Brain circuits connected with memory discovered

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(Medical Xpress) -- A new study published last week in *Science* reveals the discovery of a brain pathway that helps us link events that happen close together and play a role in memories.

The research, led by Dr. Junghyup Suh from the Massachusetts Institute of Technology found the connection between the hippocampus and the entorhinal cortex. The entorhinal cortex receives the information from areas around the brain and then passes the information to the hippocampus.

To test this pathway, the researchers used specifically bred mice. These mice had a mutant strain which allowed the cells in the entorhinal cortex

to be disabled by removing doxycycline from the food the mice were fed.

When mice are presented with a sound and then within 20 seconds given a shock, they quickly learn to associate this sound with the coming shock and freeze in their tracks when the sound is heard. This experiment was conducted on the mice with the disabled entorhinal cortex and researchers discovered that the mutant mice were less likely to react to the sound.

However, when the researchers administered the shock at the same time as the sound, both mice behaved the same. This shows that there is a connection between the connection of time and the entorhinal cortex.

Another experiment used a water maze and a small platform where the mice could find to stop swimming and rest. They were allowed to find the platform and then 30 seconds later placed in the water maze. The mutant mice were less likely to be able to find the platform even though they had just found it 30 seconds prior. The linking of memories to what was currently happening appeared difficult for these mice.

When it comes to Alzheimer's disease, patients have difficulty with memory. In Alzheimer's, the entorhinal cortex is one of the first areas of the brain that is damaged.

More information: Entorhinal Cortex Layer III Input to the Hippocampus Is Crucial for Temporal Association Memory, *Science* DOI: 10.1126/science.1210125

ABSTRACT
Associating temporally discontinuous elements is crucial for the formation of episodic and working memories that depend on the hippocampal-entorhinal network. However, the neural circuits

subserving these associations have remained unknown. The layer III inputs of the entorhinal cortex to the hippocampus may contribute to this process. To test this hypothesis, we generated a transgenic mouse in which these inputs are specifically inhibited. The mutant mice displayed significant impairments in spatial working memory tasks and in the encoding phase of trace fear-conditioning. These results indicate a critical role of the entorhinal cortex layer III inputs to the hippocampus in temporal association memory.