

## Research Highlights

### The firebrat, primitive insect, exhibits a unique circadian clock resembling that of mammals

Most animals show daily rhythms that are generated by an endogenous mechanism, the so-called circadian clock, consisting of transcriptional/translational feedback loops, in which *Clock* (*Clk*) and *cycle* (*cyc*) genes are the key elements.

Although *cyc* is known to be expressed in a daily rhythmic manner in many insects, little is known about its regulation.

Yuichi Kamae, Outa Uryu, Taiki Miki, and Kenji Tomioka at Okayama University, have identified the orphan nuclear receptor genes *HR3* and *E75* as the major regulators of the rhythmic expression of *cyc* in a primitive insect, the firebrat *Thermobia domestica*, by molecular cloning and RNA interference technology. The *HR3* and *E75* are orthologs of mammalian clock genes, *Rora* and *Rev-erba*, respectively that regulate the rhythmic expression of *Bmal1*, a mammalian homolog of *cyc*.

Knocking-down of either *HR3* or *E75* gene was found to alter the rhythmic expression profiles of not only *cyc* but also other clock genes, leading to a disorganized molecular oscillatory state of the firebrat's circadian clock. The disorganization results in a loss of behavioral circadian rhythms.

The results suggest that the *HR3* and *E75* genes are involved in the circadian clock as regulators of the *cyc* gene, like in mammals, and more importantly as phase regulators of other clock genes. They also implicate that the firebrat has a unique circadian clock in which the preservation of an appropriate phase relationship among clock genes is required for manifestation of overt behavioral rhythms.

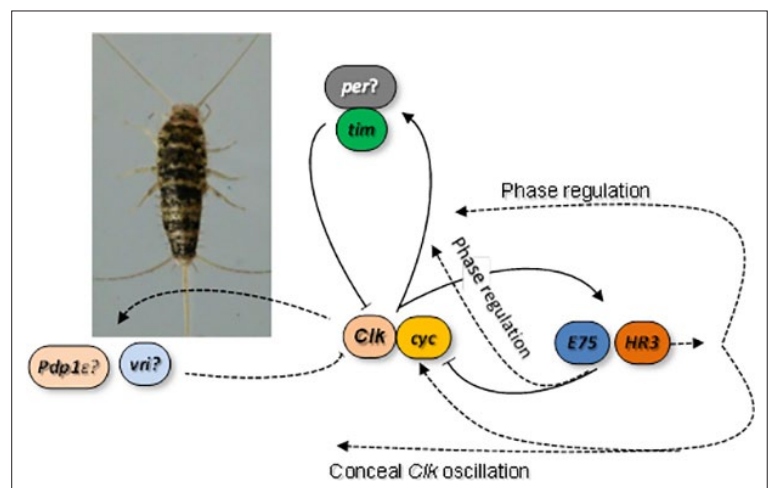
#### Reference:

Authors: Yuichi Kamae, Outa Uryu, Taiki Miki, Kenji Tomioka (2014)

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Figure caption:

The firebrat, *Thermobia domestica*, and the proposed hypothesis of its circadian clock machinery.