P-1.151

Light-responsive Asymmetric Membranes

Matilde Becheroni [1], Tsu-Wang Sun [1], Rumiana Dimova [1]

[1] Max Planck Institute of colloids and interfaces, Potsdam, Germany

Biological membranes are inherently asymmetric, with distinct lipid compositions between the leaflets, which is vital for many functions. We investigate the response of asymmetric membranes to light stimulation using giant unilamellar vesicles (GUVs) prepared via the inverted-emulsion phase-transfer method (DOI:10.1016/j.bpj.2024.05.031). This approach enables the controlled formation of asymmetric membranes and allow us to introduce the photoswitchable lipid Azo-PC into POPC membranes (DOI:10.1002/advs.202309864). The addition of Azo-PC provides photoresponsivity to the GUVs, as Azo-PC undergoes a reversible transition from its stable trans state to a metastable cis isomer under UV-A light, and back under blue light. Using phase-contrast, epifluorescence, and confocal microscopy, we demonstrate that photostimulation induces distinct morphological changes in asymmetric vesicles, including deformation and tubulation. The specific response depends on the amount and localization of Azo-PC.A key challenge lies in determining the distribution of Azo-PC between membrane leaflets and assessing potential lipid exchange during vesicle preparation. By integrating these findings, we aim to provide a comprehensive understanding of membrane dynamics and propose new light-controlled strategies for membrane remodeling, with potential applications in synthetic biology and cellular engineering.