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Crypt neurons express a single V1R-related *ora* gene

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Fish possess three types of olfactory sensory neurons, i.e., ciliated, microvillous, and crypt neurons, distributed throughout a single sensory epithelium. The former two cell populations are also present in mammals where they occur in various segregated olfactory subsystems. Whereas the ciliated neurons express odorant or trace amine-associated receptor genes, the microvillous neurons express the OlfC genes which resemble those for the mammalian vomeronasal type 2-receptors. However, the cells remained unknown that express the ora (olfactory receptor class A-related) genes, a further family of six highly conserved chemosensory receptors which is homologous to the mammalian vomeronasal type-1 receptors. Oka et al now found that only a single ora receptor, ora4, is present in almost all crypt neurons whereas the other five ora receptors are not. Other olfactory receptor family members also appear to be absent from crypt neurons. Thus, the crypt neurons show a "one cell type-one receptor" mode of expression which is even more restricted than the "one neuron-one receptor" expression pattern of the microvillous and ciliated olfactory neurons. Importantly, future deorphaning a single sensory receptor would resolve the tuning profile of an entire olfactory sensory neuron population and be crucial for identifying its biological function.

Genetic variation in odorant receptors alters olfactory behavior in a natural population of fruit flies

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Odor-mediated behaviors vary across species but less is known about variations in odor-mediated behaviors within a species. Richgels and Rollmann now investigated in a natural population of fruit flies the contribution of polymorphisms in odorant receptor genes to alterations in odor-mediated behaviors. The authors observed that flies varied in their responses to the structurally-related esters, ethyl and methyl hexanoate. Further, they associated the behavioral variations with polymorphisms in the genomic regions for three odorant receptors that have been shown previously by electrophysiological recordings to be tuned to these esters. Moreover, two further gene polymorphisms in another odorant receptor that have recently been demonstrated to contribute to varying responses to the structurally unrelated compounds, acetophenone and benzaldehyde were associated with altered responses to ethyl hexanoate. The authors conclude that genetic variations at the peripheral sensory stage affect differences in odor-mediated behaviors.

Role of alpha-gustducin in palatal and fungiform taste buds

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Alpha-gustducin is a G protein alpha subunit present in taste receptor cells that functions as a canonical signaling molecule in sweet, bitter, and umami transduction and serves as a 'marker' to classify taste cell types. Unlike some other canonical taste transduction molecules that are uniformly expressed in taste tissues, alpha-gustducin shows an area-dependent expression and function. It is predominantly coexpressed with bitter and rarely with sweet receptors in vallate papillae whereas in fungiform papillae it is frequently coexpressed with sweet receptors. Tomonari et al now examined in the soft palate and fungiform papillae the coexpression of alpha-gustducin with sweet and bitter receptors. They also compared taste-induced responses from the chorda tympani and greater superficial petrosal nerves innervating fungiform papillae and the soft palate, respectively, of wild-type mice with those of alpha-gustducin KO mice. The authors found that in both taste tissues the G-protein subunit was present in the vast majority of sweet receptor cells explaining the diminished responses to sweeteners in both gustatory nerves of the alpha-gustducin null mice. Although the G protein subunit was also found in almost 90% of the bitter sensor cells in both tissues, only the responses in the greater superficial petrosal nerve to two prototypical bitter stimuli declined in the gene-targeted mice whereas nerve responses did not differ in the Chorda tympani. Based on their data the authors conclude that alpha-gustducin is critical for sweet transduction in both palatal and fungiform taste cells. They also propose that other G protein alpha-subunits that are coexpressed with alpha-gustducin in the fungiform bitter sensor cells are sufficient for responses to the two prototypical bitter substances. Finally, they suggest that alpha-gustducin-dependent mechanisms generating robust bitter responses in the greater superficial petrosal nerve are absent in the fungiform papillae.

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