2P223 Akt と受容体の生細胞内 1 分子追跡によるシグナル伝達機構の解明

Signal transduction mechanism of Akt revealed by single molecule imaging of Akt and receptor molecules

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This study aims at revealing the mechanism of Akt to produce specific signaling output patterns depending on the input stimuli. Akt in cytosol is recruited to the plasma membrane upon the cell receives external stimuli such as growth factors. The Akt on the plasma membrane is activated and mediates the external signal to downstream molecules to generate specific signal output patterns. The mechanism of specific signal transduction is unknown. The dynamics of Akt on plasma membrane is important to understand the mechanism because the whole signaling events on Akt occur on the plasma membrane. We here show a study of single-molecule imaging of Akt in living cells and will discuss the mechanism of Akt signal transduction.

2P224 細胞性粘菌の走化性シグナル伝達におけるグアニル酸シクラーゼ(sGC)経路の興奮性応答

Excitability of Guanylate Cyclase (sGC) signaling pathway mediating chemotaxis in Dictyostelium cells

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Chemotaxis, the directed migration in chemical gradients, is a vital function in many biological processes such as immune response and synapse formation. Chemotaxis is mediated by some parallel signaling pathways, e.g. PI3K-path, sGC-path and so on. It has been considered that the excitable response to chemoattractant is important to amplify the signal and the previous work showed that PI3K-path response is an excitable system. However, what kind of property sGC-path has is unknown.

By using the pulsed chemoattractant stimulation, we found that sGC response follows all-or-none law and has the refractory period. These features are characteristics of excitable system like PI3K-path. We discuss the chemotactic signaling network consists of multiple excitable pathways.

2P225 モデル生体膜を用いたロドプシン光受容体の脂質ラフト親和性解析

Evaluating the raftophilicity of rhodopsin in a patterned model membrane

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Rhodopsin (Rh) is a photoreceptor that forms a complex with transducin (Gt) upon activation by light. It has been reported that the affinity of Rh to lipid raft (raftophilicity) increases after photoactivation and complexation with Gt (Hayashi et al. ARVO meeting (2011)). To elucidate the roles of the raftophilicity, we are developing a methodology to evaluate the raftophilicity of Rh in a model membrane that has micro-patterned liquid ordered (Lo) (raft model) and liquid disordered (Ld) (non-raft model) domains. We observed that reconstituted Rh and Gt before photoactivation were localized in Ld domains, suggesting their affinity to non-raft bilayers. We discuss on the observed distributions of Rh, Gt and Rh*-Gt complex in the patterned membrane.

2P226 ミミズ非連合学習における NO-cGMP シグナル経路の役割
Role of NO-cGMP signaling in non-associative learning of the earthworm

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Extracellular recording from the ventral nerve cord of the earthworm revealed number of action potentials in the median giant fiber decreased after repeated tactile stimulus to the body wall. NO donor and cGMP analogue also decreased the number of action potentials by single tactile stimulus. Not only cGMP analogue but also guanylate cyclase inhibitor decreased the number of action potentials. These results indicate that cGMP has an excitatory effect on action potential generation, though excess of cGMP reduced the responsibility to tactile stimulus. In conclusion, cGMP in earthworm has a bi-directional effect on neural activity, and the non-associative learning such as habituation in earthworm is assumedly formed due to cGMP accumulation.

2P227 チャコウラナメクジ脳嗅覚中枢における匂い応答の数理解析
Tone-Entropy analysis on odor-evoked neuronal activities in the procerebral lobe of a slug

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We investigate how information is included in the oscillatory activity of procerebrum (PC), an olfactory center of Limax. Here, we analyzed conditioned odor-evoked responses of the PC by using the tone-entropy (T-E) method. The T-E method calculates two indexes: tone which represents a balance between acceleration and inhibition of the oscillatory activity, and entropy which indicates the total activity of physiological mediators. After the administration of conditioned odor, the mean entropy value significantly increased in both naïve and conditioned groups, whereas the mean tone value increased in conditioned group alone. The results suggest that the balance of excitatory and inhibitory synapses in PC is altered with aversive conditioning.

2P228 記憶学習中枢海馬の性差：海馬内ホルモン変動とシナプス変動の解析

Sex difference in hippocampus: Fluctuation of hippocampal sex hormones and synapses

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The hippocampus, a center for learning and memory, does not have sex difference at the anatomical level including its volume and the number of neurons. Nevertheless, the significant sex difference in the performance of hippocampus-dependent task.

We hypothesized that the sex difference in the hippocampal structure exists at more subtle level, that is, synaptic level. A novel software, Spiso-3D, which we developed, allowed us to reveal the sex difference in the density of spines and the fluctuation of synapses in female with a period of 4 days (estrous cycle).

The estrous cycle-dependent fluctuation of the spine density in female rat hippocampus had a good correlation with the cyclic fluctuation of hippocampal levels of female hormones (estradiol and progesterone).