or stability of one or more oscillator components, which consequently resets the phase of the oscillation. In our system, light act as a resetting signal via an artificial light switch. The switch is based on the light-dependent interaction between the plant photoreceptor phytochrome A (PHYA) and its specific interacting protein FAR-RED ELONGATED HYPOCOTYL 1 (FHY1) [Hiltbrunner, 2005]. The activator and the DNA-binding domain of the GAL4 transcription factor are fused to FHY1 and PHYA, respectively, so transcription from GAL4-dependent promoters is activated only by the physical interaction between PHYA and FHY1 in mutant yeast cells lacking the endogenous GAL4 protein. Red light converts PHYA to its active form, which interacts with FHY1; however, far-red light diminishes the interaction, because it converts PHYA to its inactive conformer. To test the function of the light switch we measured expression of the GAL1 promoter driven luciferase reporter gene (GAL1:LUC+). We showed that luciferase activity is tightly controlled by red or far-red light pulses indicating the proper function of the light switch.

The core components of the oscillator (termed "Yeascillator") are represented by two artificial genes whose gene products can mutually regulate transcription of each other. Expression of the positive protein [Gari, 1997] is driven by a modular promoter, which contains cis-elements for copper induction and for binding of the negative component protein. The basal activity of this promoter is controlled by copper in the media. The positive protein is a fusion between the tetracycline-responsive transactivator (tTA) and the YFP proteins. tTA-YFP is able to bind to a specific cis-element (*tetO*) built in the promoter of the second gene encoding the negative protein. Binding of tTA-YFP can be controlled by doxycycline and results in the activation transcription. The negative protein consists of the DNA-binding domain of the bacterial LexA protein, the yeast transcriptional repressor SSN6 and the CFP proteins. LexA-CFP-SSN6 binds to the modular promoter of the first gene via specific LexA binding sites and represses transcription. The different fluorescent protein tags (YFP and CFP) allow simultaneous detection and quantification of the positive and negative protein components. The output of the oscillator is represented LUC+ reporter gene controlled by a promoter, which responds to the positive component only. Our preliminary results indicate that the two genes can regulate each other as expected, but detection of oscillation will require more optimizations.

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Supervisors: Laszlo Kozma-Bognar and Ferenc Nagy
E-mail: kapusa@brc.hu

Regulation of single spike initiated feed-forward networks through 5-HT-2 receptors in the human and rat cerebral cortex

Gergely Komlósi[1], Szabolcs Oláh[1], Gábor Molnár[1], Miklós Füle[1], Noémi Molnár[1], Pál Barzó[2], Gábor Tamás[1]

[1]Research Group for Cortical Microcircuits of the Hungarian Academy of Sciences, University of Szeged, Szeged, Hungary; [2]Department of Neurosurgery, University of Szeged, Szeged, Hungary

The performance of the human cerebral cortex is unparalleled by the nervous system of other species and this is presumably supported by refined, but largely unknown features of the human microcircuit. We have shown that single action potentials in pyramidal cells can trigger reliable and stereotyped series of multiple postsynaptic potentials in simultaneously recorded pyramidal cells and interneurons in the human cerebral cortex. These polysynaptic event series are composed of alternating excitatory and inhibitory postsynaptic potentials lasting up to tens of milliseconds (Molnar, Olah et al. 2008).

We tested how these complex network events could be affected by the endogenous neurotransmitter serotonin known to be involved in several physiological processes, and implicated in many psychiatric disorders (Jones and Blackburn 2002). We recorded from pairs, triplets and quadruplets of neurons in slices of human association cortices looking for mono- and polysynaptic connections. Nanomolar concentrations of serotonin reversibly supressed single pyramidal spike activated di- and polysynaptic events, and this effect could be mimicked by the 5-HT-2 receptor agonist alpha-methylserotonin. Similarly, alpha-methylserotonin was effective in eliminating axo-axonic cell triggered polysynaptic but not disynaptic events.

We then investigated the effect of serotonin on monosynaptic unitary connections between various types of layer 2/3 neurons. We found that serotonin and alpha-methylserotonin decreased the amplitude of EPSPs between pyramidal cells and from pyramidal to various types of interneurons including fast-spiking basket and axo-axonic cells but little or did not change the amplitude of IPSPs from fast-spiking to pyramidal neurons.

To examine the mechanism by which serotonin might modulate excitatory transmission, we analysed the percentage of failures to evoke an EPSP and the coefficient of variation of unitary EPSP amplitudes with and without serotonin and alpha-methylserotonin. Both serotonin and alpha-methylserotonin increased the failure rate and the coefficient of variation suggesting a presynaptic site of modulation of serotonin in the glutamatergic synaptic transmission.

Finally, we found that therapeutic concentrations of the serotonin reuptake inhibitor fluoxetine, a widely prescribed medication for treatment of depression, could enhance the effect of serotonin on excitatory synaptic transmission.

In conclusion, activation of 5-HT2 receptors can eliminate pyramidal cell activated feed-forward network events presumably via down-regulation of glutamate release probability in pyramidal axon terminals.

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Supervisor: Gábor Tamás
E-mail: komgeri@bio.u-szeged.hu

Identification of potential mycotoxin producing *Fusarium* species in Hungarian wheat grain samples

Zsuzsanna Koncz

Eszterházy Károly College, EGERFOOD Regional Knowledge Centre, Eger, Hungary

Fusarium Head Blight (FHB) is a disease complex of cereals, in which several fungal species may cause symptoms. The species found as the major cause of head blight of wheat are *F. graminearum* and *F. culmorum*. Less frequently isolated species are *F. acuminatum*, *F. avenaceum*, *F. poae* and *F. sporotrichioides*. FHB can significantly reduce grain yield and quality.

Fusarium species are known as mycotoxin producers. The most predominant mycotoxins found in small-grain cereals are 8-ketotrichothecenes such as deoxynivalenol (DON) and nivalenol (NIV) and their acetylated derivatives including 3-acetyldeoxynivalenol (3-ADON) and 15-ADON, as well as an oestrogenic mycotoxin, zearalenone (Mirocha et al. 1989). A less frequently examined mycotoxin group is of the enniatins (ENs). *F. avenaceum*, *F. poae*, *F. sporotrichioides* and *F. tricinctum* are the main sources of ENs (Nicholson et al. 2004, Ivanova et al. 2006).

Species identification of mycotoxin-producing *Fusarium* species is of high importance in relation to FHB. The polymerase chain reaction (PCR) is a useful technique for the identification and differentiation of *Fusarium* species.

The aim of this study was to apply species-specific PCR-based assay for the identification of *Fusarium* species from Hungarian wheat grains. After processing 75 wheat samples of different geographical origin we isolated 255 *Fusarium* strains. Identification with species-specific PCR primers revealed the following species distribution: *F. acuminatum* 7.5 %, *F. avenaceum* 8.5 %, *F. graminearum* 37.5 %, *F. poae* 30.5 % and *F. sporotrichioides* 16 %. The results were confirmed by morphological identification after culturing the isolates on potato dextrose agar plates.

In addition to the species identification, we also performed PCR reactions to reveal the presence/absence of genes responsible for the production of several toxins (DON, 3-ADON, 15-ADON, NIV and ENs) in the *Fusarium* isolates. *F. graminearum* proved to be the most important fungus responsible for different diseases of small-grain cereals in Hungary. We used diagnostic primer sets, based on the *Tri3* (3-ADON and 15-ADON), *Tri5* (DON) and *Tri7* (NIV) trichothecene genes (Qurta et al. 2006), in multiplex PCR for the detection of *F. graminearum* chemotypes. An additional primer set was used to detect the *esyn1* gene (Kulik et al. 2007) for the detection of potential enniatin-producing *F. avenaceum*, *F. poae* and *F. sporotrichioides* species.

The investigated 96 *F. graminearum* isolates were potential producers of both DON and NIV toxins. The chemotypes were the following: DON 1 isolate, DON-NIV 1 isolate, DON-15-ADON 94 isolates. There was no isolate found containing the gene responsible for 3-ADON production. Our results suggest that strains of *F. graminearum* prevailing in Hungarian wheat-growing regions belong mainly to the DON-15-ADON chemotype.

Each of the examined *F. avenaceum*, *F. poae* and *F. sporotrichioides* isolates were positive for the *esyn1* gene, except two *F. poae* isolates. This is the first data set of enniatin-producing potential of Hungarian *Fusarium* isolates and shows that toxic potential of these strains may be underestimated.

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Supervisors: János Varga, Árpád Szécsi
E-mail: koncz.zsu@gmail.com