

## PROCEEDINGS

# Environmental Influences on Biological Membranes

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## ABSTRACT

Biological membranes play crucial roles in cellular functions, serving as dynamic interfaces that regulate the passage of molecules and signals between the cell and its environment. Understanding how these membranes respond to environmental stimuli is paramount in elucidating cellular adaptation and survival mechanisms. In this talk, we will present our recent studies on the structural and mechanical changes of biological membranes in response to two different environmental factors, including the presence of reactive oxygen species (ROS) and dehydration. Through systematic molecular dynamics simulations, we have revealed a dynamic interplay between membrane components, membrane mechanics and their surroundings. In the presence of ROS, lipid peroxidation modulates lipid bilayer mechanics in a peroxidation site-specific manner: peroxidation at sites in the bilayer interior disturbs and softens the membrane, whereas peroxidation at sites near the membrane-water interface results in a more ordered and stiffer membrane [1]. In response to dehydration, plants undergo galactolipid remodeling by converting monogalactosyl-diacylglycerol (MGDG) to digalactosyl-diacylglycerol (DGDG) and oligo-galactolipids, which protects the chloroplast membrane against dehydration by limiting membrane fusion and distortion [2]. Our improved understanding of the molecular mechanisms underlying these adaptations is pivotal for obtaining a comprehensive understanding of the intricate cellular signaling and adaptive processes in response to environmental cues.

## KEYWORDS

Lipid membrane; environmental stimulus; adaptation; lipid peroxidation; dehydration

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## References

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2. Chng, C. -P., Wang, K., Ma, W., et al. (2022). Chloroplast membrane lipid remodeling protects against dehydration by limiting membrane fusion and distortion. *Plant Physiology*, 188(1), 526–539.



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