Title:	Effects of Alcohol on the Spatial Representation in the Hippocampal Formation
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Abstract:	Episodic memory plays a critical role in everyday life activities. Spatial memory, which can be a type of episodic memory is essential for navigating through an environment. Alcohol is one of the most common household beverages. Moreover, alcohol as a substance of abuse is a very active area of research. However, the effects of alcohol on the spatial memory have not been investigated adequately and hence the underlying effects are poorly understood. The aim of the present study was to investigate the effects of acute alcohol intoxication on the CA1 region in the hippocampus at the cellular and the network level with the help of in vivo electrophysiology in awake, freely behaving parvalbumin-cre mice. Further, it is known that the medial septum plays a critical role in pacing the hippocampal local field potential (LFP) theta. Therefore, this study also aimed to find if the rhythmic activation of the parvalbumin containing cells in the medial septum, via optogenetic stimulation could restore the function of the hippocampus under the influence of alcohol. It was found in the present study that acute alcohol intoxication at a dosage of 1.5 g/kg, administered intraperi- toneally led to a reduction in the mean firing rates of non-spatial cells immediately after the injection. Interestingly, no significant change was seen in the mean firing rate and the information score of the place cells following acute alcohol intoxication and the location of the place fields also remained stable. No significant change was seen in the mean firing rate of interneurons as well. At the network level, a significant drop in the LFP theta frequency and power was seen immediately after injecting alcohol. The suppression in the LFP theta frequency persisted throughout the recording session in the alcohol injected mice. Further, the optogenetic stimulation of the parvalbumin containing cells in the medial septum in the alcohol session did not reliably pace the hippocampal LFP theta since the LFP theta frequency dropped even while the stimulation was being done. Therefore, results from the present study provide evidence that acute alcohol intoxication causes changes in both cel- lular and network level in the CA1 region of the hippocampus of mice. Hence, a more xidetailed research project with a goal to find the underlying mechanisms involved in causing the deficits in the spatial memory due to alcohol intoxication should be undertaken.
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