Structure of G-protein couple Receptor (Rhodopsin)

Motoyuki Tsuda* (0004166), Masashi Nakagawa (0004172), Maiko Suzuki (0004175), Hiroshi Mukumoto (0004177), Naoki Shibata (0003018), Noritake Yasuoka (0003009)

Department of Life Science, Himeji Institute of Technology, Harima Scieence Garden City, Hyogo

G-protein coupled receptor is a key component involved in the biochemical pathway of intracellular signaling triggered by light and those by hormones or neurotransmitters and all the signal transduction systems appeared to have a similar molecular basis of action. G-protein coupled receptors show remarkable sequence similarities to each other and comprise a large family of genes (rhodopsin superfamily or G-protein coupled receptor superfamily) . At present more than 1,000 receptors have been isolated and sequenced. From hydropathy index devised by Kye and Doolittle, it is expected that G-protein coupling receptor is predicted to exist as a bundle of seven helicis . Though the projection structure of frog rhodopsin at 5 A resolution was obtained by electron cryo-microscopy and proved to be seven helices structure, there are no 3-D structure with atomic resolution.

Rhodopsin, visual pigments contain 11-cis retinal as their chromophore, covalently linked to a lysine residue in the apoprotein. Light isomerize the chromophore of rhodopsin from 11-cis to all-trans form which leads to the activation of a G-protein. Though the final photoproduct of vertebrate rhodopsin decomposed into retinal and opsin, that of invertebrate final photoproduct is stable at physiological temperature. This is the reason why we use octopus rhodopsin for stractual studies.

Several years ago we got several forms of crystals of octopus rhodopsin, which were too thin for diffraction experiment. Recently we got several cubic crystals of octopus rhodopsin ,which are expected for X-ray diffraction studies. The we proposed to use SPring8. This was the first time for me to use SPring8. Since visual pigments is light sensitive and keep cool. However, these condition were not available in the present condition. Moreover, our crystals were degradated. In spite of these unsatisfied conditions, we measured X-ray diffraction for these several crystals. Unfortunately, we could not get good results. However,these experiences were useful for next experiments.