

## Neural mechanisms of odor memory formation and consolidation

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It is known that the odor memories are associated with not only what the odor is but also the episode that experienced when we smelled the odor. However, the neural mechanism of association between an odor and the episode is still unclear.

The piriform cortex, a major part of the olfactory cortex, is known as an association cortex integrating incoming olfactory sensory information from the olfactory bulb with top-down input from higher regions such as the orbitofrontal cortex. To reveal the neural mechanisms of association memory between an odor and the episode when the odor was experienced, we recorded the neural activities in the anterior piriform cortex (aPC) of freely moving rats performing an odor-guided go/no-go task and its reversal learning task. To reveal memory consolidation mechanisms of the aPC, we recorded the neural activities during the pre- and post-task sleep.

We found that many aPC neurons fired during the odor presentation period and the specific behavioral scene during the odor-induced behavioral go/no-go events, such as the moving to the reward port scene, the consumption of rewards scene, and so on. Such the odor-scene responsive aPC neurons were tuned to a smaller scale scene within each behavioral scene. After rats learned the reversal task, many aPC neurons respond to the reversed odor-scene combinations. We also found that the odor-scene responsive neurons reactivated associated with the olfactory cortex sharp-waves.

These results suggest that the odor-scene responsive aPC neurons have an important role in the memory formation and the consolidation between the odor inputs and the top-down scene signals related to the odor-guided learned behaviors.