Abstract

The orbitofrontal cortex (OFC) controls flexible behavior through stimulus value updating based on stimulus outcome associations, allowing seamless navigation in dynamic sensory environments with changing contingencies. Sensory cue driven responses, probed primarily during behavior, exist in the OFC. However, OFC sensory response properties, particularly auditory, are unknown in the mouse, a genetically tractable animal model. Our main focus in this thesis was to understand how auditory information is represented in the mouse OFC single units and to parse out the sources that bring in auditory information to the OFC**.** We first show that mouse OFC robustly responds to auditory stimulation but lacks a frequency-based tonotopic organization. We also show that OFC single units have unique auditory response properties showing pure oddball detection and long timescales of adaptation resulting in longer stimulus-history dependence. Next, using anatomical tracing, we first parse out the OFC afferents that may contribute to the auditory responses in the OFC. Further, using pharmacological silencing, we show that OFC auditory responses are shaped by two parallel sources; lemniscal and non-lemniscal, both at the auditory cortex (AC) and thalamus. We demonstrate that the non-lemniscal thalamic component mainly contributes to observed oddball detection and persistent activity in the OFC via amygdala. Using Optogenetics, we also show that primary AC modulates the OFC response characteristics via direct projections, despite the fewer projections to OFC. Unraveling OFC's auditory responses from a sensory perspective and their origins would help better understand various demand based response modifications during OFC-based behaviours