Researchers discover sleep mechanism critical to memory consolidation and find that Ambien enhances the process

March 12 2013, by Bettye Miller

Discoveries by Sara Mednick's research team could lead to new sleep therapies that improve memory.

(Medical Xpress)—A team of sleep researchers led by UC Riverside

psychologist Sara C. Mednick has confirmed the mechanism that enables the brain to consolidate memory and found that a commonly prescribed sleep aid enhances the process. Those discoveries could lead to new sleep therapies that will improve memory for aging adults and those with dementia, Alzheimer's and schizophrenia.

The groundbreaking research appears in a paper, "The Critical Role of Sleep Spindles in Hippocampal-Dependent Memory: A Pharmacology Study," published in the *Journal of Neuroscience*.

Earlier research found a correlation between sleep spindles—bursts of brain activity that last for a second or less during a specific stage of sleep—and consolidation of memories that depend on the hippocampus. The hippocampus, part of the cerebral cortex, is important in the consolidation of information from short-term to long-term memory, and spatial navigation. The hippocampus is one of the first regions of the brain damaged by Alzheimer's disease.

Mednick and her research team demonstrated, for the first time, the critical role that sleep spindles play in consolidating memory in the hippocampus, and they showed that pharmaceuticals could significantly improve that process, far more than sleep alone.

"We found that a very common sleep drug can be used to increase verbal memory," said Mednick, the lead author of the paper that outlines results of two studies conducted over five years with a $651,999 research grant from the National Institutes of Health. "This is the first study to show you can manipulate sleep to improve memory. It suggests sleep drugs could be a powerful tool to tailor sleep to particular memory disorders."

A total of 49 men and women between the ages of 18 and 39 who were normal sleepers were given varying doses of zolpidem (Ambien) or sodium oxybate (Xyrem), and a placebo, allowing several days between

doses to allow the pharmaceuticals to leave their bodies. Researchers monitored their sleep, measured sleepiness and mood after napping, and used several tests to evaluate their memory.

The researchers found that zolpidem significantly increased the density of sleep spindles and improved verbal memory consolidation.

"(P)harmacologically enhancing sleep spindles in healthy adults produces exceptional memory performance beyond that seen with sleep alone or sleep with the comparison drug (sodium oxybate)," the sleep researchers wrote. "… The results set the stage for targeted treatment of memory impairments as well as the possibility of exceptional memory improvement above that of a normal sleep period."

Mednick said one of the next steps in this line of research is to determine which component of the physical response to Ambien—the amnesia associated with the drug, or something related to a specific aspect of sleep—is responsible for increasing the density of sleep spindles and the resulting consolidation of memory. She also hopes to study the impact of zolpidem on older adults, who experience poor declarative memory and also decreased sleep spindles. Individuals with Alzheimer's, dementia and schizophrenia also experience decreases in sleep spindles.

"Could we find a dose response, for example, the more Ambien, the more benefit?" she asked.

Sleep is a very new field of research and its importance is generally not taught in medical schools, Mednick said.

"We know very little about it," said Mednick, who began studying sleep in the early 2000s with research into how naps benefit perceptual learning. "We do know that it affects behavior, and we know that sleep is

integral to a lot of disorders with memory problems. We need to integrate sleep into medical diagnoses and treatment strategies. This research opens up a lot of possibilities."

More information: www.jneurosci.org/content/33/10/4494.full

Provided by University of California - Riverside