2P381

Controlling neurite differentiation by single cell neurite's elongation pattern and length using agarose micro chamber method.

○Tetsuo Kitamura, Ikurou Suzuki, Tomoyuki Kaneko, Kenji Yasuda

Department of Life Sciences, Graduate School of Arts And Sciences, The University of Tokyo

We have developed a technique to control the growth direction of axon/dendrite selectively on agarose microchamber(AMC). AMC enables flexible and precise control of elongation length and pattern. We observe varied pattern of controlled neurite-elongation. For example, microchamber have two inverse direction straight microchannel with varied length, microchamber have two inverse direction microchannel with branching varied point, et al. We are using fluorochrome-labeled second antibody staining and conducting an electrophysiologic study. We classify relationship between differentiation and designs. And we found a key to differentiation control. This work set the goal to establish the method of research the neuronal system by synthetic biologic approach.

2P382

Analysis of acute corticosterone effects on NMDA receptor-mediated Ca^{2+} signals in mouse hippocampal slices

○Hiromi Osanai¹, Yoshimasa Komatsuzaki¹, Suguru Kawato², Minoru Saito¹

¹Grad. Sch. of Int. Sci., Nihon Univ., ²Grad. Sch. of Arts and Sci., Tokyo Univ.

Corticosterone (CORT) is a principal glucocorticoid synthesized in the rodent adrenal cortex and secreted in response to stress. We examined the rapid effects of CORT on N-methyl-D-aspartate (NMDA) receptor-mediated Ca^{2+} signals in adult mouse hippocampal slices by using Ca^{2+} imaging technique. Application of NMDA caused a transient elevation of intracellular Ca^{2+} concentration followed by a decay to a plateau within 150 sec. The 30 min preincubation of CORT induced a significant decrease of the peak amplitude of NMDA-induced Ca^{2+} elevation in the CA1 region. The rapid effect of CORT was induced at a stress-induced level (0.4-10 μM). In contrast, CORT induced no significant effects on NMDA-induced Ca^{2+} signals in the dentate gyrus. In the CA3 region, CORT effects were not evaluated, because the marked elevation of NMDA-induced Ca^{2+} signals was not observed there. The membrane non-permeable BSA-conjugated CORT also induced a similar rapid effect in the CA1 region. The rapid effect of CORT should therefore be induced via putative surface CORT receptors. A possible candidate for surface CORT receptors is a classical intracellular glucocorticoid receptor (GR). To confirm this idea, we examined the effects of dexamethasone (DEX, an agonist of GR) and CORT with RU38486 (an antagonist of GR) on NMDA-induced Ca^{2+} signals. As the results, DEX also induced a significant decrease of the peak amplitude of NMDA-induced Ca^{2+} elevation in the CA1 region, and RU38486 inhibited the suppressive CORT effect.

2P383

Neurosteroids rapidly modulate the activity of hippocampal neurons at CA1 region.

○Yuuki Ooishi¹, Suguru Kawato^{2,3}

¹Dept. of Physics, Tokyo Univ., ²Dept. of Arts and Sciences, Tokyo Univ.,

³CREST, JST.

It is well known that stress reduces several activity of brain. The hippocampus is the most prominent target of stress in the brain. These phenomena are caused by glucocorticoids which are synthesized at adrenal gland when suffering from stress. On the other hand, 17 beta estradiol (E2) is one of the neuroprotective factors and rescues neural death caused by several neurotoxins. In this study, we focused on the acute effects of corticosterone and E2 on the synaptic transmission of the rat hippocampal neurons in CA1 region. We chose population spike (PS), related to the hippocampal LTP. The hippocampal slices were perfused with steroids for 30 minutes. We observed that 1 μM corticosterone (stressful concentration) rapidly decreased the magnitude of PS in CA1 region. Glucocorticoid receptor (GR) antagonist RU486 inhibited the PS decrease by CORT, and GR agonist dexamethasone (DEX) decreased PS. It suggests that CORT suppress PS via GR, while E2 rescue this PS suppression induced by CORT. We conclude that E2 shows the acute neuroprotective effect by inhibiting the suppressive effect of CORT.

2P384

Non-genomic rapid effects of estradiol, a xenoestrogen and androgen on hippocampal synapses

○Noritaka Inoue, Mari Ogiue-Ikeda, Norio Takada, Kohei Nakajima, Suguru Kawato

Dept. of Life Sciences, Graduate School of Arts and Sciences, Univ. of Tokyo, MEXT project

Estradiol (E2, female hormone) has a rapid effect on synaptic transmission. Recently, we found that hippocampal neurons express estrogen receptor $\text{ER}\alpha$ at synapses (Tsurugizawa et al., 2005). Endocrine disrupters such as BPA, DES, TBT, NP and OP are thought to be estrogenic or anti-estrogenic. Effects of these endocrine disrupters in the brain attract much attention in scientific as well as social point of view. We investigated the low dose effects of E2 (1-10nM), dihydrotestosterone (DHT, male hormone 1-10nM), DES, BPA, TBT and NP (1-100 nM) on NMDA-induced LTD (long-term depression) in the rat hippocampal slices using a custom made multi-electrode system. E2, DES and BPA enhanced the LTD in CA1, CA3 and DG. NP and OP suppressed the LTD in CA1, but enhanced LTD in CA3. DHT enhanced LTD in CA3 and DG but no effect in CA1. Our results indicate that the action of sex steroids and endocrine disrupters can be quantitatively analyzed by measuring the modulation of LTD of the hippocampal neurons.