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Articles Highlighted

Seasonal Variation in Toad Olfactory Receptor Neurons and Olfactory Sensitivity

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Each spring, many amphibians migrate to and from their breeding sites, which are often their birthplaces. Exact orientation along the migration route requires a functional olfactory system, suggesting that olfactory cues are critical for path finding. Nakazawa et al. now show in *Bufo japonicus* that the density of olfactory sensory neurons increases gradually in the intermediate layer of the olfactory epithelium during the torpid period peaking in the early breeding period and declining to lowest levels at the end of the foraging period. The additional neurons were created by increased proliferation rates in the basal layer of the olfactory epithelium from where they migrated into the intermediate layer. The altered density of olfactory sensory neurons correlated well with variations in the animals' sensitivity for the odorant isoamyl acetate as assessed by recording electroolfactograms. The data suggest that toads modify the number of olfactory receptor neurons to gain higher olfactory sensitivity that is apparently required for navigation during migration.

Olfaction and Experience-Conditioned Sucrose Preference in Sweet-Ageusic Mice

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Engineered mice lacking a functional gene for the sweet taste receptor-specific subunit T1R3 still develop significant preference for sucrose during long-term exposure to the sugar. Zukerman et al. report now on the role of olfaction in this experience-conditioned sucrose preference. They offered knockout and wild-type mice increasing concentrations of sucrose or water prior to olfactory bulbectomy or sham operation. When the authors retested the animals with sucrose, sham-operated knockout mice preferred all sugar solution over water, though less pronounced than their wild-type counterparts. In marked contrast, knockout mice without olfactory bulbs showed almost no preference for dilute sucrose solutions compared with anosmic wild-type mice. However, they still had strong preference for concentrated sugar solutions. Anosmic mice of both genotypes consumed less dilute but more concentrated sucrose solutions than sham-operated animals did. The results demonstrate a critical role of olfaction in conditioned sucrose preference in mice lacking the T1R3 sweet taste receptor subunit. They also highlight the importance of post-oral nutritive mechanisms for ingestive behavior. Finally, the report also suggests that the role of olfaction should not be ignored in studies of gustatory abilities of laboratory animals.

Function of Olfactory Sensory Neurons During Aging

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The sense of smell changes for the worse in normal aging, but underlying mechanisms have not yet been uncovered. Lee et al. now investigated in 3- to 27-months-old mice 2 factors that critically define odor sensitivity, that is, number and sensitivity of olfactory receptor neurons. By *in situ* hybridization, these authors observed maximal densities of neurons expressing individual olfactory receptors in the olfactory epithelium at different ages. Moreover, an age-related decline was seen for only 6 out of the 9 neuronal populations. Next, the authors patch-clamp recorded odorant responses elicited by lyral from individual sensory neurons expressing the odorant receptor MOR23 and green fluorescent protein. No obvious differences were seen when aged and younger mice were compared. The data indicate that individual olfactory sensory neurons can maintain their sensitivity, even though the number of certain types of sensory neurons may shrink during aging. Thus, alterations of the olfactory epithelium alone cannot account for the loss of smell in advanced ages.

The Attractive Scent of Male Urine

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Rats use urine volatiles for communication, yet the levels of certain volatile constituents depend on sex and maturity. Osada et al. conducted chemical and behavioral studies to identify volatiles that attract mature females. They found 3 compounds with higher levels in adult male urine relative to urine of prepubescent male rats. Supplementing urine of juvenile males with appropriate levels of these compounds enhanced attraction of females markedly. The authors conclude that chemosignaling underlies this behavioral response.

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