



## Glia get rhythmic

Flies have been used to study the molecular basis of circadian behaviours since the early 1970s, and many genes that govern daily rhythms in *Drosophila melanogaster*, such as *period (per)*, have been shown to be conserved in humans. The *D. melanogaster* brain contains populations of clock neurons that regulate dawn and dusk bouts of locomotor activity. In *Current Biology*, Jackson and colleagues now show that astrocytes have a key role in the regulation of this circadian behaviour.



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The authors expressed a bacterial sodium channel in adult glial cells to disrupt the cells' ionic gradient and, hence, their function. Expression of the sodium channels was temperature sensitive to avoid potential developmental effects. Following light–dark entrainment at 23 °C, both control and mutant flies displayed rhythmic locomotor activity. However, when these flies were exposed to a temperature of 30 °C, which allowed expression of the bacterial sodium channel, the mutant flies showed arrhythmic locomotor activity within 1 day. Disruption of vesicle trafficking (through expression of a temperature-sensitive dynamin molecule, *Shibire<sup>ts</sup>*) or an elevation of calcium levels in the glial cytoplasm (through knockdown of the sarco-endoplasmic reticulum calcium ATPase) caused a similar loss of rhythmicity in mutant flies. Together, these findings indicate that gliotransmission and calcium-dependent pathways are important for the generation of this circadian behaviour.

To examine whether impairment of glial activity affected clock neurons, the authors quantified the abundance and cyclic expression of the clock proteins PER and PDP1ε,

but they found no differences between the mutant and control flies at 30 °C. They did, however, find a marked decrease in the levels of the clock neuron peptide transmitter pigment dispersing factor (PDF) in projections of the ventral lateral pacemaker neurons in flies expressing *Shibire<sup>ts</sup>*. These levels returned to normal when the temperature was decreased to 23 °C, suggesting that glia physiologically regulate neuronal PDF levels.

Five classes of glial cells exist in flies. Through the use of class-specific Gal4 drivers, Jackson and colleagues limited the expression of *Shibire<sup>ts</sup>* to specific glial subpopulations. They showed that *Shibire<sup>ts</sup>* expression in astrocytes was sufficient to disrupt circadian locomotor activity. Given that the regulation of circadian networks is highly conserved across species, it will be interesting to determine whether glia also have an important role in regulating circadian behaviour in mammals.

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**ORIGINAL RESEARCH PAPER** Ng, F. S. *et al.* Glial cells physiologically modulate clock neurons and circadian behavior in a calcium-dependent manner. *Curr. Biol.* 14 Apr 2011 (doi:10.1016/j.cub.2011.03.02)