Flies sleep just like us

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Close-up of the head of Calliphora vomitoria. Credit: Wikipedia.

(Phys.org) —Researchers at The University of Queensland have discovered that, like humans, flies sleep in stages of different intensities.

The UQ Queensland Brain Institute's Associate Professor Bruno van Swinderen said that human sleep involved the rapid eye movement (REM) stage, or light sleep during which dreaming typically occurred, and several stages of non-REM sleep, or deep sleep.

"We have shown that sleep in flies also appears to alternate between lighter and deeper sleep stages, suggesting different functions for each even in the smallest animal brains."

The study, led by Dr Bart van Alphen, measured sleep intensity in flies

by recording their brain activity and responsiveness to mechanical stimuli.

During waking behaviour and learning, some synaptic connections – the parts of the neurons that allow cell-to-cell communication – become strengthened.

One proposed function of deeper sleep stages is to proportionally weaken all synapses in the brain, so as to preserve learning while decreasing energy requirements.

The research group discovered that if they activated learning pathways during the day, the flies needed deeper sleep at night.

If they mutated a protein known to be important for weakening synapses, the flies compensated by sleeping more deeply even during the day.

"This suggests that synaptic weakening probably involves molecular processes that are engaged during deeper sleep stages," Associate Professor van Swinderen said.

Fruit flies are being increasingly used as a model for studying the role of sleep in disease.

Associate Professor van Swinderen said that it is important to consider the importance of different stages of sleep in future studies of this kind.

A second study showed that a better understanding of sleep processes in the fly model might be relevant to general anaesthesia.

The study, led by Dr Benjamin Kottler, found that the brain circuits that promote sleep in the fly are also important for regulating sensitivity to a commonly used general anaesthetic, isoflurane.

Increasing activity of sleep-promoting neurons in the fly brain resulted in increased sensitivity to anaesthesia, while stimulating wake-promoting neurons results in resistance to anaesthesia.

That is, flies that slept more were hypersensitive to anaesthesia and those that slept less were resistant to anaesthesia.

The first study, "A dynamic deep sleep stage in Drosophila", will be published online in the April 17 issue of *Journal of Neuroscience*.

The second study, "A sleep/wake circuit controls isoflurane sensitivity in Drosophila", was published on April 8 in *Current Biology*.

Provided by University of Queensland