Sea snails help researchers explore a way to enhance memory

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(Medical Xpress) -- Efforts to help people with learning impairments are being aided by a species of sea snail known as *Aplysia californica*. The mollusk, which is used by researchers to study the brain, has much in common with other species including humans. Research involving the snail has contributed to the understanding of learning and memory.

At The University of Texas Health Science Center at Houston (UTHealth), neuroscientists used this animal model to test an innovative learning strategy designed to help improve the brain's memory and the results were encouraging. It could ultimately benefit people who have impairments resulting from aging, stroke, traumatic brain injury or congenital cognitive impairments.

The proof-of-principle study was published on the *Nature Neuroscience* website on Dec. 25. The next steps in the research may involve tests in other animal models and eventually humans.

The strategy was used to identify times when the brain was primed for learning, which in turn facilitated the scheduling of learning sessions during these peak periods. The result was a significant increase in memory.

"We found that memory could be enhanced appreciably," said John H. "Jack" Byrne, Ph.D., senior author and chair of the Department of Neurobiology and Anatomy at the UTHealth Medical School.

Building on earlier research that identified proteins linked to memory, the UTHealth investigators created a mathematical model that tells researchers when the timing of the activity of these proteins is aligned for the best learning experience.

Right now, the scheduling of learning sessions is based on trial and error and is somewhat arbitrary. If the model proves effective in follow-up studies, it could be used to identify those periods when learning potential is highest.

“When you give a training session, you are starting several different chemical reactions. If you give another session, you get additional effects. The idea is to get the sessions in sync,” Byrne said. “We have developed a way to adjust the training sessions so they are tuned to the dynamics of the biochemical processes.”

Two groups of snails received five learning sessions. One group received learning sessions at irregular intervals as predicted by a mathematical model. Another group received training sessions in regular 20-minute intervals.

Five days after the learning sessions were completed, a significant increase in memory was detected in the group that was trained with a schedule predicted by a computer. But, no increase was detected in the group with the regular 20-minute intervals.

The computer sorted through 10,000 different permutations in order to determine a schedule that would enhance memory.

To confirm their findings, researchers analyzed nerve cells in the brain of snails and found greater activity in the ones receiving the enhanced training schedule, said Byrne, the June and Virgil Waggoner Chair of Neurobiology and Anatomy at UTHealth.

"This study shows the feasibility of using computational methods to assist in the design of training schedules that enhance memory," Byrne said.

More information: "Computational Design of Enhanced Learning Protocols," *Nature Neuroscience* Dec. 25, 2011.

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