2P241 アナベナセンサリーロドプシンの細胞質側で生じる光誘起プロトン移動反応の解析
Light-induced proton transfer reactions at the cytoplasmic half channel of Anabaena sensory rhodopsin
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The photocycle of Anabaena sensory rhodopsin (ASR), which is the photoreceptor for the cyanobacterial chromatophoric adaptation, was examined by focusing on the H+ transfer reactions. Photoinduced deprotonation of the Schiff base induces the formation of M, I, and N intermediates. However, the M formation of ASR was accompanied with the H+ uptake from the medium. This indicates the contributions of two residues: a H+-accepting residue from the Schiff base and a H+-capturing residue from the medium. The mutation experiments suggested that these residues are assigned to Asp217 and Glu36, respectively, and their protonation states influence each other. We will discuss the relationship between the H+ transfer reactions and the conformational change of ASR.

2P242 海洋性細菌に含まれる光駆動クロライドポンプの分光研究
Spectroscopic study of light-driven chloride pump from marine bacteria
Arisa Mori, Keiichi Inoue, Faisal Hammand Mekky Koua, Yoshitaka Kato, Rei Abe-Yoshizumi, Michio Homma, Hideki Kandori

Thousands of microbial rhodopsins have been recently found from marine bacteria. Most of them are light-driven proton pumps, possessing the DTE motif at the corresponding positions of D85, T89 and D96 in bacteriorhodopsin. In contrast, some rhodopsins contain the NDQ or NTQ motif, which functions as light-driven sodium or chloride pump, respectively. The latter is evolutionally far different from halorhodopsin, and mutant proteins are also used in this study. Molecular mechanism of uni-directional chloride transport will be discussed based on the present results.

2P243 チャネルロドプシンの吸収波長に関する量子化学的研
Quantum chemical study of the absorption maximum of channelrhodopsin
Nami Yoshino, Tomohiko Hayashi, Azuma Matsuura, Tadaomi Furuta, Minoru Sakurai

Herein, the absorption maximum of channelrhodopsin (ChRh) is calculated using our recently developed method in which the whole protein can be treated quantum mechanically at the level of INDO/S-CIS. This calculation successfully reproduced the so-called opsin shift of ChRh. We also applied the same calculation for different mutants, each of which was constructed by replacing any one of the amino acid residues of the wild-type ChRh with Gly. This substitution made it possible to elucidate the extent to which each amino acid contributes to the opsin shift and to estimate the inter-residue synergetic effect. Based on these data, we discuss the spectral tuning mechanism in ChRh.

2P244 固体 13C NMR によるファラオニスマポロドプシンの機能
Conformation of functionally important Tyr residues in pharaoonis photorhodopsin as studied by Solid-State 13C NMR
Ryota Nishikawa, Izuru Kawamura, Takashi Okitsu, Akimori Wada, Yuki Sudo, Naoki Kamo, Akira Naito

The photocycle of ChRh was examined by light-induced FTIR spectroscopy. The results are compared with those of halorhodopsin, and mutant proteins are also used in this study. Molecular mechanism of uni-directional chloride transport will be discussed based on the FTIR spectral comparison with the other visual pigments.

2P245 サル科感受性視物質の赤外分光解析
FTIR study of monkey blue-sensitive visual pigment
Yuki Nonaka, Kota Katayama, Kei Tsutsui, Hirono Imai, Hideki Kandori

Primates including human have three types of color visual pigments; blue, green, and red. Although these pigments contain the same chromophore molecule, 11-cis-retinal, different chromophore-protein interactions allow absorption of different colors. In color tuning, three factors are generally considered; (i) chromophore distortion, (ii) interaction between the protonated Schiff base and the counterion, and (iii) polarity around the chromophore. In this study, structural basis of color tuning in monkey blue-sensitive visual pigment was examined by light-induced FTIR spectroscopy. The color tuning mechanism of blue pigment will be discussed based on the FTIR spectral comparison with the other visual pigments.

2P246 In-situ 光照射固体 NMR によるパクテリオロドプシンの光動
In-situ light-irradiated solid-state NMR
Arisu Shigeta, Ryota Miyasa, Miyako Horigome, Izuru Kawamura, Takashi Okitsu, Akimori Wada, Satoru Tuzi, Akira Naito

Bacteriorhodopsin (BR) is an seven-helical membrane protein that functions as a light-driven proton pump and has retinal chromophore which forms two different configurations of all-trans (AT) and 13-cis, 15-syn (CS) with 1:1 ratio in the dark state, and changes to ~100% AT under photostimulation at 20°C. Using in-situ photostimulation SS-NMR and [1-13C]Tyr, [2b-13C]Retinal-BR, CS-like intermediate and N intermediate were trapped under green light illumination at ~20°C. Large structural changes between dark and light state were observed not only in retinal configuration but also in protein structure. These results gain insight into an essential role of CS state in proton pump function. At the presentation, trapping yield of N intermediate will be displayed.