ACTIVITY IN THE NUCLEUS ACCUMBENS CORE NEURONS REFLECTS BEHAVIORAL MODE CHANGE IN THE RAT

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Neuronal activities within the core and shell regions of the nucleus accumbens (NAcc) were investigated in freely-moving rats during their food-seeking behavioral task on an 8-arm radial maze. In this task, rats learned a consistent pattern of sequential visiting to the arms for reward-seeking and post-seeking automatic switching of behavior mode from food-seeking to explorative one. Forty percents of the neural activity recorded in the core region occurred in behavioral contexts: pre-seeking, reward seeking, or post-seeking phase. Fifteen percents of neurons in the shell region of the NAcc displayed clear changes in activity during the three phases of the test session. Collectively these data suggest that the activities of Nacc core neurons represents behavioral context in a well-trained reward-directed seeking and in behavioral switching upon task completion to exploration.

EXPRESSION OF GnRH RECEPTOR GENES IN THE DWARF GOURAMI (*COLISA LALIA*) BRAIN AS REVEALED BY *IN SITU* HYBRIDIZATION

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Three different GnRH (gonadotropin releasing hormone) neuronal systems generally exist in the vertebrate brains. They synthesize different GnRH molecules and are also structurally as well as functionally diverse. The dwarf gourami brain has great advantages for the study of GnRH neurons, and we have suggested the neuromodulatory function of the terminal nerve (TN-) GnRH systems based on its widespread distribution of GnRH immunoreactive fibers throughout the brain. To clarify the distribution of GnRH target neurons, we first characterized partial sequences of three distinct GnRH receptor (GnRHR) cDNAs from the gourami brain. The cloned GnRHRs (dgGnRHRs 1-1, 1-2 and 2-1) were divided into two distinct lineages: type 1 and 2. *In situ* hybridization demonstrated that these three types of receptor genes were expressed in various brain regions including TN-GnRH neurons, optic tectum and cerebellar Purkinje cells. The wide-spread distribution of GnRHRs in various brain regions may support our hypothesis about the wide-spread neuromodulatory function of the TN-GnRH system. The expression of GnRHR in TN-GnRH neurons supports the autocrine/paracrine regulation of TN-GnRH neuron activities.

GnRH RECEPTORS AND LIGANDS IN TELEOST TN-GnRH NEURONS

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A decapeptide hormone GnRH does not only facilitate the gonadotropin release from the pituitary but acts as a neuromodulator in the brain. Single-cell reverse transcription of mRNA and amplification of cDNAs by polymerase chain reaction (sc RT-PCR) approach was used to identify GnRH receptors (GnRHR's) and peptides expressed in terminal-nerve GnRH (TN-GnRH) neurons of the dwarf gourami (*Colisa lalia*).After recording the spontaneous pacemaker activity of TN-GnRH neurons in the whole-cell current clamp-mode, the cytoplasm was harvested, and mRNAs were reverse transcribed into cDNA. Two-step amplification of cDNAs demonstrated that TN-GnRH neurons express three types of GnRHR cloned so far in our laboratory: dwarf gourami (dg) GnRHR1-1, 1-2 and dgGnRH2. scRT-PCR data also proved that cytoplasm of TN-GnRH neurons contains high amount of salmon GnRH peptide mRNA transcripts.In summary, our data confirm the results previously obtained with the help of various methods: TN-GnRH neurons produce and release salmon GnRH peptide, and their electrical activity is modulated through GnRHR's, probably in an autocrine/paracrine fashion.

A NOVEL *C. ELEGANS* TRANSCRIPTION FACTOR MBR-1 IS INVOLVED IN OLFACTORY PLASTICITY AND AXON PRUNING

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Elimination of excessive neurites occurs commonly for the construction of functional neural circuits. The molecular basis of this phenomenon, however, is poorly understood. Here, we provide evidence that specific neurites of the simple model animal *C. elegans* also undergo elimination and that MBR-1, a novel transcription factor involved in olfactory plasticity, is involved in this process.

Expression analysis revealed that MBR-1 is localized to the nuclei of various neurons. We compared the morphology of the *mbr-1*-expressing neurons between wild-type and *mbr-1* mutants. An extra pair of neurites, which connects the AIM neurons, was observed in the *mbr-1* mutant adults. This connection, however, was observed also in the wild-type at the early larval stages. These results indicate that these neurites are eliminated during the larval stages and that MBR-1 is involved in this process. Furthermore, we found that expression of *zig-3*, which encodes a secretory protein, is attenuated in the AIM neurons in the *mbr-1* mutants, suggesting that MBR-1 regulates the expression of *zig-3*.

MORPHOLOGICAL COLOR CHANGES CAUSED BY LONG-TERM BACKGROUND ADAPTATION IN ZEBRAFISH, *DANIO RERIO*

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In zebrafish, it is known that the striped color patterns in the flanks result from chromatophores deep within the dermis or hypodermis, while superficial melanophores associated with dermal scales add a dark tint to the dorsal coloration. We compared responses of these chromatophores during the long-term adaptation of zebrafish to a white or black background. Within a week, the superficial melanophores and iridophores showed apparent changes in their density and/or areas of distribution along the dorso-ventral axis. These changes adopted the dorsal skin color and the hue of the flank color pattern to the background, but did not affect the striped pattern. The increase and decrease in superficial melanophores are thought to be caused by apoptosis and differentiation, respectively. These results indicate that superficial chromatophores play an important role in background adaptation. When the adaptation period was prolonged more than several months, the striped color pattern was affected by changes in the width of the three melanophore stripes. Stripe III in white-adapted fish was interrupted by the invasion of yellowish interstripe.

SIGNALING PATHWAY OF UVA LIGHT IN NILE TILAPIA ERYTHROPHORES

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In addition to visible light, UVA light was found to induce photoresponce in Nile tilapia erythrophores in the primary culture: Pigment aggregation occurred in response to UVA with a peak wavelength of 365 nm, and this response was reversible. In k^+-rich solution, pigment aggregation was also caused by application of UVA. Using split-fin fin preparations, the effects of D-600, a Ca^{2+} channel blocker, and TTX, a potent Na^+ channel blocker, on UVA-induced aggregation were examined. Both chemicals did not affect the photo-sensitive response. W-7, an inhibitor of Ca^{2+}/calmodulin complex, also did not arrest the response. In contrast, forskolin, an adenylate cyclase (AC) stimulating agent, and theophylline, a blocker of cyclic AMP phosphodiesterase, inhibited the pigment aggregation by UVA in a dose-dependent manner. From these results, it is suggested that stimulation with UVA may be accompanied by a decrease in cytosolic cAMP level, which is probably caused by an inhibition of AC activity through Gi protein. The effect of pertussis toxin is now examining.

EFFECTS OF SEROTONIN AND RELATED DRUGS ON THE PERIODIC UREA EXCRETION OF UREOGENIC GOBY, ABEHAZE (*MUGILOGOBIUS ABEI*)

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Only very few teleosts are known to produce urea through O-U cycle. Abehaze not only exhibits ureogenesis, but also excretes urea with a very clear daily periodicity. Under all photoperiods examined, urea was excreted during the light phase. When a light phase was reversed, the periodicity of excretion was entrained within 48h. When the fish was immersed in 200 ppm serotonin solution, a significant increase in urea excretion during the dark phase. This result suggests a role for serotonin in cntrolling the periodicity of urea excretion. In the present study, effects of several drugs affected on serotonin receptors such as a tricyclic antidepressant agent, clomipramine and antagonist, methiothepin on a periodic urea excretion of this goby were tested.

IDENTIFICATION OF VAGAL BRANCHES INNERVATING THE UPPER ESOPHAGEAL SPHINCTER MUSCLE IN THE SEAWATER EEL

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When the eel drinks sea water, the upper esophageal sphincter muscle (UES) must be relaxed. The UES is innervated chlinergically by the glossopharyngeal-vagal motor complex (GVC) in the medulla oblongata (Mukuda & Ando, 2003; Kozaka & Ando, 2003). However, it is not identified yet which vagal branch is the efferent or affrent nerve innervating the UES. The present study aimed to identify such effent and afferent branches in the vagal nerves. Eel vagal nerve consisted of 10 branches, and named as X1 to X10. When the X5 branch was stimulated electrically, the balloon inserted into the upper esophagus was pressed, and the optimal frequency was 20 Hz.