electron transfer cofactor we performed extensive ultrafast optical pump-probe experiments on different preparations of RC complexes from *Chlorobium tepidum*, revealing energy/electron transfer rates between different groups of pigments. Surprisingly, we found that ~3 out of 4 Chl *a* pigments do not transfer excitation energy to the BChl *a* antenna or to P840, which indicates that these pigments must be >20Å away from any other BChl *a* pigment and thus argues against the suggested presence of 4 Chl *a* in the reaction center core complex.

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Biochemical and structural characterization of Photosystems from Galdieria sulphuraria

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Red alga (Rhodophyta) is one of the most ancient eukaryotic algae and its photosynthetic apparatus is in a transitional state between cyanobacteria and higher plants. Under rhodophyta, cyanidiales are group of asexual, unicellular red algae which thrive in acidic pH (0.5 - 3.0) and high temperature (50 to 55^0C). Cyanidiales are classified into three genera, Cyanidium, Cyaniodioschyzon and Galdieria. Within cyanidiales, Galdieria has been a considerable debate among researchers about its systematic position and it's an outlier in terms of habitat, reproduction and sequence similarity. There is also considerable difference in photosystems of cyanidiales. In case of photosystem I (PSI), cyanidium has a monomeric PSI with an intrinsic light harvesting complex attached to it. Also, in photosystem II (PSII), different cyanidiales have different lumenal PSII subunits: Cyanidium has PsbV not PsbP, whereas PsbV is replaced by PsbP in cyaniodioschyzon. But there is only minimal knowledge of PSI and PSII in Galdieria. In our study, we addressed these questions by use of high resolution mass spectrometry to identify the different subunits of PSI and PSII in *Galdieria sulphuraria*. For structural and functional aspects of both photosystems, we had studied the isolated complexes by electron microscopy and time resolved fluorescence spectroscopy. Initial results from these studies showed that PSI is a monomer and there are several pools of red-shifted chlorophyll with potentially complex kinetic relationships. Our work is supported from grants of National Science Foundation (MCB-0417142).

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Direct Photoelectrochemical Energy Transfer from Chlorosomes at Biohybrid Interfaces

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The electrogenic capacity of light antenna structures derived from *Chloroflexus aurantiacus* under light stimulation were explored in this study. Chlorosomes, which are unique light antenna structures composed of bacteriochlorophyll-c oligomers encased in a lipid monolayer, initiate the photoelectrochemical energy harvesting process in green photosynthetic bacteria at high quantum efficiencies (>92%). Previous work by this group suggest chlorosomes could be exploited for their fluorescence properties to enhance conventional silicon photovoltaics. Recent work suggests that chlorosomes can be functionally immobilized on conductive substrates. However, to date, chlorosomes have not been demonstrated to directly transduce light energy in an electrochemical system. In this study, chlorosomes are characterized in customized electrochemical cells using various electrochemical techniques, such as electrochemical impedance spectroscopy, chronoamperometry, cyclic voltammetry. The results obtained from chronoamperometric experimental studies demonstrate that isolated chlorosomes decoupled from their reaction centers are able to generate a measurable photocurrent when irradiated with light. In addition, the results indicate that only chlorosomes in proximity to the electrode participate in bioelectronic energy transfer. Electrochemical charge storage densities, also known charge injection capacities in neuroscience, show that when light stimulated, chlorosomes under a variety of conditions, i.e in bacterial fragments coupled to the photosynthetic apparatus, uncoupled colloidal solutions, and adsorbed systems, increase the charge stored near the electrode. The clear demonstration of the electrogenic capacity of chlorosomes at a heterogenous biohybrid interfaces may facilitate innovation in green technologies to novel biomedical therapeutics.

2712-Pos Board B682

Living Optical Elements in the Vertebrate Retina

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While cells are mostly transparent they are phase objects that differ in shape and refractive index. Any image that is projected through layers of cells will normally be distorted by refraction, reflection, and scattering. Strangely, the retina of the vertebrate eye is inverted with respect to its optical function and light must pass through several tissue layers before reaching the light-sensitive photoreceptor cells, with each photon having a chance of being scattered. Here we report how nature has optimized this apparently unfavourable situation. We investigated the optical properties of retinal tissue and individual Müller cells, which are radial glial cells spanning the entire thickness of the retina. Using confocal microscopy, quantitative refractometry, and a modified fiber-based dual-beam laser trap, we found that these cells act as optical fibers and guide light, which would otherwise be scattered, from the retinal surface to the photoreceptor cells. Their parallel arrangement in the retina is reminiscent of fiber-optic plates used for low-distortion image transfer. Behind the Müller cells, there seems to be a specific adaptation of the rod photoreceptor nuclei for improved light transmission through the outer nuclear layer of nocturnal animals. These nuclei have an inverted chromatin structure that turns them into microlenses channeling the light through the ONL. These findings ascribe a new function to glial cells, demonstrate the first nuclear adaptation for an optical function, and shed new light on the inverted retina as an optical system.

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Recording of Electrooculography in photo phobia patients

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Abstract

Photophobia is the condition which in accompanied by lack of color perception in human beings. Color perception is one of the characteristics of visual system in human beings. Retina in visual system is responsible for this characteristic. Electrooculogram(EOG) which is an electrophysiological technique has a contribution from cone cells in retina. Therefore EOG was examined in photophobia patients to search the possible disability of color perception. Fifty photophobia were selected & Electrooculography test was examined for all patients. Arden index (AI) was recorded in the population. SPSS a computerized program was used to analyze the data. The result of present study shows fall in Arden index. It is already reported that EOG has contribution from cone cells in addition to Retinal Pigment Epithelium (RPE) in Retina. Therefore the color vision is slightly distorted in patients suffering from photophobia.

KEYWORDS: Photophobia, Electrooculogram, Color Vision

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The Influence Of Rhodopsin Chromophore Binding On Protein Biosynthesis Examined In Vivo

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Over 100 mutations in the rhodopsin gene are associated with retinitis pigmentosa (RP) and other retinal disorders. A subset of mutations found in the N-terminus of rhodopsin cause sector RP in which the lower retina is preferentially affected, suggesting that in these cases retinal degeneration (RD) is influenced by light exposure. One such example, P23H, is the most prevalent RP-causing rhodopsin mutation in North America. Recently we have developed X. laevis (frog) models of RP based on human and bovine P23H rhodopsin which demonstrate light sensitivity. In these models, dark rearing either partially or completely rescues RD. We have shown that the rescuing effect of dark rearing is associated with chromophore binding, since blocking binding also prevents rescue. Light exposure is associated with decreased expression of P23H rhodopsin and decreased transport of P23H rhodopsin to the rod outer segment, suggesting a defect in export of the mutant protein from the ER. In order to define the role of chromophore binding in the rescue of P23H-induced RD, we have performed an extensive characterization of light sensitivity in these models. We raised transgenic F1 tadpoles in varying intensities, durations and wavelengths of light and determined the influence of these factors on RD. Our results suggest that the rescuing effects of dark rearing are not mediated by increased chromophore availablility, but rather by increased stability of rhodopsin in the secretory pathway. Our results have significant implications for the design of molecular chaperone therapies for RP.

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Photoreceptor ABC Transporter ABCA4: Its Role in the Visual Cycle and Retinal Degenerative Diseases

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