Researchers unlock key to memory storage in brain

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Scientists know little about how the brain assigns cells to participate in encoding and storing memories. Now a UCLA/University of Toronto team has discovered that a protein called CREB controls the odds of a neuron playing a role in memory formation. The April 20 edition of *Science* reports the findings, which suggest a new approach for preserving memory in people suffering from Alzheimer's or other brain injury.

"Making a memory is not a conscious act," explained Alcino Silva, principal investigator and a professor of neurobiology and psychiatry at the David Geffen School of Medicine at UCLA. "Learning triggers a cascade of chemicals in the brain that influence which memories are kept and which are lost.

"Earlier studies have linked the CREB protein to keeping memories stable," added Silva, a member of the UCLA Brain Research Institute. "We suspected it also played a key role in channeling memories to brain cells that are ready to store them."

Silva and his colleagues used a mouse model to evaluate their hypothesis. They implanted CREB into a virus, which they introduced into some of the cells in the animal's amygdala, a brain region critical to emotional memory.

Next they tested the mouse's ability to recall a specific cage it had visited before. The cage was outfitted with patterned walls and a unique smell.

To visualize which brain cells stored the mouse's memories about the cage, the scientists tracked a genetic marker that reveals recent neuron activity. When the team examined the animals' amygdalas after the experiment, they found substantial amounts of CREB and the marker in neurons.

"We discovered that the amount of CREB influences whether or not the brain stores a memory," said Silva. "If a cell is low in CREB, it is less likely to keep a memory. If the cell is high in CREB, it is more likely to store the memory."

Human implications of the new research could prove profound.

"By artificially manipulating CREB levels among groups of cells, we can determine where the brain stores its memories," he explained. "This approach could potentially be used to preserve memory in people suffering from Alzheimer's or other brain injury. We may be able to guide memories into healthy cells and away from sick cells in dying regions of the brain."

Our memories define who we are, so learning how the brain stores memory is fundamental to understanding what it is to be human, Silva observed.

"A memory is not a static snapshot," he said. "Memories serve a purpose. They are about acquiring information that helps us deal with similar situations in the future. What we recall helps us learn from our past experiences and better shape our lives."

Source: University of California - Los Angeles