An artificial sparsely tethered rod outer segment photoreceptor cell membrane with rhod(opsin) undergoes early steps of phototransduction process

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In the eye, in the retina the photoreceptor cells harvest light and initiate a cascade of reactions: the phototransduction process. The outer segment of a rod photoreceptor cell is a very specialized organelle built of parallel membrane discs that are densely filled with a G-protein receptor: rhodopsin. Rhodopsin contains a chromophore: cis retinal that after absorption of light isomerizes to the trans form and initiates the primary signaling pathway in visual perception. The structure and functions of dark-adapted rhodopsin and photoactivated opsin are well known and the purification and extraction protein are established, serving as a perfect model for biomimetic studies for understanding of the mechanisms of action of G-protein receptors, an important large class of membrane proteins.

Aim of this study is to fabricate an artificial membrane of the outer segment of a rod photoreceptor cell and test, at the molecular-scale, processes in the protein and the membrane involved in the cascade of reactions of the phototransduction process. Bcelles provide a perfect environment to introduce an active transmembrane protein into the bilayer core. A bicelle is a disc-shaped two-component lipid assembly that contains a core lipid bilayer and a rim made of a detergent lipid. Bicelles filled with rhod(opsin) were spread onto the gold surface to yield a model membrane with uniformly oriented membrane proteins. The early steps of the phototransduction process: the photoactivation, the binding of transducin G_t (G-protein receptor) and its biochemical activity were investigated using infrared spectroclectrochemistry and will be discussed in this talk.