Abstract:

The basic characteristics underlying how olfactory and gustatory sensory modalities interact are not well understood. We compared the single-neuron and population responses of the cortical regions that process these senses in rats in order to understand how taste and smell work together during consummatory behaviors. Rats learn odor-taste associations more robustly when they are delivered at the same time and via the same route (the mouth) than when odors are delivered to nose at the same time that a taste is delivered into the mouth. The cortical regions that process taste and smell, gustatory cortex (GC) and piriform cortex (PC) respectively, are specifically influenced by each other even without stimuli. The temporal responses of GC and PC chemosensory neurons are modulated by which route the odor is delivered; retronasally (into the mouth) versus orthonasally (into the nares). Coactivation is particularly stronger when both taste and smell are delivered intraorally than either stimulus alone. This synergistic effect is diminished when they are delivered via separate routes or at different times. Our work highlights specific characteristics of chemosensation at the cortical level and how flavor networks are differentially coactivated during consummatory behaviors.