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“INHIBITORY NEURONS CONTROL CELLULAR ENGRAM FORMATION AND MEMORY STABILITY”

Summary: Only a small fraction of neurons participate in the storage and recall of memories of past events. However, little is known about network mechanisms that select and integrate subpopulations of neurons in a specific cellular engram. In order to address this question, we used optogenetics and chemogenetics to manipulate the activity of excitatory and inhibitory hippocampal neurons during contextual memory formation and retrieval. The results I will present in this seminar show that memory is competitively distributed among groups of excitatory neurons according to their own level of activity and that of neighboring cells at the time of training. Ensembles of active neurons inhibit surrounding neurons and become involved in the memory trace by engaging inhibitory microcircuits formed by dendrite targeting interneurons. Somatostatin but not parvalbumin expressing inhibitory neurons control the size of the engram and the stability of long term memories. These findings suggest that memory is distributed among excitatory cells of the hippocampus through an activity dependent process of mutual inhibition mediated by somatostatin expressing dendritic targeting interneurons.

Recent publications.

Flores CE, Nikonenko I, Mendez P, Fritschy JM, Tyagarajan SK, Muller D. Activity-dependent inhibitory synapse remodeling through gephyrin phosphorylation. PNAS 2014