

Publication

Noradrenergic activation of the basolateral amygdala maintains hippocampus-dependent accuracy of remote memory

JournalArticle (Originalarbeit in einer wissenschaftlichen Zeitschrift)**ID** 3983599**Author(s)** Atucha, Erika; Vukojevic, Vanja; Fornari, Raquel V.; Ronzoni, Giacomo; Demougin, Philippe; Peter, Fabian; Atsak, Piray; Coolen, Marcel W.; Papassotiropoulos, Andreas; McGaugh, James L.; de Quervain, Dominique J.-F.; Roozendaal, Benno**Author(s) at UniBasel** [Papassotiropoulos, Andreas](#) ; [de Quervain, Dominique](#) ;**Year** 2017**Title** Noradrenergic activation of the basolateral amygdala maintains hippocampus-dependent accuracy of remote memory**Journal** Proceedings of the National Academy of Sciences**Volume** 114**Number** 34**Pages / Article-Number** 9176-9181**Mesh terms** Adrenergic alpha-Agonists, pharmacology; Animals; Avoidance Learning, physiology; Basolateral Nuclear Complex, drug effects; Cell Adhesion Molecules, Neuronal, genetics; DNA Methylation, drug effects; Discrimination (Psychology), physiology; Extracellular Matrix Proteins, genetics; GABA-A Receptor Agonists, pharmacology; Hippocampus, physiology; Male; Memory, Long-Term, physiology; Muscimol, pharmacology; Nerve Tissue Proteins, genetics; Norepinephrine, pharmacology; Rats, Sprague-Dawley; Serine Endopeptidases, genetics; Transcriptome, drug effects

Emotional enhancement of memory by noradrenergic mechanisms is well-described, but the long-term consequences of such enhancement are poorly understood. Over time, memory traces are thought to undergo a neural reorganization, that is, a systems consolidation, during which they are, at least partly, transferred from the hippocampus to neocortical networks. This transfer is accompanied by a decrease in episodic detailedness. Here we investigated whether norepinephrine (NE) administration into the basolateral amygdala after training on an inhibitory avoidance discrimination task, comprising two distinct training contexts, alters systems consolidation dynamics to maintain episodic-like accuracy and hippocampus dependency of remote memory. At a 2-d retention test, both saline- and NE-treated rats accurately discriminated the training context in which they had received footshock. Hippocampal inactivation with muscimol before retention testing disrupted discrimination of the shock context in both treatment groups. At 28 d, saline-treated rats showed hippocampus-independent retrieval and lack of discrimination. In contrast, NE-treated rats continued to display accurate memory of the shock-context association. Hippocampal inactivation at this remote retention test blocked episodic-like accuracy and induced a general memory impairment. These findings suggest that the NE treatment altered systems consolidation dynamics by maintaining hippocampal involvement in the memory. This shift in systems consolidation was paralleled by time-regulated DNA methylation and transcriptional changes of memory-related genes, namely *Reln* and *Pkmζ*, in the hippocampus and neocortex. The findings provide evidence suggesting that consolidation of emotional memories by noradrenergic mechanisms alters systems consolidation dynamics and, as a consequence, influences the maintenance of long-term episodic-like accuracy of memory.

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