# Effects of alcohol on the representation of hippocampal place cells

Kousaku Miyake, Saichiro Yagi, Yuki Aoki, Yuji Ikegaya, Takuya Sasaki

*Lab. of Chem. Pharmacol., Grad. Sch. of Pharmaceut. Sci., The Univ. of Tokyo*

Alcohol exposure impairs the retention of spatial memory. Consistently, previous reports have demonstrated widespread changes in a variety of receptor functions and gene expressions in the hippocampus, a brain region involved in spatial memory. However, it remains unknown how these molecular mechanisms are integrated to alter neuronal spike patterns. Hippocampal neurons consist of place cells as they fire preferentially when an animal visits a specific area (a place field), which are considered to play a crucial role in spatial memory. Here, we recorded spatial spike patterns of hippocampal neuronal ensembles from freely moving rats running on familiar linearized tracks. The rats were tested in two 20-min sessions of running and during a 10-min inter-session interval, they were injected intraperitoneally with 1.5 g/kg ethanol, a dose comparable to those generally consumed by humans. The alcohol administration triggered the emergence of a subset of place cell populations, while abolishing place-selective firing of the other place cell populations. Moreover, a subset of place cells altered their place fields. These results demonstrate that hippocampal spatial maps are dynamically reorganized by ethanol administration. The neuronal mechanism may underlie alcohol-induced impairments in hippocampus-dependent memory.