# Gene that helps form trauma-related memories may also help prevent PTSD

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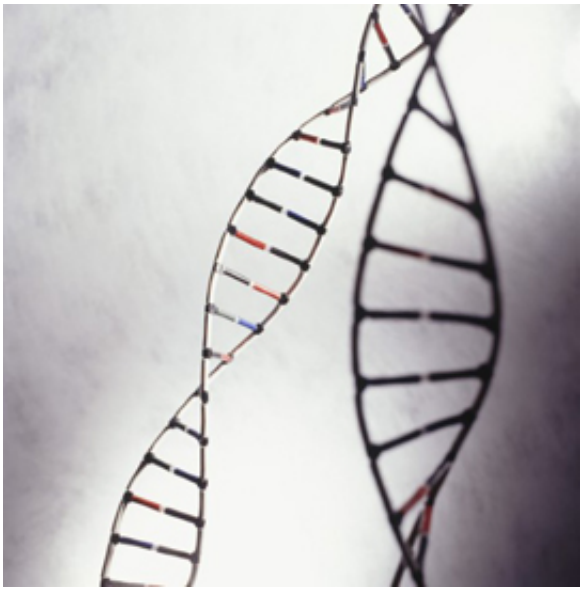

Credit: NIH

A specific gene that helps form memories from traumatic events can be manipulated—and in doing so may actually help prevent post-traumatic stress disorder (PTSD), according to a new study led NYU Langone Medical Center that recently published in *Neuropharmacology*.

Specifically, the findings explain how a particular gene—called fkbp5—is involved in a phenomenon known as "fear extinction," through which animals and humans disassociate with fearful memories of a traumatic experience, such as war, assault or a natural disaster. Most

people recover with no ill effects, but approximately one out of 10 go on to develop PTSD.

The new study, in collaboration with Harvard and Emory Universities and other organizations, examined fear extinction patterns in mice and humans. They found that dexamethasone, a widely prescribed steroid for inflammatory conditions, affects the expression of fkbp5 in the brain, preventing the formation of the fearful memories that are the hallmark of PTSD.

"The interaction between fkbp5 and dexamethasone could enable us to enhance fear extinction," says Isaac Galatzer-Levy, PhD, a research assistant professor in the Department of Psychiatry at NYU Langone and its Steven and Alexandra Cohen Veterans Center, and the lead investigator on the study. "If dexamethasone works well in humans, we could potentially use it to prevent fearful memories in soldiers on the battlefield, patients in emergency rooms, or anywhere else where healthcare providers provide treatment within hours of traumatic events ."

In a life-threatening situation, the brain launches into "fight-or-flight," a rapid and instinctive survival mechanism during which cortisol travels to the brain to dampen the initial response. Versions of the fkbp5 gene, in turn, affect how well cortisol affects memory around that event.

Galatzer-Levy analyzed data from large studies in humans and mice that involved "fear conditioning" and "fear extinction," during which subjects receive a mild aversive stimulus when exposed to a sound or light, and "fear extinction learning," during which conditioning is reversed by applying sound or light without the stimulus.

In humans, Galatzer-Levy found that different versions of the fkbp5 gene were able to predict specific differences in extinction learning

related to PTSD symptoms such as reliving or re-experiencing the traumatic event; avoiding reminders of the event; and, in particular, hyperarousal, or the inability to sleep or concentrate.

To further determine if manipulating fkbp5 could prevent the abnormal paths of extinction learning, Galatzer-Levy looked at data taken from a mouse study in which they were fear conditioned, given doses of dexamethasone or a placebo, and then put through fear extinction training the following day. He found that when given a dose of dexamethasone high enough to enter the brain, the mice almost uniformly extinguished fear. Although the change in fkbp5 expression was temporary, the effect of high-dose dexamethasone on extinction learning was permanent, Galatzer-Levy says.

To further this research, Galatzer-Levy recently launched a pilot project to test whether a single oral dose of dexamethasone given in the emergency room after a traumatic accident or injury decreases the chances of developing PTSD.

"A treatment like dexamethasone is very appealing because it has very few side-effects and is inexpensive," Galatzer-Levy says. "It potentially could be an ideal preventative treatment since we know it has effects that alter fear learning and memory."

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