Medical Xpress

Slow waves may explain the brain's disconnect during dreaming

January 27 2016

When we're dreaming, our brains appear almost as active as when we are awake, yet we remain asleep and oblivious to our surroundings.

A University of Wisconsin study of mice suggests a reason: small areas of the brain responsible for alerting us to outside sensation are not as active as previously thought, potentially keeping the rest of the brain out of touch with the surrounding world.

"The basis for the sensory disconnection during REM (rapid-eye-movement) sleep has been a mystery for a long time, but we may have found at least one potential explanation," says lead author Dr. Chiara Cirelli, professor of psychiatry in the UW School of Medicine and Public Health. "Slow wave activity in a few key areas of the brain may be enough to interfere with transmission of stimuli to the rest of the brain."

Cirelli and her team from the Center for Sleep and Consciousness published their latest findings this week in the journal *Current Biology*.

About 80 percent of our sleep time is spent in non-rapid-eye-movement (NREM) sleep, another state characterized by sensory disconnection. During NREM sleep, there is a good explanation for this sensory disconnection: neurons in the brain are less active than in wake, and most crucially, they show a very different pattern of activity. They switch on and off, rather than being on all the time, resulting in large slow waves that can be detected by brain electrodes. Earlier work by coauthor Dr. Giulio Tononi showed that this on/off pattern interferes with the transmission of information in the brain and disrupts the communication among different brain areas.

To study REM sleep, when dreams are very common, the researchers recorded the activity of neurons in different layers of sensory and motor cortex of mice while the animals were allowed to move and sleep freely in their enclosures.

They found that as expected, most cortical areas show wake-like activity during REM sleep; yet, the on/off pattern associated with NREM sleep is actually present also during REM sleep, but only in a few small areas of the cerebral cortex. Specifically, they found that slow wave activity during REM sleep is mostly confined to superficial layers of the primary sensory and motor areas in the cortex. Since this is where sensory information from the environment is first relayed from the thalamus, it may explain the sensory disconnection that occurs during REM sleep.

"We believe this may be enough to interfere with the transmission of information from the external world to the brain, even if the overall activity of the brain is wake-like," Cirelli says.

The study's lead author is Chadd Funk, a medical student in the UW SMPH Medical Scientist Training Program. Other members of the research team include Sakiko Honjoh and Alexander Rodriguez.

Provided by University of Wisconsin-Madison