Light induces lipid-raft-based molecular interactions in retinal disc membrane.

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Vertebrate phototransduction system requires the two-dimensional diffusion of photoexcited-rhodopsin and G protein transducin (G_t), and their specific association in retinal disc membrane to construct signalling-cascade. However, recent studies have suggested structural heterogeneity in the disc membrane and require in-depth examination of the behavior of these proteins.
We examined their diffusivities by single molecule imaging technique on a TIRF microscope, and found that rhodopsin and transducin reduces their diffusivities when they form light-dependent complex. Together with single-molecule observations, biochemical investigations revealed that this reduction occurs because of the lipid raft formation around rhodopsin dimer, which is stabilized by binding of G_t to photoexcited-rhodopsin. Our observation on light- and GTP-dependent diffusivity of S-modulin, a myristoylated Ca^{2+}- dependent inhibitor of rhodopsin kinase, revealed reduction of diffusivity of S-modulin upon light illumination. These data suggests the light-induced lipid raft recruits S-modulin to the vicinity of light-bleached rhodopsin and modulate phototransduction.