

# Immunity stronger at night than during day

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The immune system's battle against invading bacteria reaches its peak activity at night and is lowest during the day.

Experiments with the laboratory model organism, *Drosophila melanogaster*, reveal that the specific immune response known as phagocytosis oscillates with the body's circadian rhythm, according to Stanford researchers who presented their findings at the American Society for Cell Biology (ASCB) 48th Annual Meeting, Dec. 13-17, 2008 in San Francisco.

"These results suggest that immunity is stronger at night, consistent with the hypothesis that circadian proteins upregulate restorative functions such as specific immune responses during sleep, when animals are not engaged in metabolically costly activities," explains Mimi Shirasu-Hiza of Stanford University.

Shirasu-Hiza and her colleague David Schneider turned to the fruit fly, *Drosophila melanogaster*, as the model system to help them define the relationship between innate immunity and circadian rhythm, which is the oscillating protein clock or timing mechanism in cells.

Circadian rhythm paces the human body as well as the fruit fly through its days and nights, setting the rest/activity cycle that cues when to eat, sleep and mate over a 24-hour cycle.

In phagocytosis, the innate immune response targeted by the Stanford researchers, specific immune cells engulf and destroy the bacteria

invading the body.

In humans, immune responses such as phagocytosis not only are involved in clearing bacterial infection but also are implicated in a growing number of human diseases, including cancer and neurodegenerative disorders.

In previous experiments, the researchers noted that flies sick with bacterial infection lost their circadian rhythm and that flies lacking circadian rhythm were highly susceptible to infection.

The flies were infected with two different bacterial pathogens, *Listeria monocytogenes* and *Streptococcus pneumoniae*.

To determine whether circadian proteins regulate immunity, the scientists infected flies with these pathogens at different times of day or night.

The flies infected at night had a better chance of surviving than did the flies infected during the day. In addition, the researchers also detected low phagocytic activity in some flies with a mutated circadian clock.

Source: American Society for Cell Biology

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