

A Molecular Link between “Sleep and Immunity”

A novel sleep-inducing gene, “*nemuri*” functions as anti-microbial peptide

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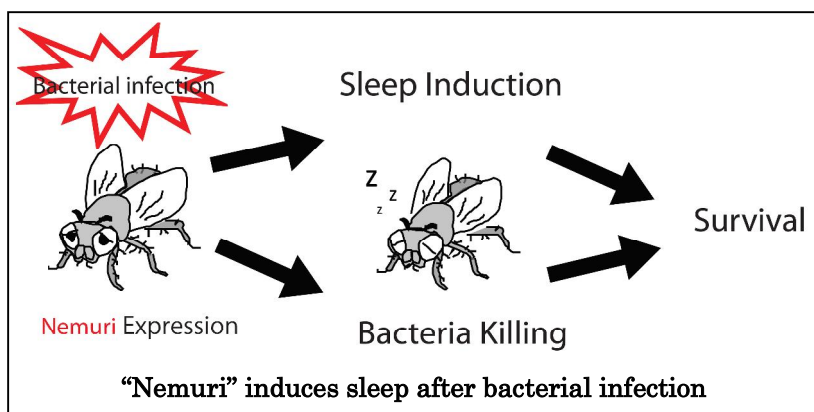
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Sleep is conserved in all animals from humans to insects. We spend one third of life asleep, yet why we sleep and the underlying mechanisms remain a major mystery in biology. Particularly, little is known about the mechanisms of sleep drive.

In order to understand the mechanisms of sleep, fruit flies (*Drosophila melanogaster*) serves as a fantastic model system to tackle such questions because they offer a battery of genetic tools to dissect out the molecular and cellular mechanisms *in vivo*. Moreover, fruit flies are amenable for behavior screening to identify the genetic components of a particular biological phenomenon.

To identify molecular factors that induce sleep, we carried out a genome-wide gain-of-function behavioral screen, evaluating over 12,000 fly lines, and found a novel sleep inducing factor that we named “*nemuri*”. When *nemuri* expression was induced in fly neurons, they slept more than three hours longer per day than usual. *Nemuri* functions as an anti-microbial peptide and is essential for bacterial infection-induced sleep. We found that *nemuri* is induced upon bacterial infection and promoted survival, suggesting *Nemuri* serves as a key link between sleep and immunity.

By combining genetic, biochemical, behavioral and neuronal imaging techniques, we aim to elucidate the mechanisms of how *Nemuri* functions inside neurons to induce sleep. Moreover, we plan to carry out a behavioral screen by expressing human candidate genes in the fly brain to identify the mammalian homologue of *nemuri*. These studies will improve our understanding of how the sleepiness is represented inside the brain.



References

- 1) Toda H, et al : Science, 363(6426):509-515, 2019