(while ignoring other important processing steps, e.g. within the receptor neurons themselves). I propose that the main difference between mushroom bodies and lateral protocerebrum is not about learned vs. innate behavior. Rather, mushroom bodies perform odor identification, while the lateral protocerebrum performs odor evaluation (both learned and innate). I will discuss the concepts of labeled line and combinatorial coding and postulate that under restrictive experimental conditions, these networks lead to an apparent existence of “labeled line” coding for special odors. Modulatory and peptidergic networks are proposed as switches between different evaluating systems in the lateral protocerebrum.

Development of flavour perception & preference

John Prescott

Like any complex behavior, food preferences and choices reflect the action – and interaction - of genetic, learning and cultural factors. Three distinct learning processes – exposure, flavor-flavour conditioning, flavour-nutrient conditioning – underlie the development from innate taste preferences to preferences for flavours and foods. However, these processes operate within the constraints of individual differences in taste genetics and anatomy, which determine the nature and strength of conditioned responses. Culture is probably the most pervasive influence on food choices, since it operates even prior to birth through the transmission of “flavor principles” from the mother’s diet. Too, the impact of variations in underlying physiology/genetics will take place within a cultural context. Thus, while certain foods or beverages may be intrinsic to a culture, there is evidence that individuals modify foods to take account of their individual sensitivity. Thus, recent data have shown a relationship between the amount of sugar added to coffee and the density of fungiform papillae. Cognitive influences on food preferences are less well understood, but are nevertheless highly important. Exposure to a novel flavor can result in increased liking, but this depends on how attention is directed to the stimulus. Similarly, pairing a liked taste with a novel flavor results in an increased liking for that flavor – but only when the taste and flavor are attended synthetically as a “flavour object”. Understanding the mechanisms underlying food preference development also provides insight into increasing consumption of high-energy foods and the difficulty in maintaining low energy diets. Cues to the energy that foods provide elicit conditioned wanting, while eliminating high-energy foods from the diet increases vulnerability to these cues, manifested as hedonic hunger.

Sexual behavior under olfactory control: from invertebrates to human

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Chemosignals are probably the signals that play the most important role in the control of sexual behaviour across both vertebrates and invertebrates. In this symposium, we propose speakers that will provide a broad overview of the actions of chemosignals in the context of sexual behaviour and sexual interactions. These presentations will illustrate this action in a wide diversity of animal models, ranging from invertebrates to vertebrates, including human. We have chosen 3 presentations dedicated to various aspects of this field and that will respectively illustrate the olfactory switch-off of male moth after mating. (C. Gadenne, FR); the control of pheromone-stimulated sexual and reproductive behaviors in mice by vomeronasal G protein G alpha; and finally the responses of gender dysorphic children and adolescents to sexual odors such as androstadienone (J. Bakker, Amsterdam, NL and Liège, BE). Because the proposal covers both a range of species, and various approaches and techniques including electrophysiology, behaviour or fMRI, we hope that this symposium will stimulate interest from a wide variety of researchers in the ECRO community, investigating questions across levels of analysis. We hope that the proposal will gather the attention of the programme committee for the 2014 ECRO meeting.

Post-mating olfactory switch-off in a male moth: Smell, Sex, and Stop!

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In the male moth, Agrotis ipsilon, mating induces a transient inhibition of behavioural and central nervous responses to sex pheromone. Newly mated males are not attracted to sex pheromone, and the sensitivity of their antennal lobe (AL) neurons is lower than in virgin males. This transient olfactory inhibition takes place very early after the onset of the 2 h-copulation (a few minutes) and lasts during the whole scotophase. This switch-off prevents males from re-mating unsuccessfully until they have refilled their sex glands with the proteins that are needed for the production of a spermatophore. The mating-dependent olfactory plasticity is restricted to pheromone perception: newly-mated males still respond to plant odours. Moreover, the sex pheromone becomes inhibitory by differential central processing: below a specific threshold, it is not detected within the AL; above this threshold, it becomes inhibitory, preventing newly-mated males from responding even to plant odours. To explain the mechanisms of this rapid and transient olfactory switch-off, we have studied the role of biogenic amines such as octopamine (OA) and serotonin (5HT), and of hormones such as 20-hydroxyecdysone (20E). Amine treatments did not restore the behavioural pheromone response of mated moths. Although AL neuron sensitivity increased in newly mated males after injection of OA or 5-HT, only OA treatment affected certain response characteristics of AL neurons in virgin males. Whereas all measured AL neuron response characteristics were different between virgin and
A wide range of pheromone-stimulated sexual and reproductive behaviors in female mice depend on G protein Gαo

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Optimal reproductive fitness is essential for the biological success and survival of species. The vomeronasal organ (VNO) is strongly implicated in the display of sexual and reproductive behaviors in female mice, yet the roles that apical and basal vomeronasal neuron populations play in controlling these gender-specific behaviors remain largely unclear. To dissect the neural pathways underlying these functions, we genetically inactivated the basal VNO layer using conditional, cell-specific ablation of the G protein Gαo. Female mice mutant for Gαo show severe alterations in sexual and reproductive behaviors, timing of puberty onset, and estrous cycle. These mutant mice are insensitive to reproductive facilitation stimulated by male pheromones that accelerate puberty and induce ovulation. Gαo mutant females exhibit a striking reduction in sexual receptivity or lordosis behavior to males, but gender discrimination seems to be intact. These mice also show a loss in male scent preference that requires a learned association for volatile olfactory signals with other nonvolatile ownership signals that are contained in the high molecular weight fraction of male urine. Thus, Gαo impacts on both instinctive and learned social responses to pheromones. These results highlight that sensory neurons of the Gαo-expressing vomeronasal subsystem, together with the receptors they express and the molecular cues they detect, control a wide range of fundamental mating and reproductive behaviors in female mice.

Hypothalamic response to the chemo-signal androstadienone in gender dysphoric children and adolescents

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The odorous steroid androstadienone, a putative male chemo-signal, was previously reported to evoke sex differences in hypothalamic activation in adult heterosexual men and women. In order to investigate whether puberty modulated this sex difference in response to androstadienone we measured the hypothalamic responsiveness to this chemo-signal in 39 prepubertal and 41 adolescent boys and girls by means of functional magnetic resonance imaging. We then investigated whether 36 prepubertal children and 38 adolescents diagnosed with Gender Dysphoria (GD; DSM-5) exhibited sex-atypical (in accordance with their experienced gender), rather than sex-typical (in accordance with their natal sex) hypothalamic activations during olfactory stimulation with androstadienone. We found that the sex difference in responsiveness to androstadienone was already present in prepubertal control children and thus likely developed during early perinatal development instead of during sexual maturation. Adolescent girls and boys with GD both responded remarkably like their experienced gender, thus sex-atypical. In contrast, prepubertal girls with GD showed neither a typically male nor female hypothalamic activation pattern and prepubertal boys with GD had hypothalamic activations in response to androstadienone that were similar to control boys, thus sex-typical. We present here a unique data set of boys and girls diagnosed with GD at two different developmental stages, showing that these children possess certain sex-atypical functional brain characteristics and may have undergone atypical sexual differentiation of the brain.

The Role of Glucocorticoids in Reception of Sex Pheromones in the House Mouse

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Olfactory cues play an important role in regulation of complex forms of social behavior including sexual behavior in mammals. A number of studies demonstrated a direct involvement of accessory olfactory system in regulation of male sexual