Why you are not thirsty while sleeping

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A child sleeping. Image: Alessandro Zangrilli, via Wikipedia.

(PhysOrg.com) -- New research suggests the body's internal clock is what prevents you from becoming dehydrated and needing to drink during sleep.

The research was carried out by neurophysiologists Charles Bourque and Eric Trudel of McGill University Health Center's Research Institute in Montreal, Canada. The study identified how the body's internal clock (circadian system) controls water regulation during sleep through activating the release of the hormone vasopressin, which instructs cells to retain water.

During waking hours, the body controls hydration by balancing the loss of water via urine with intake of water by drinking, but people do not drink or go to the toilet while they are sleeping, and so the body must use another mechanism to keep itself hydrated. Research has already shown

that body clock neuron activity declines and vasopressin levels are raised when we are sleep, and that vasopressin is released by specialized neurons, which are activated by osmosensory neurons when water levels are low.

Bourque and Trudel's research investigated the proposal that reduced activity in the clock neurons could enable the osmosensory neurons to activate neurons to release vasopressin before water levels were low, which would lead to lower levels of urine production and greater water retention. They achieved this by removing thin slices of rat brains with intact clock and vasopressin neurons. The neurons function even when isolated from the brain. They stimulated the sensory neurons and monitored electrical activity between them and the neurons producing vasopressin, and compared the communication between the neurons when the clock neurons were activated (the 'awake' cycle), and when they were not ('sleep' cycle). They found the communication between sensory and vasopressin neurons decreased significantly when the clock cells were activated.

In essence, the body clock neurons act as a kind of 'dimmer switch', so that when they are active they suppress instructions to discharge vasopressin, but when they are inactive the sensory neurons can more easily instruct the neurons to release vasopressin, which ensures the cells retain their water reserves.

Rats and humans have similar vasopressin and body clock neuron activities, but Bourque said more research is needed to determine if the body clock neurons regulate other cycles as well, such as sleepiness, hunger, and other mechanisms related to circadian rhythms.

The research paper was published in the journal *Nature Neuroscience*.

More information: Trudel, E., Bourque, C. W. *Nature Neuroscience*

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