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Lipid oxidation induces structural changes in biomimetic membranes†

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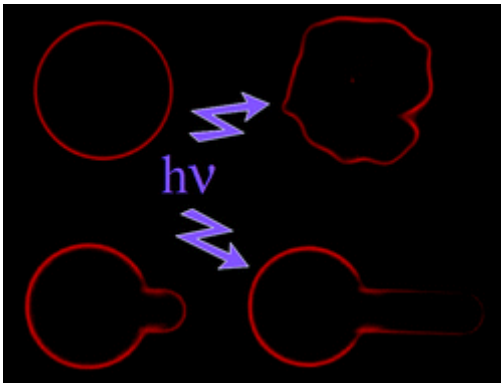
Abstract

Oxidation can intimately influence and structurally compromise the levels of biological self-assembly embodied by intracellular and plasma membranes. Lipid peroxidation, a natural metabolic outcome of life with oxygen under light, is also a salient oxidation reaction in photomedicine treatments. However, the effect of peroxidation on the fate of lipid membranes remains elusive. Here we use a new photosensitizer that anchors and disperses in the membrane to achieve spatial control of the oxidizing species. We find, surprisingly, that the integrity of unsaturated unilamellar vesicles is preserved even for fully oxidized membranes. Membrane survival allows for the quantification of the transformations of the peroxidized bilayers, providing key physical and chemical information to understand the effect of lipid oxidation on protein insertion and on other mechanisms of cell function. We anticipate that spatially controlled oxidation will emerge as a new powerful strategy for tuning and evaluating lipid membranes in biomimetic media under oxidative stress.



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