Amnesia research takes new turn after scientists use light pulses to revive lost memories in mice

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Amnesia remains a controversial subject in the field of neuroscience, with some researchers arguing that it occurs when cells are damaged and memory cannot be stored, while others believe that the memories are simply blocked and cannot be recalled.

The study, published in the US journal *Science,* indicated that memories do in fact remain, but are simply unable to be recollected.

“The majority of researchers have favored the storage theory, but we have shown in this paper that this majority theory is probably wrong,” researcher Susumu Tonegawa of the Massachusetts Institute of Technology said.

“Amnesia is a problem of retrieval impairment,” the Nobel Prize-winning scientist said.

The study, carried out by researchers at MIT and the Riken Brain Science Institute in Japan, used blue light pulses to stimulate “memory engrams,” the neurons that are activated as memories are formed.

When these engrams are activated in normal day-to-day life by stimuli such as an image, smell or taste, memories are triggered.

Scientists conducting the research, however, attached a protein to these neurons to enable them to be activated by light.

– Paralyzed with fear –

One change that was thought to occur in engrams during the formation of memory was the strengthening of their synapses — structures that allow the neurons to send signals to each other.

So the researchers set out to see what would happen if the synapses did not strengthen, by using a compound called anisomycin to prevent that process from happening in mice.

The mice were placed in a chamber where they were given an electric shock to the feet — which elicits a “freezing” response in the rodents.

Those that did not receive the compound would exhibit the same freezing response when returning to the chamber where the shock was administered, but those that were given anisomycin did not freeze, having clearly forgotten the shock.

The researchers would next activate the neurons involved in the foot-shock memory in the treated mice, by using blue light pulses.

Even when placed in a totally different chamber, the treated mice would demonstrate the freezing response, indicating that they were paralyzed with fear from the memory, which still existed.

The study allowed scientists to separate memory storage mechanisms from those allowing an organism to form and recover the memory, said MIT researcher Tomas Ryan, who co-authored the study.

“The strengthening of engram synapses is crucial for the brain’s ability to access or retrieve those specific memories,” Ryan said.

Tonegawa added that the research indicated that “past memories may not be erased, but could simply be lost and inaccessible for recall.”

The findings “will stimulate future research on the biology of memory and its clinical restoration,” he added.