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Articles Highlighted

Facilitative Glucose and Monocarboxylate/ H^+ Transporters in Rat Olfactory Epithelium

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Intercellular metabolic interactions are crucial for the integrity of all tissues including the olfactory sensory epithelium which is characterized by a highly organized cytoarchitecture formed by the polarized olfactory sensory neurons, supporting cells, and Bowman's gland duct cells. The endothelial cells of the capillaries run along the lamina propria and express tight junction proteins, suggesting the presence of a blood–mucosa barrier and the existence of special supply pathways for metabolites. Nunez-Parra et al. now examined the expression and distribution of various key transport molecules in the olfactory mucosa, that is, members of the facilitative glucose (GLUT) and monocarboxylate/H^+ (MCT) transporters. They found that the endothelial cells exhibit GLUT1, which transfers its substrate from the blood into the interstitial space, and MCT1, by which lactate is released into the extracellular space. Similarly, sensory neurons and supportive cells express GLUT1 at their basolateral and apical aspects. However, the latter additionally contain GLUT3, a high-affinity glucose transporter, and MCT1 at the apical parts. Cells of the Bowman's glands express GLUT1 and GLUT3, as well as the high-affinity carboxylate transporter MCT2. Based on their observation, the authors propose energetic coupling between supportive cells and Bowman's gland cells as well as sensory neurons. Glucose, incorporated from endothelial cells into supportive cells, is metabolized to lactate which in turn is transferred to Bowman's gland duct cells as metabolic fuel. Furthermore, supportive cells could also export glucose and lactate to the mucous layer to supply the cilia of the sensory receptor neurons with energy.

Subunit Contributions to Insect Olfactory Receptor Function

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Insect olfactory receptors are heteromeric ligand-gated ion channels composed of Orco, a common subunit and another subunit that confers odorant specificity. However, little is known about the subunit's individual contribution to the receptor's function. Nichols et al. now investigated *Drosophila* olfactory receptors by heterologous expression in *Xenopus laevis* oocytes. They found that the cation channel blocker, ruthenium red, inhibited the Drosophila olfactory receptors to different extents depending on the specific subunits present in the heteromer, suggesting that the specific subunits contribute to ion pore formation. Receptors heteromers that were assembled from Orco and a specific subunit of different insect species exhibited similar odorant response profiles, suggesting that Orco does not engage in the formation of the odorant-binding site. Together, the findings favor specific arrangements of the subunits in the insect olfactory receptor complex.

Terminal Disulfide Bonds and the Sweetness of Brazzein

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Sweetness is mediated by a single receptor composed of 2 subunits, T1R2 and T1R3 of class C G protein–coupled receptors, characterized by large amino-terminal extracellular domains that form so-called Venus fly trap binding motifs. Brazzein is a 54-amino acid sweet-tasting protein. It is much larger than small molecule sweeteners, and its interaction with the sweet receptor molecule is not well understood. Proposed receptor interaction sites of brazzein include 2 surface loops and a disulfide bond that connects the amino- and carboxy-termini. Dittli et al. now examined the importance of the termini for the sweetness activity of brazzein by shifting the position of the disulfide bond through mutation and recombinant bacterial expression. The structure of the variant as revealed by high-resolution nuclear magnetic resonance spectroscopy is characterized by extended β-structure of the terminal β-strands and increased dynamics relative to wild-type brazzein. In vitro assays revealed only a modest impairment of the variant to activate the sweet receptor. Thus, the data propose that the termini are not the primary site for brazzein–sweet taste receptor interaction even though they are necessary for full action of this sweet protein.

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