Chem. Senses 35: 645–646, 2010 doi:10.1093/chemse/bjq097

IN THIS ISSUE

Articles Highlighted

Phospholipid Signaling in Taste Responses of *Drosophila*

Page 663

The *Drosophila* gustatory system, like that in mammals, detects sugars through heptahelical receptors. The fly gustatory receptor neurons express 68 gustatory receptors, Grs, most of which function in contact chemosensation detecting ''sweet'' or ''bitter'' compounds or nonvolatile pheromones. One of these receptors, Gr5a, is sensitive to the sugar trehalose. Mutant flies with defective Gr5a show behavioral and electrophysiological deficits toward trehalose. Gr5a expressing gustatory neurons coexpress the guanine nucleotide regulatory (G) protein Gαs that stimulates adenylyl cyclase activity. Gαs mutant flies show impaired responses to trehalose. However, the observation that sensitivity to trehalose is not completely abolished suggests that other transduction pathways function in trehalose detection. Kain et al. now used green fluorescent protein reporter to monitor expression of Gq, a G protein that stimulates phosphoinositide signaling, in the flies' gustatory neurons. Gq mutant flies and flies with knocked down Gq levels demonstrated impaired behavioral responses to trehalose which could be rescued by targeted expression of a wild-type Gq transgene in the gustatory receptor neurons. Thus, different transduction pathways appear to operate in *Drosophila* trehalose-sensing gustatory receptor neurons to mediate adequate behavioral output.

Genetics of Tasting the Bitterness of the Plant Toxin Goitrin

Page 685

Numerous cruciferous vegetables produce noxious secondary metabolites as chemical weapons to deter herbivores. One abundant of these compounds is goitrin, a bitter tasting potent inhibitor of thyroid peroxidase. The consumption of goitrin can therefore diminish thyroid hormone synthesis and constitute a risk factor for thyroid disorders in iodine-deficient populations. Goitrin structurally resembles propylthiouracil (PROP) and phenylthiocarbamide (PTC). Due to mutations in the bitter taste receptor gene *TAS2R38*, these compounds are tasteless to some people, whereas others perceive them as intensely bitter. Similarly, mutations of *TASR38* are associated with the perceived bitterness of cruciferous vegetables releasing goitrin. Together, these observations suggest that TAS2R38 is a receptor for goitrin and that bitter taste responses to goitrin depend on *TAS2R38* haplotypes. Wooding et al. examined the relationships between genetic variation in the *TAS2R38* gene, functional variation in the encoded receptor, and bitter threshold responses to goitrin as well as to PROP and PTC in subjects. The data revealed that taste responses to goitrin were associated with those for PROP and PTC. Goitrin robustly activated the sensitive TAS2R38 variant in cellular receptor assays, although with lower potency and efficacy compared with PROP and PTC. The insensitive TAS2R38 variant did not respond to stimulation with either compound. Finally, it was found that taste responses to goitrin were associated with mutations in the *TAS2R38* gene. The mutations were the same found previously to be crucial for perceiving the bitterness of PROP and PTC. However, these mutations accounted for a smaller proportion of variance in tasting goitrin relative to PROP and PTC. Thus, whereas mutations in *TAS2R38* play a role in shaping goitrin perception, the majority of variance must be explained by other, still unknown, factors

An Integrated Orosensory Module in the Human Anterior Ventral Insula

Page 693

The flavor that we perceive, when we eat or drink, contains a strong orosensory component generated by gustation and somatosensation. Even a single taste stimulus can elicit gustatory as well as somatosensory responses. Although the 2 types of input signals are carried by different nerves they join in the central nerves system resulting in overlapping representations of gustatory and somatosensory information in various areas involved in crossmodal integration. One such area is the anterior insular cortex. However, the influence of taste modality and physiological significance upon the representation of oral stimulation remained unknown. Using functional magnetic resonance imaging and nutritive or aversive taste stimuli as well as a somatosensory stimulus, Rudenga et al. asked whether the physiological significance

of tastants is represented independently of their taste per se. The authors observed a region of the anterior ventral insula that responded to oral stimulation irrespective of taste modality or physiological significance, suggesting that this region is involved in the global flavor experience. Differential activation was seen for nutritive stimuli preferentially activating the Rolandic operculum and potentially harmful stimuli preferentially activating the frontal operculum. Nutritive stimuli also resulted in greater connectivity between the insula and various sites of a feeding network relative to potentially harmful stimuli. No differential connectivity was observed when gustatory and chemesthetic stimulation was compared. Thus, the data point to the existence of a flavor system in the anterior insula that reflects the physiological value of a taste stimulus.

Wolfgang Meyerhof