ASHBi SEMINAR

Circuit dynamics of the entorhinal cortex in associative learning and in Alzheimer's disease

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Venue: seminar room 107, Faculty of Medicine Bldg. D

The entorhinal cortex is a gateway of information into the hippocampus, playing a critical role in learning and memory. The entorhinal cortex is anatomically divided into two cortical regions, the medial entorhinal cortex (MEC) and the lateral entorhinal cortex (LEC). Electrophysiological investigations into the functions of MEC in the past two decades have discovered grid cells and other spatially-representing cells critical for animals' spatial navigation and spatial memory.

Although these findings accelerated investigations into spatial memory, spatial memory holds only a portion of brain's memory function. What about associative memory? Associative memory is indeed the most common form of memory; suppose you sniff a smell of curry and it suddenly reminds you of dinners with your parents in good old days. Despite its importance, circuit mechanisms for associative memory is still very unclear, and our lab have been striving to identify such mechanisms. We previously showed that the LEC, rather than MEC, has a critical role in the formation of associative memory (Igarashi et al., Nature 2014). In our lab at UC Irvine, we recently found that, of two molecularly-defined principal cell types of superficial LEC, one neuron type plays a major role in enabling animals' acquisition of associative memory. We also found that the release of dopamine from the VTA into the LEC is critical for the acquisition of associative memory. Although dopamine has been thought to play a critical role in memory, it's function in the hippocampus remained enigmatic. Our data point to critical role of entorhinal dopamine release in associative memory.

In the second half of my talk, I would like to discuss our recent findings in the analyses of the entorhinal cortex of Alzheimer's disease (AD) mouse model. The entorhinal cortex has been known to be a first brain region that shows atrophy in the early stage of AD. Nonetheless, it is still unclear what type of activity in the entorhinal-hippocampal circuit is affected in AD. We previously found that gamma oscillations are impaired in the MEC (Nakazono et al., Front Syst Neurosci 2017). I will talk about our recent finding on the impairment of place cells and grid cells in AD mouse model.

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