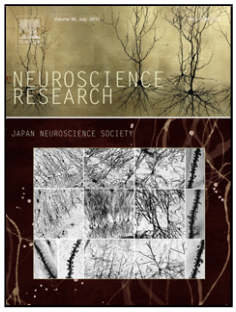

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PII: S0168-0102(16)30227-9
DOI: http://dx.doi.org/doi:10.1016/j.neures.2017.04.005
Reference: NSR 4036

To appear in: *Neuroscience Research*

Received date: 22-10-2016
Revised date: 16-3-2017
Accepted date: 12-4-2017

Please cite this article as: Kitamura, Takashi, Driving and Regulating Temporal Association Learning Coordinated by Entorhinal-Hippocampal Network.Neuroscience Research http://dx.doi.org/10.1016/j.neures.2017.04.005

Driving and Regulating Temporal Association Learning Coordinated by Entorhinal-Hippocampal Network

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Highlights

Entorhinal-hippocampal network is crucial for temporal association learning.

Entorhinal cortex layer III is crucial for driving temporal association learning.

Island Cells in entorhinal cortex layer II control temporal association learning.

Timing-related hippocampal CA1 activities may bridge temporal gap between two events.

Prefrontal cortex may coordinate with entorhinal cortex for temporal association learning

Abstract

Episodic memories shape future behaviour and by aiding adaptive behaviour, are therefore important for survival in nature. Entorhinal cortex (EC)-hippocampal (HPC) networks have a crucial role in the formation of episodic memory, which consists of associations of space, objects, individuals and time. Neural circuits have been identified in the EC-HPC networks that provide spatial, contextual and object information. However, the specific neural circuits that allow animals to associate two temporally segregated events, called temporal association learning, are still nebulous. In this review, I will review recent experimental evidence concerning the role of the EC in temporal association learning, with an emphasis on the neural circuits functioning to drive and regulate the temporal associations between events, and focusing on the trace fear conditioning paradigm in rodents. Then, I will discuss hippocampal activity during the trace