Effect of temperature on membrane lipidome of Aurantiochytrium mangrovei

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Abstract

This study investigates the influence of culture temperature on the fatty acid composition of different membrane lipid classes and on the membrane molecular species composition in the heterotrophic protist *Aurantochytrium mangrovei*. Using liquid chromatography coupled with tandem mass spectrometry (LC-MS-MS) and corona discharge aerosol detector (LC-Corona) approaches, we analyzed temperature-induced changes in membrane lipid profiles. Results reveal that temperature fluctuations significantly impact the relative proportions of various polar lipid classes, suggesting physiological adaptations within cell membranes. These modifications in membrane lipid composition can lead to changes in membrane physical properties, such as fluidity, and may consequently affect essential membrane-related processes, including molecule transport, cell signaling, and protein-lipid interactions.

Notably, a phosphate-free membrane lipid class, M-glyceride, first discovered in *Aurantiochytrium* by Kaya et al. (2021), was identified. Its fatty acid and molecular species compositions were determined, providing new insights into the lipid diversity of this protist and confirming the presence of this unique lipid class. The potential of M-glyceride as a specific biomarker for heterotrophic protists will be explored in future research. The aim is to develop tools to identify and quantify these organisms in complex environmental samples, ultimately enhancing the understanding of their roles in natural ecosystems.
Furthermore, this study aims to determine the distribution of docosahexaenoic acid (DHA) among membrane lipid classes and identify its predominant molecular species. Results demonstrate that in most lipid classes, DHA is primarily associated with palmitic acid (16:0), which is the most abundant saturated fatty acid.

Keywords: Temperature, fatty acids, molecular species, membrane lipids, Aurantochytrium mangrovei, M, glyceride

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