Japan Geoscience Union Meeting 2012
(May 20-25 2012 at Makuhari, Chiba, Japan)

MIS28-03 Room:301A Time:May 20 16:09-16:24

Characterization of photosynthetic apparatuses from a new aerobic chlorophototroph discovered in microbial mats.

TSUKATANI, Yusuke[1*], ROMBERGER, Steven P.[2], GOLBECK, John H.[2], BRYANT, Donald A.[2]

[1]Dept. Biosci. Biotechnol., Ritsumeikan University, [2]Department of Biochemistry and Molecular Biology, The Pennsylvania State University

Most anoxygenic chlorophototrophs are strict anaerobes and can only grow and perform light-energy capture and conversion under anoxic conditions. The recently discovered thermophilic acidobacterium "*Candidatus* Chloracidobacterium thermophilum" is the first aerobic chlorophototrophic bacterium that has a type-I, homodimeric reaction center (RC). This organism and its type-I RCs were initially detected by the occurrence of pscA gene sequences, which encode the core subunit of the RC complex, in metagenomic sequence data derived from hot spring microbial mats.

Here, we report the isolation and biochemical characterization of the type-I RC and light-harvesting complexes from *Ca*. C. thermophilum. The RC complex comprised two polypeptides: the reaction center core protein, PscA, and a 22-kDa carotenoid-binding protein. The light-induced difference spectra of the isolated RC showed maximal bleaching at 840 nm, which is attributed to the special pair and which we denote as P840. The RC was photoactive even in the presence of oxygen. In combination with the spectroscopic measurements, HPLC and MS analyses revealed that the RC complex contained bacteriochlorophyll (BChl)-a, chlorophyll-a and Zn-containing BChl-a molecules. The possible functions of the Zn-BChl-a molecules and the carotenoid-binding protein will be discussed. Light-harvesting complexes, chlorosomes, were also isolated from *Ca*. C. thermophilum. Although *Ca*. C. thermophilum is an aerobe, energy transfer among the BChls in these chlorosomes was very strongly quenched in the presence of oxygen, as measured by quenching of fluorescence emission. Spectroscopic, biochemical, and structural analyses showed that the chlorosomes of *Ca*. C. thermophilum possess a number of unique features but also share some properties with the chlorosomes found in anaerobic photosynthetic bacteria of other phyla.