional theory.

The team performed multiple-electrode patch-clamp recordings of the Drosophila clock neurons, and discovered that most clock neuron subtypes showed a pattern of synchronous ultradian burst firing. This solely relied on the synaptic inputs from outside the master clock. The synchronous burst firing was found to come from neurons that could oscillate self-autonomously.

These neurons were later named as xCEO (extra-Clock Electrical Oscillator) by the team. The study hence revealed that the master clock is not self-sufficient, instead requiring the help of xCEOs to generate timekeeping of behavior rhythms. Such timekeeping may actually be a core mechanism of the circadian clock in both insects and mammals.

More information: Min Tang et al, An extra-clock ultradian brain oscillator sustains circadian timekeeping, *Science Advances* (2022). DOI: 10.1126/sciadv.abo5506

Provided by Peking University

Citation: How an extra-clock ultradian brain oscillator sustains circadian timekeeping (2022,

September 14) retrieved 26 April 2024 from https://phys.org/news/2022-09-extra-clock-ultradian-brain-oscillator-sustains.html

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