Fruit flies reveal surprising new evolutionary link for studying human health

September 13 2012

fruit fly

New research reveals that fruit flies and mammals may share a surprising evolutionary link in how they control body temperature through circadian rhythm, unlocking new ways to study the insects as models of human development and disease.

The study posted online Sept. 13 by Current Biology reports that similar to people, *Drosophila* fruit flies – a common research tool in life sciences – have a genetically driven internal clock. This circadian clock prompts the insects to seek out warmer or cooler external temperatures according to the time of the day. Cold-blooded creatures change behavior to alter body temperature, usually by seeking out different external temperatures. But fruit flies are the first cold-blooded species to demonstrate their modification of temperature preference behavior is

controlled by a circadian clock.

"We show that *Drosophila* fruit flies exhibit a daily temperature preference rhythm that is low in the morning, high in the evening and that follows a similar pattern as body temperature rhythms in humans," said Fumika N. Hamada, PhD, principal investigator and a researcher in the Division of Pediatric Ophthalmology at Cincinnati Children's Hospital Medical Center. "This study also reports the first systematic analysis of the molecular and neural mechanisms underlying temperature preference rhythm in fruit flies."

The research is important to understanding how regulation of daily body temperature is linked to homeostasis – the body's ability to maintain a stable internal environment while exposed to changes in the external environment. Failure to manage related stress and maintain homeostasis can lead to abnormal function and disease, Hamada said.

The circadian clock's internal control of body temperature rhythm in warm-blooded mammals, including humans, allows them to maintain homeostasis by regulating sleep and metabolic energy use. The study by Hamada and colleagues is the first to demonstrate that fruit flies have a similar circadian clock system for temperature control, although one more influenced by external temperatures than for mammals. It also is the first to show that *Drosophila*'s behavior modification to adjust body temperature is not controlled by a subset of pacemaker neurons in the brain responsible for locomotor activity.

By subjecting a variety of genetically altered flies to different degrees of light and darkness and then analyzing the insect's brains, the scientists identified a pacemaker neuron in the dorsal region of the fruit fly brain called DN2 that controls the bug's temperature preference rhythm. The function of this neural circuit had previously been unknown, the researchers said.

Hamada said continued study of the newly discovered circadian clock for *Drosophila* temperature preference rhythm may help explain mechanisms that underlie body temperature control in animals. It also could provide a better understanding of circadian rhythm's changeability from external influences.

Provided by Cincinnati Children's Hospital Medical Center